

**GENERAL SIR JOHN KOTELAWALA  
DEFENCE UNIVERSITY  
SRI LANKA**

**CHALLENGES OF POST  
CONFLICT SRI LANKA**

**OUTCOMES OF SYMPOSIUM - 2011**

**18<sup>th</sup> -19<sup>th</sup> August 2011**

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## FORWARD

The enormous human and material cost of the separatist war in Sri Lanka during the last three decades hindered the economic development of the country. However, in 2009, Sri Lankan government forces were able to militarily defeat the Liberation Tigers of Tamil Eelam (LTTE) through its comprehensive counter terrorism/ counter insurgency measures taken on par with other humanitarian efforts. Following the end of LTTE violence, the necessity to effectively deal with the root causes of terrorism and restore enduring peace has become the top most priority of the nation.

General Sir John Kotelawala Defence University as the leading establishment in the country, blending academics and the profession of arms has well comprehended the needs of contemporary Sri Lanka. This is reflected in the choice of theme for the Annual symposium 2011: “*Challenges of Post Conflict Sri Lanka*”. The organizing committee, under the guidance of the Vice Chancellor Major General Milinda Peiris, planned this two day symposium, complete with Plenary Sessions and Technical Sessions under five selected themes that are significantly linked to the economic development of the country in the post conflict era. These areas are,

1. Defence
2. Engineering and other technical sciences
3. Law, International relations and Humanities
4. Social Sciences
5. Medicine

This year’s symposium was upgraded to an international level forum where foreign scholars including expatriates of Sri Lanka and other overseas researchers shared their experience with their peers in defence establishments, universities and other research organizations. The plenary sessions presented an overview of the respective session by an eminent scholar either from home or abroad. Each of the plenary sessions was chaired by a reputed figure in the respective field.

Under this arrangement, Mr. Gotabaya Rajapaksa Secretary to the Ministry of Defence, chaired the Defence Session and facilitated the plenary speakers to make their presentation with the appropriate alignment to the symposium theme. In this plenary session Prof. Rohan Gunaratne – an International Terrorism Analyst, presented a paper on “Post War LTTE Structure: The Threat and Response”. Thereafter, Major General (Retd) GA Chandrasiri presented a paper on “Integration of Armed Forces in Development Efforts of Post Conflict Sri Lanka”. The third speaker, Prof. Alan I Hatcher from

United Kingdom, presented a paper on “Role of Armed Forces in Post Conflict Scenario: Lessons for Sri Lanka”. Major General Javed Iqbal Ramday from Pakistan followed with a paper on “ The Role of Armed Forces in Post Conflict Sri Lanka: Lessons Learnt, from a Regional Perspective. Finally Ms Mara E Karlin (USA) presented a paper on “The Role of Armed Forces in Post Conflict Sri Lanka: Lessons Learnt from a Global Perspective”.

The two plenary sessions of International Relations, Humanities and Law and Social Sciences were chaired by Hon. Dr. Sarath Amunugama - Senior Minister, International Monetary Cooperation. In the Plenary Session of Law and Humanities, Mr. Gomin Dayasiri, a Senior Lawyer presented a paper on “Constitutional Reforms in Post Conflict Sri Lanka: A Prospective Analysis of Sri Lanka’s Constitutional Changes”. Thereafter, Mr. Mohan Peiris - the Attorney General presented a paper on “Constitutional Reforms in the Post Conflict Sri Lanka: Problems and Issues of Sri Lanka’s Constitutional Changes. Under the social sciences, Dr. Ranjith Bandara, Chairman, Sri Lanka Foundation Institute presented a paper on “Social Integration and Economic Development. The next speaker, Prof. Shantha Hennayake’s paper on attitudinal changes as a necessary condition for national level social integration in Sri Lanka drew the attention of the audience on the needs of societal change in the present context of Sri Lanka.

The medical plenary session where four speakers presented papers was chaired by one of the eminent scholars in the medical field: Prof. Carlo Fonseka. In this plenary session, the first speaker was Prof. Nimal Attanayake of the Department of Economics University of Colombo. He presented a paper on the “Role of Health in Economic Development”. Dr Kumari Nawaratne, Public Health Specialist, World Bank, presented a paper on Health and Economic Development : Problems and Prospects. The third speaker in the medical session was Prof. Susirith Mendis, the Vice Chancellor of the University of Ruhuna, who presented a paper on “Medical Ethics - Some Concepts, Issues and Trends”. The final speaker Palitha Fernando, Additional Solicitor General, presented a paper on “Ethical Aspects in Practicing Medicine” in Sri Lanka.

After the plenary sessions and the research papers submitted by local and foreign scholars, many other scholars presented their research in the respective technical sessions under three consecutive parallel sessions in the selected sub-themes under the umbrella theme of Challenges of Post Conflict Sri Lanka. Over sixty research papers were shared with peer reviewers of the respective technical sessions who attended the forum. The discussions in the technical sessions, under the guidance of the session chairs, helped the presenters to filter their conclusions before finalizing the research papers.

This Outcomes Report of the symposium includes the summary of each plenary session and the technical presentations under each of the sub-themes of the symposium. Many of the full papers of the plenary sessions and the technical sessions are also published in this report. Selected papers will be reviewed by a subject specialist of the respective discipline and will be published in the KDU Defence Journal.

Editor



## WELCOME SPEECH

### **“KDU as a Pioneer in Military Education Looks Forward with its New Programs”**

Vice Chancellor of General Sir John Kotelawala Defence University Major General Milinda Peiris

RWP RSP USP ndc psc

Ven. Clergy, Hon. Minister of External Affairs Prof. GL Peiris, Secretary to His Excellency the President Mr. Lalith Weeratunga, Secretary to the Ministry of Defence and the Chairman of the Board of Management of KDU Mr Gotabaya Rajapaksa, Secretary External Affairs Mr Karunathilake Amunugama, Your Excellencies, Chief of Defence Staff, Commander of the Army Commander of the Navy, Commander of the Air Force, Inspector General of Police, Vice Chancellors of other universities, Distinguished invitees, Senior Officers, international scholars, scholars from other universities and institutions, ladies and gentlemen,



*Vice Chancellor Major General Milinda Peiris addressing the Symposium gathering (IMG\_1663)*

As the Vice Chancellor of General Sir John Kotelawala Defence University, I have the honour and privilege to welcome all of you to the fourth Annual Symposium 2011 on the theme of *Challenges of Post Conflict Sri Lanka*.

The year 2009 changed the paradigm for the country, with Sri Lanka’s unprecedented victory over the apparently invincible surge of terrorism that had engulfed the nation for thirty long years. This was a

victory achieved mainly due to the foresight and visionary leadership of H.E. the President Mahinda Rajapaksa. The other contributory factors were the relentless and resolute leadership of Secretary Defence Mr. Gotabaya Rajapaksa; the valour, courage, and determination of officers and soldiers of the tri-forces, Police and civil defence force; and the moral support extended by all patriotic peoples of the country irrespective of ethnic, religious or other differences.

In this period of massive transformation, Kotelawala Defence University too assumed a prominent role in a resurgent Sri Lanka. Ladies and gentlemen, I am humbly proud to announce that in the recent past, with the blessings of H.E. the President, and particularly with the dynamic leadership of the Secretary Defence Mr Gotabaya Rajapaksa and the cooperation and encouragement extended by all members of the Board of Management, the University has been able to take a giant stride forward; and the achievements of the university during the last couple of years have been quite phenomenal. Every attempt has been made to enhance KDU to be a centre of excellence in military education and other relevant disciplines. The establishment of new Faculties of Medicine and Law, the revision of curriculums to address new demands, expansion of the scope of KDU courses to offer Masters' and Doctoral degree programmes, opening up opportunities for non-military students to follow KDU courses, enhancement of human resources and infrastructure facilities such as the KDU teaching hospital with all modern facilities are among them to name a few. The university is now on its way to assume a leading role in the country's tertiary education to fulfill the contemporary demand of building a society fortified with knowledge to face new challenges in the post conflict scenario. I, as well the staff of KDU, am quite confident that we, as a university, are capable of becoming one of the best universities in the country in the years to come. This year's symposium bears ample testimony to the new role assumed by this Defence University as I mentioned above.

Even though we are confident that our motherland is back on track for a glorious future as a peaceful nation – a future in which all communities will live harmoniously together - we are not without challenges ahead of us. It is true that we will not encounter the traumatic experiences that we were used to experiencing in our daily lives a few years ago. But, there are envious, yet invisible, forces from within and without operating to unsettle the stability we have achieved through great sacrifices. Hence, we should constantly be vigilant of such threats and always be ready to counteract and foil such attempts. Herein, we must have the foresight to intelligently reexamine the future role of our armed forces.

Further, the contemporary socio-cultural, geopolitical, and economic realities of the world make matters even more complicated. They make it difficult to foresee entirely the gravity of problems faced by emerging nations like ours. That is why we need to assess and reassess our strengths and weaknesses alike in all fields of expertise to forge ahead to achieve our dream world of prosperity. Therefore, we do not have the luxury of being complacent in the face of the victory achieved. We, as a unified nation, must strive hard for further victories in economic, social, cultural, scientific, and technological spheres that can contribute to the post conflict developmental efforts aimed at making Sri Lanka the “Wonder of Asia”, while focusing on reconstruction, rehabilitation and reconciliation as major areas of interest in the nation building process.

I believe that our armed forces have a major responsibility in this nation building process too. Hence, we have already begun the necessity of reshaping and redefining the role of our armed forces to suit this new scenario. Ladies and gentlemen, one of the greatest advantages Sri Lanka has today is that we possess one of the most professional armed forces in the contemporary world. We should harness this great human resource with unparalleled and versatile skills, great expertise in diverse fields of specialization and remarkable potential for innovation for the development efforts of the nation. Already, the country can witness their contribution in the reconstruction and rehabilitation process in the north and the east. This, I believe, should be planned and meticulously executed considering possible future threats for peace, sovereignty and territorial integrity of the nation. Thus, I am of the view that in this symposium we should pay serious and focal attention to reshape and redefine the role of the armed forces in the post conflict era to enable the country to march towards success.

With all these issues in mind, we invited intellectuals, scholars, researchers, military leaders, professionals, expatriates, political authorities and the business community to take part in the present symposium. The idea is to enable all of them to share their knowledge and expertise in diverse fields, which I believe is essential to steer the nation towards our cherished goal of a developed nation – a target we need to achieve sooner than later.

Ladies and gentlemen, I am glad to mention on this occasion that the response towards our request from our sister universities and other academic and professional bodies has been excellent. Out of hundreds of academic papers more than 75 papers selected by a well-qualified panel of reviewers will be presented tomorrow in five technical sessions. Equally, we have organized five plenary sessions where eminent national and international scholars will address the symposium on sub themes that come under the overarching symposium theme. Further, these sessions will be chaired by eminent

scholars and personalities in relevant fields. And so, I am sure that KDU Symposium 2011 will pave the way for an awakening of intellectual activities in the country, which will be of paramount importance to face novel challenges in order to set and achieve new goals in the country's forward march.

In conclusion, I wish to welcome, once more, all the national and international dignitaries, presenters, and participants who are here today. Let me especially welcome with gratitude Maj General Javed Iqbal Ramday of Pakistan Army, Mr Mobirar Rabani from Qatar, Prof Alan I Hatcher from the UK, and Ms Mara E Karlin from the USA for coming all the way to Sri Lanka to take part in our Symposium. I hope that the deliberations in this symposium will be beneficial for all parties concerned, and will help uphold the Sri Lankan nation as a country that befits its rich 2500 year old culture. Like the legendary phoenix that emerges from the ashes, Sri Lanka had emerged from dark eras time and again in the past, and this time around we should emerge with a determined effort with redefined strategies to face future challenges.

May the Symposium 2011 be a productive one for all participants, and may its deliberations be useful for the future of our nation!

Thank you.

## KEYNOTE ADDRESS

### “Emerging into the Promise of the Future”

Hon Prof. GL Peiris, Minister for Foreign Affairs

#### *Summary*

*Hon. Prof. GL Peiris, Minister for Foreign Affairs, an eminent scholar with academic and professional experience in the area of law and diplomacy, was invited to present the keynote address of this symposium. In the keynote address Prof. GL Peiris shared his views on the role of armed forces and its transformation within the contexts of war time, humanitarian operational environment and finally during the time of transition from conflict to peace. In his presentation Prof. GL Peiris referred to the humanitarian operations and their background, and said that the operations were carried out with minimal harm to the civilian population. He also gave attention to the Darusman Report on Sri Lanka and mentioned that it is neither an official document by any means, nor has it any kind of legitimate nexus with any UN organ. The key note address also touched upon the major issues of post conflict Sri Lanka. Thus, the address by Prof GL Peiris’ was able to set the stage with necessary conditions for the symposium to proceed with a good momentum.*



*Hon Prof. GL Peiris, Minister of Foreign Affairs, addressing the Symposium Gathering (IMG\_1667)*

Before I address the manner in which the armed forces should respond to contemporary challenges, I would like to say a word about the singular contribution that was made by the armed forces during the period of the conflict. The Vice-Chancellor of the Kotelawala Defence University told us that the victory that was achieved was not something that was contemplated by anybody. Indeed, it was thought to be well-nigh impossible. It became a reality because of the combination of several circumstances; the political leadership of His Excellency Mahinda Rajapaksa, the dedication and perseverance of Mr. Gotabaya Rajapaksa, the perfect rapport between the political and the military leadership, the provision of adequate resources to make victory possible, the handling of Sri Lanka's international relations with particular finesse, with particular reference to the relationship with India, and also the ability of the President in handling domestic issues as to ensure that the continuing support of the people of Sri Lanka was available for the war effort. It was the coming together of all these elements that accounted for a victory that was considered not merely difficult but virtually impossible. It is important to note that during the whole of that period the armed forces were expected to play a very unorthodox role.

### **The Challenge**

In military history the victor is expected to demonstrate certain qualities and capabilities. In our situation what was expected of the armed forces was fundamentally different. It was an initiative that was directed towards the liberation of an oppressed people. In many comments that are made about the circumstances which existed during the period of conflict, it is easily forgotten that this was one of the largest and most serious hostage situations ever recorded in contemporary military history. We were dealing with more than three hundred thousand people held hostage by a terrorist organization, people who were striving to come to government controlled areas where all facilities - food, health, rehabilitation - were available to them. Large numbers lost their lives in the process. The terrorist group was endeavouring to retain them as human shields, forcibly making them dig trenches and perform services of various kinds - not spontaneously - but very much against their will. No government worth its salt can possibly acquiesce in such a situation. It was the indisputable duty of the government to intervene effectively in that situation to make it possible for the people who were being held hostage to enjoy freedom.

There are allegations in the Darusman Report that there was a deliberate attempt on the part of the government of Sri Lanka, with the connivance of the armed forces, to starve the civilian population. That is an extremely grave allegation. It involves penal liability under several international

instruments including the Geneva Conventions. Let us, for a moment, dispassionately and objectively examine the facts. The government was sending food to the affected areas. This is probably the only instance in history when a government was feeding the terrorists. We were sending food, medical supplies and other necessities of life to the affected areas on the basis that it is the duty of the government of Sri Lanka to look after all its people. We were paying public officials in those areas, who found themselves compelled to carry out the instructions of the terrorist group.

When food was being sent to the North, the terrorist group took action to close down the A9 highway. The government did not then say that that this is action the LTTE had taken, and therefore there was nothing the government could do about it. We did not adopt that attitude. We found alternative ways of getting food across to the people of the North. Ships were used to convey food and medical supplies by sea. The ships were then attacked and several ships were indeed sunk, the government then made arrangements within the North and the East to collect food, often at the expense of other communities in the area, to make essential supplies available to the people of the North, notwithstanding the attempts that had been made by the LTTE to deprive the people of the North of the food which they required for their sustenance. The government did not give up when one method proved impossible, the government strained every sinew to conceive of other modalities for bringing food within reach of the people of the North.

### **The Darusman Report**

It is not in anger, but with deep sadness, that I remind you that in the Darusman Report there is a paragraph in which they say that there were individual members of the armed forces who came to the rescue of civilians, some of them very old; the armed forces saved those who were wounded and struggling across the waters of lakes and lagoons in order to reach safety. But this credit is given not to the armed forces collectively, or as an institution, but to individual members of the armed forces. There are many features of the report which indicate beyond any doubt whatsoever that it is a biased document, and it is a document that was prepared for a political purpose. This is one clear illustration. Even though the visual evidence is very clear - there are photographs of members of the army risking their own lives to help innocent civilians reach safety, the clear impression created in the report is that these are acts of good Samaritans rendering some form of service in the midst of demons who personify wickedness.

I want to take a few moments to comment on the sequence of events. The Secretary-General appoints a panel solely to advise him, and repeatedly assures the government of Sri Lanka, and indeed the international community, that this panel is appointed only for an advisory purpose. It is a fiduciary relationship between the Secretary General and his advisors. The Panel then submits their report to the Secretary General. The Panel says in the report that they have prepared the report in a manner that is appropriate for publication. The Secretary-General did not ask them to prepare the report in that form. And if the purpose of the panel was simply to offer advice to the appointing authority, it is difficult to understand why the panel should take it upon themselves to prepare the report in a manner that is appropriate for publication. They say so categorically and explicitly. What is more, the panel travelling completely outside their mandate makes the recommendation to the Secretary-General that their report should be submitted to the Human Rights Council in Geneva. That is not their business at all. Their business is simply to advise the Secretary-General. It is for the Secretary-General to decide what he proposes to do with the report. It is certainly not the function of the Panel to decide what should be done with their own report.

In any case, it would be grossly improper and wholly indefensible for this document to be submitted to the Human Rights Council for its consideration because it is not an official UN document; it has no nexus of any kind with any legitimate UN organ, be it the Security Council or the General Assembly. It is therefore entirely inconsistent with the applicable law and practice for any part of this report to be taken into consideration by the Human Rights Council, and that would constitute a very unsound and indeed dangerous precedent. This should be of concern not only to Sri Lanka but to the international community in general.

### **Continuing Challenges**

That was the role of the armed forces at the time. It was characterized by empathy, by compassion and by a desire to give freedom to a segment of the people of Sri Lanka who had been deprived of the rudiments of that freedom for a long period. That unhappy era is now gone. It has gone forever. But, as the Vice Chancellor of the Kotelawala Defence University very rightly pointed out, the challenges are not over. There is no room for complacency. It is wholly unrealistic to make the assumption that all our challenges are behind us.

### **The Progress**



Today, the groups that are close to the forces of terror know full well that what has occurred in this country culminating in the events of May 2009 is indeed irreversible. What is happening now is that these forces are transferring their initiatives from the arena of battle to the field of international action. This is a segment of the diaspora that is determined to prevent the government of Sri Lanka from moving rapidly to bring prosperity and stability in particular to the people of the North and to distract the government from its efforts; to keep us continually and consistently embroiled in counter measures to deal with problems that they are contriving to create on a daily and weekly basis. That is the pith and substance of the economic onslaught that these forces are now engaged in against the people of this land.

There is no need to be on the defensive at all. There is much that is positive from which we can justifiably derive strength and confidence. As at the end of the first quarter of this year, the economy of Sri Lanka is growing by 7.9%. Our foreign reserves are at the unprecedented level of almost 8 billion US Dollars. Inflation is controlled at approximately 5%. We have been able to bring down the poverty threshold from 12% to 8% during the period of President Mahinda Rajapaksa's administration. The unemployment rate in Sri Lanka is just 5%.

Let us consider the magnitude of the achievements during the last few months. Before the end of the year the process of resettlement will be completed. Two and a half years ago there were 297,000 people who had been displaced. Today the figure is less than 10,000, and before the end of this year all of them will be resettled. No camp will exist. 95% of schools in the Northern Province are now functioning. Hospitals, clinics, medical services are freely available. 90% of the lands in that area are now cultivated. There are no restrictions whatsoever on fisheries, and it is now a thriving industry. The waters of the North are replete with fisheries resources, and the fishermen in that part of the country are now able to engage in their livelihood without any form of impediment or constraint.

## **The Future**

What is more, all of this has been done not on an ad hoc basis but in a systematic and structured way. We have begun at the grass roots level. Consider the extent of availability of micro-credit to the people of the North. Figures are available, and I propose to present them to the diplomatic community next week - the quantum of money which has been lent by banks in the Northern Province, the extent to which these resources have resulted in generation of employment, and the

resuscitation of the economy of the North and the percolation of these benefits to the grass roots level.

This has been reinforced and supplemented by a variety of mega projects, the main purpose of which has been to enhance connectivity in that part of the Island. With the assistance, principally, of the government of India, major rail road systems have been constructed in that part of the country. The government of China has played a major role in assisting us with regard to the development and the reconstruction of highways and roads in the North. The Government of India, UN HABITAT and the Asian Development Bank have assisted us in the construction of houses. All of this is happening under the aegis of a carefully formulated programme which is being rapidly implemented, and the dividends which that programme is yielding are going to the northern part of Sri Lanka for all to see in an environment in which we have been able, in addition to the economic initiatives, to successfully reactivate the electoral process.

### **Role of the Armed Forces**

There is talk of militarization of the North. We were told that the elections were going to be a sham because the army was going to prevent the elections from being just and fair. The outcome speaks for itself. It needs no embellishment or embroidery. The outcome is that parties which are not with the government won many of these elections. That, in itself, convincingly dispels the whole fog of prejudice that has been built up, without any basis whatsoever against the intentions of the government of Sri Lanka.

Major General Milinda Peiris spoke of a new role for the armed forces in the situation which has now manifested itself in our country. There is a transition that is taking place, involving adaptation to changing circumstances. I would suggest to you that the new role of the armed forces has two dimensions: an internal dimension and an external dimension. If we may dwell briefly on the internal aspect, I think the armed forces have a significant role in facilitating, with the minimum of pain and discomfort, the transition from conflict to the era of peace and tranquillity which has happily arrived for our motherland.

That is a potentially difficult period because you are leaving behind the trauma of the past, and you are emerging into the light and promise of the future. There is the potential risk of turbulence and unrest. The armed forces have a specific role in ensuring conditions of serenity in order to make the

transition as easy as possible for the people who inhabit the affected areas. The armed forces also have a crucial role to play with regard to development, particularly with respect to the development of infrastructure. I want to tell you that, among the institutions in this country which have won the respect and confidence of the people, the armed forces occupy a pre-eminent position.

One of Sri Lanka's inherent strengths over the ages has been the durability of our institutions. Today, without fear of contradiction, it can be asserted that the armed forces are one of the major institutions in which the overwhelming majority of the people of Sri Lanka repose a high degree of confidence. Therefore, as we rebuild our infrastructure, as we improve the lot of our people, as we enhance connectivity giving our farmers access to markets and enabling civilian lives to return to a threshold of normalcy as rapidly as possible, there is no way that the armed forces can relieve themselves of these crucial obligations. I also suggest that the armed forces have a role to play in promoting a culture of harmony in those areas, encouraging different communities speaking different languages, professing different religions, coming from different cultural backgrounds to work with each other productively in a spirit of amity and goodwill. The armed forces have a role in assisting in the creation and strengthening of structures conducive to the accomplishment of that objective, bringing communities together, at a time of healing, a period of rapprochement.

The armed forces also have duties to perform with regard to ensuring conditions of order and stability in which the revival of the electoral process can take place. To my mind, the most heinous thing that the LTTE did was to decimate the legitimate democratic Tamil leadership, thereby creating a vacuum which now needs to be refilled. The suffrage is pivotal; it is the source of all democratic rights and freedoms. It is a fundamental right which the people of the North were deprived of for so long with relatively little protest from the people who are now crying out from the roof tops about imaginary transgressions. That is the internal aspect of the role that the people of this country expect of the armed forces at this juncture in our contemporary history.

To turn now to the external dimension, that is no less significant. The discharge of this cluster of obligations by Sri Lanka's Armed Forces has won the recognition of the international community. The Navy, in particular, has played a magnificent role in mitigating the problems that are arising from illicit immigration to other countries such as Australia, Canada and possibly New Zealand. I have had discussions on this matter with many of my counterparts in foreign governments when I met them recently at international gatherings, most recently in Bali, Indonesia and also at the Shangri-La dialogue in Singapore. The representatives of these countries have expressed warm

appreciation of the vigorous action that the Navy has taken, which resulted in these problems becoming much less acute than they would otherwise have been. Illicit immigration is creating problems of major magnitude in these countries - problems connected with law and order, and social unrest. There were vessels like Sun Sea, Ocean Lady and most recently the vessel Alicia which was detained a few weeks ago by Indonesian authorities in their waters. These are matters in respect of which there is a challenging role for the Sri Lankan Navy to play, and that role has been played by the Navy in a manner that won the unqualified approbation of countries which would have been made vulnerable by the consequences of illicit immigration.

Do not forget that in comparable situations in other parts of the world, including South East Asia, there has been a major problem connected with the proliferation of small arms during the period of transition from conflict to stability. These are problems which have been minimized or have not existed at all in our own country.

You are aware that terrorist groups do not work in isolation. They have linkages. We have seen to it that our territorial waters, the Gulf of Mannar, the Cauvery Basin, have not been used by terrorist groups to work in concert in pursuit of their pernicious objectives. With regard to refugee problems, in respect of the prevention of collaboration among terrorist groups, with regard to ensuring the security of sea lanes and the integrity of transnational commerce, and the prevention of proliferation of weapons, in all these areas the armed forces of Sri Lanka have performed yeoman service not only to the people of Sri Lanka but to the countries of the region and, therefore, more broadly to the international community.

These are the current challenges and, having regard to the range and the quality of the responses thus far by the armed forces of Sri Lanka, I would submit to you that there is an unassailable basis for confidence with regard to the ability of our armed forces to deliver the results which are expected of them by the people of Sri Lanka.

Before I conclude, I want to make some general observations about contemporary developments, and I believe that the Kotelawala Defence University is the proper forum to make those observations. Consider some of the things that are happening in the world around us. I think it is time for the international community to reflect on these developments and their implications. We are convinced, as a government, that at the end of the day, problems, however complex they may be, have to be resolved in a manner that is compatible with the culture, traditions, and cherished beliefs of

the people of the country in question. That is absolutely essential if you are interested in sustainability of the solutions that are put in place.

Under the leadership of His Excellency the President and Mr. Gotabaya Rajapaksa we accomplished something which the world thought impossible. It is not the first time that was attempted, that had been attempted repeatedly in the past, but the lesson to be learnt from the entire sequence of events, is that these are problems which cannot be solved simply by the intervention of external forces. Of course, we want assistance from outside. However, it is the elected government of the country and the people of the country who should be in the driving seat. It is they who must direct the process and make the crucial decisions. It is not possible for other countries to come in, entertaining the entirely unrealistic hope and expectation of putting things right instantly and then moving out.

People who resort to such actions forget that the countries which they are entering have a history of their own. There is a structure that imparts cohesion and stability to the social order. It is easy to come in; it is much more difficult to move out. That is why an exit strategy has proved to be excruciatingly difficult. What do you then do? Once you move in, what are the limits of your intervention? You get embroiled in internecine conflict. You support one group against another. Where does that assistance stop? If arms are supplied, who will be the recipient of these arms, and what is the control those who provide the arms will be able to exercise over those who receive the arms? What is the guarantee of law and order and stability? Does regime change, when it is brought about, assure finality and stability, or is it merely the precursor of fresh - and seemingly intractable - problems which consume the energies of the nation for decades? The really crucial question, at the end of the day, is - Are things better for the people of the countries concerned, as a result of the intervention, or are they in fact worse? All of this is done in the name of the wellbeing of the people of those countries. And if that is the governing criterion and if you apply that criterion honestly and consistently, and then in your own conscience you examine the question whether the condition of the people of those countries has improved or deteriorated in consequence of the intervention, the answer is at best highly equivocal.

### **Request to the World Communities**

There is also the question of reactions within those countries which are responsible for the interventions. We have seen very vividly in recent weeks some of the expressions of opinion in those countries with regard to these interventions. We live in a world where financial resources are by no

means infinite, all over the world including in some of the wealthiest and most powerful countries. Now we see in the most graphic images the reaction from disenchanted sections of the community. If the aged are to be deprived of heating in winter, if education is going to cost much more than it did earlier, if problems with regard to unemployment are to become more acute, and the capacity of the state to assist vulnerable segments of their communities to deal with pressing problems with regard to health, education and welfare is to be greatly reduced, if scarce resources are to be utilized for aggressive intervention in other countries, does such a policy seem to the public of the countries in question to reflect a sound and defensible scale of priorities? These issues would appear to be integral to the ensuing debate.

The third and last point I want to make is the absolute need for consistency in the application of norms and standards of international law and practice, i.e. the minimum and irreducible condition of credibility. There are no political nuances or degrees of terrorism. Terrorism, whatever its objective, is to be condemned with equal vehemence. It is not possible to have gradations within the spectrum of terrorism. If you have standards which are obviously not uniform, then there is an insurmountable problem of invoking international law as the source of intervention.

I will cite one example of this. There have been situations in military history in recent times where governments have had to deal with terrorist groups that mingle with civilian populations. What are the acceptable limits of government action in these situations? The purpose of the insurgents, obviously, is to impose constraints and limitations on the capability of the State to deal effectively with terrorist groups. This situation was encountered in the West Bank and Gaza and was the subject of considerable comment in the report prepared by Justice Goldstone. The response to that report was the following; H.E. Hillary Clinton, Secretary of State of the United States in formal testimony before Congress, said that if these norms which are being prescribed by Justice Goldstone are to be regarded as binding on governments dealing with terrorism, then the governments will be very seriously handicapped. You are stultifying these governments. You are crucially circumscribing the scope of legitimate action. This point was made very persuasively by the Secretary of State of the United States.

The question which we would like to ask is, how it is possible to refrain from applying this principle to the circumstances which manifested themselves in our own country? If the principle is valid in relation to Gaza and the West Bank, it clearly applies with even greater force to the situation in Sri Lanka. In Sri Lanka, it is not by coincidence or by virtue of geographical circumstances that the

civilian population happened to be physically with the terrorists. The terrorists compelled the civilian population at gun point to remain with them; women and children were shot dead when they tried to escape to government controlled areas. If the articulation of the Goldstone principles is thought to be inimical to the war against terror, then why are these principles selectively imposed only on smaller country with limited resources? Is that right? Is that fair? Is that in the interest of vanquishing the forces of terror in the world at large? That is the question which, as Foreign Minister of this country, I would like to pose to the international community.

I hope that some of these issues will engage the attention of the exceedingly competent participants drawn from different strata of society who will be involved in the deliberations that will take place in this hall during the next few days.



*Coffee Room Discussion after the Inaugural Session (IMG\_1687)*

## EXECUTIVE SUMMARY

### “Challenges of Post Conflict Sri Lanka”

The annual symposium 2011 of General Sir John Kotelawala Defence University is an unparalleled academic forum. The selected theme of the symposium is very timely and important in enlightening all stake holders on the necessary conditions for development, and in stimulating research for further studies in the different dimensions of socio economic and political conditions of a post conflict Sri Lanka. This symposium is also very beneficial for the KDU as the highest academic institution in the defence structure of the country.

After looking firstly, at the thirty years of disastrous war that ravaged the country for more than half the period since its independence in 1948; secondly, at the humanitarian operations in the latter part of the period of war that brought peace to the country; and finally, the socio economic and technological potential that Sri Lanka has, KDU selected “Challenges of Post Conflict Sri Lanka” as the theme of its fourth annual symposium.



*Participants registering for the Symposium (IMG\_1605)*

To open the proceedings, the symposium was inaugurated with the key note address. The defence sessions covered the overview areas as well as indepth analyses of national defence in the post conflict period. The engineering sessions addressed the role of engineering sciences in dealing with issues in the post war Sri Lanka. The social sciences and humanities took up legal issues and socio economic issues of the country after defeating terrorism militarily. The medical session focused on



the North and East drew the attention of the audience to medical and legal ethics of medical profession.



*Salute to War Heroes with Two Minutes Silence (IMG\_1643)*

Hon. Prof. GL Peiris, the Minister for Foreign Affairs, an eminent scholar with academic and professional experience in the area of law and diplomacy, was invited for the keynote address of this symposium. In the keynote address Prof. GL Peiris shared his views on the role of armed forces and its transformation within the contexts of war time, humanitarian operational environment, and finally, during the time of transition from conflict to peace. In his presentation Prof. GL Peiris referred to the humanitarian operations and their background and reiterated that the operations were carried out with minimum damage to the civilian population, and that the Darusman Report on Sri Lanka is neither an official document by any means, nor has it any kind of legitimate nexus with any UN organ.

The Defence Session which kicked off the proceedings included speakers from various countries and fields with a defence focus. Prof. Rohan Gunaratne, a defence analyst, presented a paper on the LTTE threat and response in the post conflict scenario and took the audience through LTTE's continued ideological stratagems in the international arena, and its possible impact. He was of the view that it was an issue that needed more vigorous concern at diplomatic level. He stressed the need to find a counter mechanism for LTTE ideological propaganda with the support of the international, governmental and nongovernmental organizations. He further emphasized the importance of productive communication and recommended a strategy at all levels in both national and international

scenarios that could prevent LTTE or other similar threats to national interest, sovereignty and integrity of Sri Lanka.

Maj Gen (Retd) GA Chandrasiri, Governor of the Northern Province, presented his views on the importance of integrating the armed forces into the economic development of Sri Lanka in the post conflict period. He further proved how such integration is important in future development programs in the North and East.

Maj Gen Javid Iqbal Ramday of Pakistan recommended the continued engagement of armed forces in post conflict Sri Lanka until the return to normalcy. He explained the need for the involvement of the armed forces to provide different services, such as construction and resettlement, as the civil administration may not be able to provide such services effectively immediately after conflict. However, he stressed that, with time, civil administration must be increased along with a gradual reduction of armed forces in the areas of civil administration.

Prof. Alan Hatcher echoed the view on the integration of armed forces into development programs which would enable the utilization of training and skills of Sri Lanka's well-trained troops while maintaining security. Referring to the role of armed forces and the responsibility of the international community, he said that the Darusman report cannot be accepted as there is no factual evidence to prove its allegations against Sri Lanka.

Taking a different view, Mara E Karline in her paper emphasized the reduction of the armed forces as a small economy cannot run a larger army. In response, the Chairperson of the session, Mr. Gotabaya Rajapaksa, explained that when one looked at thirty years of disastrous war which cost all communities in Sri Lanka, especially those in the North and East of the country, and which would have a deep impact even on future generations, need to be carefully dealt with a view to prevent the recurrence of such disasters. Further, he drew attention to the need for careful consideration of the ramifications of immediate reduction or withdrawal of armed forces from the conflict ridden areas. Following a discussion on the issue, it was the view of the panel that immediate reduction of armed forces as suggested by the speaker is not possible, and recommended that the world communities should help Sri Lanka proceed with its home grown solutions rather than being a negative influence in current post conflict programs.

Prof. Shantha Hennayake in his paper reinforced the cooperation of Aian countries in these endeavours. Yet, he expressed the belief that it is important for Sri Lanka to be enemies of none and

friends of all. R Adm Jayanath Colombage of Sri Lanka Navy presented a paper on Maritime Threat and Maritime Security – Way a Head for Sri Lanka and said that the importance of maritime security in the future development of the country and said that it will be an investment for Sri Lanka.

Giving consideration to possible legal solutions provided for ethnic issues in the history right from the Soulbury constitution to the constitutions of 1972, 1978 and finally the Thirteen Amendment, Mr Gomin Dayasiri said that with the two third majority in the parliament, the post conflict scenario is an opportunity to find a solution for the problem. Attorney General Mr. Mohan Peiris said that a constitutional solution or devolution of police power and land power alone does not a solution to the ethnic problem. He believes that a home grown solution that reflects the hearts and the minds of the people need to be tailored to find a final solution to the problem.

Mr. Mobisher Rabani a foreign delegate presented a paper discussed on China, Sri Lanka and Pakistan relationships. This paper discussed on the future possible regional cooperation among the nations of China, Sri Lanka, and Pakistan. He is with a view that such alliance will be mutually benefited for the state security of the individual countries as well as the region and helps the countries in creating necessary conditions for economic growth and development.

Dr. Ranjith Bandara a Senior Lecturer in Economics at the University of Colombo said in his presentation that the policy shifts, right from the post colonial economic policy ( the policy following colonial rulers in the early independence, the closed economic policy thereafter and the open economic policy since 1978) has failed to make structural change in the society leading to social integration that could find solutions for the problems of conflicts and other issues that interrupt the socio economic development in the country. He also said that *Mahinda Chinthanaya* in 2005 and the *Mahinda Chintana Randoratuwa* - the ten year plan have been able to initiate the required structural changes in the society. Prof. Shantha Hennayake Head of Department of Geography, University of Peradeniya said that Sri Lanka has failed to introduce an effective method to built the necessary conditions for social integration. According to Prof. Hennayake, many of the post independent policies of Sri Lanka have led not for social integration but for social disintegration. He emphasized giving consideration to the fact that Sri Lanka is one country and one nation, there is a need of attitudinal change within the mind sets of the people of Sri Lanka no matter the cast or race that they belong to. According to Prof. Hennayake, Education System is one of the important mechanisms that need to be addressed to accomplish the mission. He pointed out how USA moulds the national identity of the Americans, right from their Kindergarten education. Prof. Shantha Hennayake

proposed Sri Lankan National Identity, not just only with official ID but with collective heart feelings and requested everybody to get set for necessary conditions for such an identity.

In the technical sessions Mr. MM Jayawardena proposed system approach as a policy guideline for national defence in the present context as well as in the future possible scenarios. According to the analysis, national defence needs to be performed effectively in the short run and then it has to be performed efficiently in the long run. The presenter given attention to the performance of national defence against the separatist war and tested applicability of the system approach as a policy guideline for national defence. Using the empirical information he argued that at the beginning of war national defence has not been able to maintain the theoretical presumption made here in the study but agreed that in the latter stage of war (after 2005) the theoretical presumptions and the empirical experiences were compatible each other. Therefore, he recommended this approach as a policy guideline for national defence. Dr. Susantha Gunatilake who carried out a study on “soft power” suggested that a small state like Sri Lanka could maintain such strategy to win the hearts and minds of the world and can become competitive as a nation. According to the author India and China use Buddhism as a soft power and capitalized such conditions in their competitive scenarios in the current global competition. The presenter believes that Sri Lanka also can use such conditions better than these countries because of the unique conditions that Sri Lanka is having.

Opening the engineering session Hon. Champika Ranawake Minister of Power and Energy told the audience that in the field of engineering there is need of attention to the Nano Technology, Bio Technology and Nue-Clear Technology. Mr. Lalith Weeratunga giving consideration to the demand and the potential for ICT in the post conflict scenario wanted to introduce new academic and professional programs with the aim of new employment and new value additions in the production sectors. Mr. Lalith Weeratunga wants KDU to start such an ICT degree program to strengthen the ICT industry that can serve the military forces as well as the governmental and nongovernmental sectors. He further said that such contribution to the telecommunication infrastructure with skills and knowledge will help the economy in the post conflict scenario, directly and indirectly. Dr. Ajith Pasqual selecting the education sector studied the problems and issues of ICT education in Sri Lanka and said that investment in the ICT just one time and just one off training alone will not be able to get the contribution by ICT in economic growth and development. He said that there is a need of continuous investment and training in the ICT industry. Prof. Dileeka Dias said that ICT infrastructure investment is a part of Social Overhead Capital. She recommends the shift from mobile to internet with use of other complementary innovations. Prof. Ananda Jayawardena with the focus on

economic growth by 2015 with \$4000-5000 per capita income convinced the audience that Engineering sciences can play a big role in accomplishing the task of development. In this regard he mentioned that increase of engineering graduates with the potential for innovative capabilities that linked with entrepreneurial abilities is important. He said that the current R&D investment of less than 1% of GDP is very much low even when compared with the other South Asian countries. He also recommends for the country to gear for Sri Lankan companies to come out as world recognized companies and be competitive in regional and global challenges. Prof. Jayawardena, giving special reference to construction engineering, praised the projects of Southern high way and Hambantota port that are in the process of leading towards the vision of development.

In the technical sessions a paper presented by Sqn Ldr DLA Manage presented on Bell Helicopters which is based on an ongoing project, recommends the Vacuum Bag Processing method to fabricate an engine deck by utilizing tools and equipment available to the SLAF. Session chair Mr. MA Nimalsiri Deputy Director General commended the research effort of Squad Ldr Manage.

In the medical session, Prof. Nimal Attanayake said the development in the health sector lead to higher labour productivity and higher life expectancy and also said that improvement in the health while reducing the cost of living as the healthy environment saves health expenditure both at micro level as well as at macro level. According to Prof. Attanayake currently per capita health expenditure per person is Rs. 10 and said that contribution is more than the expenditure. Therefore he said that if we can face the challenges of health effectively it can contribute in the post conflict scenario of Sri Lanka. Dr. Kumari Nawaratne drew the attention of the audience on the possible health hazards due to various factors such as environmental pollution, traffic congestions, issues of workaholic environment, stress related issues and finally household problems including family issues that are associated with the acceleration of economic growth. According Dr. Kumari Nawaratne the health sector needs to be addressed with appropriate precautionary measures and such health hazards should be minimized. Dr. Kumari Nawaratne also said that the malnutrition and undernourishment need to be taken up and the nutritional standards of the people enhanced as it closely associated with economic development. With respect to the prospects of health of the post conflict scenario, Dr. Kumari Nawaratne said that there is a need of immediate attention to the North and East and then in overall country on prevention as well management of disease in an effective and efficient manner.

Prof. Susirith Mendis explained how doctor- patient relationship is important in maintaining health as a wealth in the contemporary competitive world. According to Prof., doctor should be a counselor

rather than a decision maker for the patient. Professor also noted that Sri Lankan medical profession cannot forget the characteristics of Sri Lanka and its unique cultural and historical features in the society. Additional Solicitor General R DM. Palitha Fernando said that if a doctor does not make the expected deliveries to his patient in line with doctors' training and qualifications he or she can be guilty for negligence that can be taken up in the court. He also referred to confidentiality of information diverged in the medical examination and the limit of the doctor in his examination of a patient.

## **Conclusion**

During a phase when Sri Lanka is undergoing serious challenges at national and international levels, KDU was able to make an initiative for the stakeholders to rethink on the thirty year period of the disastrous war and the post conflict scenarios. All five sessions including the defence session were able to maintain their momentum throughout the symposium of both the plenary session as well as the technical sessions. The symposium concludes that national defence needs to continue without drastic change in its activities. Firstly the threat on national security, sovereignty and the integrity of the country is not yet fully guaranteed. Secondly national defence as public good needs to contribute in the country's development efforts by bridging the gaps between the conflict affected society and the post conflict society. Thirdly, national defence needs to carry out urgent reconstruction work and other needful of ill-fated society in the North and East. Finally the military forces need to be alert until the establishment of perpetual peace since a small incident can increase up to violent movements. The symposium also concludes that there is a need of structural changes in the physical environment, the institutional environment and the mind sets of the stakeholders in the country in the areas of humanities, social sciences, law and order, health, education, engineering and technical sciences. The symposium was also able to stimulate the research minds of the academic and military staff of KDU as well as the other participants of the tri services, national universities, governmental and nongovernmental organizations including research institutes for further studies on different aspects of socioeconomic development of Sri Lanka within country, regional and global level perspectives.



## **DEFENCE**

### **PLENARY SESSION**

Chaired by Mr. Gotabaya Rajapaksa  
Secretary to the Ministry of Defence



## **Summary**

*Hon Secretary to the Ministry of Defence, Mr Gotabaya Rajapaksa, as the Chairperson of the session expressed at the very outset the importance of the symposium, and the timeliness of the theme at this crucial juncture in disseminating vital facts and information on the Humanitarian Operations, and subsequent developments in the region. He believed that this symposium would enable a reshaping of prevailing misunderstandings among different parties at national, regional and global level.*

*In this session, five speakers deal with different aspects of national defence in contemporary discussions and analyse the issues both retrospectively and prospectively through different perspectives. Professor Rohan Gunarathna, the head of RSI's International Centre for Political Violence and Terrorism Research, presenting a case on the 'Post War LTTE Structure: The Threat and Response' enlightened the audience on LTTE's ideological strategy in the international arena and its possible impact in the post conflict scenario. His recommendation is to give this issue more vigorous attention at diplomatic level and find mechanisms to counter international propaganda of the LTTE with the support of the international, governmental and nongovernmental organizations. He further emphasized on the importance of productive communication strategies at all levels of both nationally and internationally to prevent LTTE and other similar threats to national interest, sovereignty and integrity of Sri Lanka.*

*Maj Gen (Retd) GA Chandrasiri, the Governor of the Northern Province, focused on the integration of the armed forces into economic development activities in Sri Lanka, with special reference to their contribution in the North and the East. Giving attention to Tamil terrorism that has been a threat for ordinary Tamils and the socio economic and political systems in the North and East, he explained how the intervention of the armed forces contributes to rebuild Tamil communities; especially, in demining, infrastructure development, resettlement of displaced communities, which are crucial in the transition from war to peace, and also to ensure sustainable socio economic stability. General Chandrasiri gave examples as to how the armed forces cooperate with Civil Administrators (GAs) in the region, with resettlement activities, construction work and social service projects that are important to bridge the communal gaps and other ill feelings among Tamils. Major General Javid Iqbal based his analysis on his experience in Pakistan. He was of the opinion that the armed forces need to be involved in providing different services to the people as the civil administration may not be able to provide such services effectively. He also emphasized the need for a productive role for the armed forces during the transition period from war to normal civilian administration.*

*Thereafter, Prof. Alan Hatcher who dealt with lessons for Sri Lanka, and Maj Gen Javid Iqbal Ramday of Pakistan who presented the lessons for Sri Lanka in a regional perspective, explained the role of armed forces in post conflict Sri Lanka until the return to normalcy. Prof. Alan Hatcher referring to the role of armed forces and the responsibility of the international community said that the Darusman Report cannot be accepted as there is no factual evidence to prove its allegations against Sri Lanka.*

*The paper on “Lessons for Sri Lanka in Global Perspective” presented by Mara E Karline (USA) recommended the reduction of the armed forces. Her view is that a small economy cannot run a large army. In reply, the Chairperson of the session, Mr. Gotabaya Rajapaksa, explained that when one looked at the 30 years of disastrous war with huge cost to Tamils, Muslims and Sinhalese who lived in the Northern and Eastern Provinces, and the impact of which will continue to haunt future generations, the issue needs to be carefully dealt with to prevent a recurrence. Further, he said that there is a need for careful consideration of the outcome of an immediate reduction or withdrawal of armed forces from post-conflict areas. In his view, such an action might lead to other socio economic problems where mass demobilization would result in a rapid injection of labour which would be difficult to absorb into a newly recovering economy. Therefore, it was the view of the panel that an immediate reduction of armed forces as suggested by the speaker is not advisable. Considering the historical dynamics of the separatist war in Sri Lanka and the future challenges to national security, the speakers were of the opinion that Sri Lanka’s case is unparallel to those of other conflict ridden countries of Europe, Latin America, Africa, and even Asia. There was a need, therefore, to consider the situation as unique and tailor it to answer specific needs of the Sri Lankan people. The panel is of the view that the world communities should help Sri Lanka to proceed with home-grown solutions. The foreign scholars in the panel agreed that there is a need for effective communication regarding the ground realities of post-war Sri Lanka because at this delicate stage even a small event could have negative effects.*

*In summing up, Defence Plenary Session Chair Mr. Gotabaya Rajapaksa re-emphasized the willingness of the Government of Sri Lanka to discuss the prevailing situation with the international community.*

## INTRODUCTORY NOTE

*Mr. Gotabaya Rajapaksa*

Good morning. Welcome to the first plenary session of the symposium 2011 at KDU. Once again, I want to congratulate the Vice Chancellor, Major General Milinda Peiris and his team for organizing this symposium and discussing a very appropriate and a timely subject.



*Mr. Gotabaya Rajapaksa, Secretary to the Defence Ministry, Chairman of the Board of Management of KDU, addressing the Plenary Session forum (IMG\_1712)*

As you all know, we have suffered for nearly three decades from this terrorism. In many parts of the world there are terrorist activities. But when you take Sri Lanka, it was not only the military but also the whole country as a society, irrespective of race or religion, which was affected by LTTE terrorism. During the period of war and also in the post conflict scenario, we have been suffering economically, industrially, socially, diplomatically, politically and militarily. Therefore, even after the conflict is over, we still have many challenges. We know it was because of the terrorism that we lost many opportunities to develop our country, and at the same time we lost many intellectuals to it. We have challenges in each of the above fields to develop our country and become conversant with reconciliation. Therefore, the areas that have been selected for discussion at this forum is very appropriate. I think the plan of this symposium is to cover many of the areas coming under the disciplines of defense, humanities, international relations, law and social sciences, engineering and

medicine. This particular session is planning to cover the field of defence and we have five speakers, who are going to speak on five different themes.

When we talk about defence, I think the primary role and responsibility of the armed forces have not changed though the conflict is over. In any country, the primary role and the responsibility of the armed forces is to protect the country and its sovereignty from internal and external threats. That does not change under any circumstances. But the *modus operandi* or how you do it may change. After the conflict, or after the defeat of the LTTE, we don't have an enemy to confront directly. We no longer have an armed terrorist group. However, the challenge for the armed forces to maintain security, maintain the protection of the country is applying in different manners. That remains as the main role of the armed forces.

Therefore, the emphasis on services may change. We can see that sometimes more responsibility has been transferred towards different services. For example, in my opinion, the Navy has a bigger role to play in protecting Sri Lanka. Especially, at the beginning of 2005, when you saw the strength of the LTTE and the equipment that they used against our military, those weapons were smuggled into Sri Lanka by sea. They were not manufactured in Sri Lanka and they had arrived from all over the world. Therefore, I think one of the primary duties is to prevent such equipment, arms and ammunitions, or even the cadres who had left Sri Lanka, coming back to the island. Further, as the honorable minister mentioned, the stopping of human smuggling is a major role that the navy has to play in time to come. Even though, sometimes we assume that these elements will not come up again, I think the emphasis on intelligence agencies and the surveillance is a very important area on which to concentrate. Now, after two years, you can see the challenges faced by the military forces.

At the same time, look at the challenges in the field of law and order in certain parts of the country. Therefore, you have to change the tactics in use, the weapons you use; and as very correctly mentioned by the honorable minister, there is a necessity for better equipped, well trained and advanced military in Sri Lanka. It is because the primary role and the responsibility of the military still remain unchanged.

Then of course, as Major General Milinda Peiris and the minister mentioned, the military armed services are the main resource that we have in Sri Lanka. It is true; because we have about 500,000 troops with well organized and well trained young leaders, providing leadership with high qualities at each and every level. This resource can be used not only for the protection of Sri Lanka, but also in

other development needs of the country as well. They can be utilized for construction efforts and infrastructure building in conflict ridden areas as well as in other regions where there are problems.

After the conflict, His Excellency, the President, has used these resources very wisely. For example, for the first time we have appointed Ambassadors/ Deputy Ambassadors for many places, but not defence attaches but as diplomats. At present, we have Major General Shavindra Silva as the Deputy Ambassador to the UN. Then, we have Deputy Ambassador in Germany and Deputy Ambassador in Malaysia. All these officers have shown their ability to work very efficiently and effectively in different fields. So, I think His Excellency the President is utilizing their capability, leadership quality, their discipline, the commitment to serve the nation in different areas, and their willingness to work and see results. Here, I am not talking about the retired Army officers but the serving Army officers whom are being used in different fields both nationally and internationally.

We also have many challenges where armed forces further need to be engaged proactively. For example the IDPs, tackling of the IDPs, re-settlement of IDPs, demining unsafe areas, rehabilitation of those who have surrendered, and the rehabilitation or the prosecution of some detainees. All these are immediate challenges that the security forces have to face. The security force commanders in the North and East areas are directly responsible for IDP resettlement. I think as of today, 95% of the IDPs have already been resettled and the security forces have done a tremendous job in this endeavor.

Then, we are in the process of rehabilitating surrenderers. At the initial stage, after defeating LTTE, we had about over 11,000 surrenderers or LTTE cadres. We have started a very effective, well planned and a successful programme on rehabilitating them and also re-integrating them into the society. When it comes to demining, I think 70% of the demining was taken over by the corps engineers of the Sri Lanka Army. Beyond that, our troops are involved in helping people in these areas to re-establish their normal lives. They help them in many ways, even directly helping them to build their houses, getting involved in agriculture and other economic activities.

In this way I think the Sri Lankan armed forces, after a very successful military operation, are continuing their service in diverse activities that are related to security, development and other contingency services. They have been very successful in post conflict adaptation.

## **Post War LTTE Structure: The Threat and Response**

*Prof. Rohan Gunaratna.*

Thank you very much Secretary Defence, acting US Ambassador to Sri Lanka, Defence Chief, Service Chiefs, ladies and gentlemen.

The very first event we witnessed today was a very beautiful dance! It reflected the true spirit of Sir John Kotalawala. Sir John was a man who had a zest for life. He was a man with tremendous brilliance. I thought Vice Chancellor General Milinda Pieris has maintained that spirit of Sir John.

Eighteen years ago when I left the shores of Sri Lanka for my higher education, I was searching for an institution to donate my collection of books and papers. The Kotelawala Defence Academy was the natural place that came to my mind. I am very pleased that today, the KDA has reemerged as KDU. Today, the KDU is one of the best established defence universities in Asia. So I want to pay tribute to the present and past Vice Chancellors, Commandants and the staff who served in this great institution.

Let me focus on three aspects in my presentation. First, Sri Lanka achieved great moral and strategic triumph by dismantling the LTTE in May 2009. Sri Lanka is the first country in the 21<sup>st</sup> century to have defeated a terrorist organization and an insurgent movement. The Americans in Iraq and Afghanistan, despite so much of resources and so many human fatalities and casualties, have not been able to bring law and order to those two countries. After engaging in Iraq and in Afghanistan, the US is now planning to withdraw. The insurgency still rages. In the global canvass of terrorism, the LTTE rank very high. Many said that the Lebanese Hezbollah, Al Qaeda and the Tamil Tigers belong to that class of terrorist groups that was very resilient. They were very difficult to dismantle. In many ways, the achievement of Sri Lanka in defeating the LTTE is a very unique example.

After its military defeat in Sri Lanka, the LTTE has transformed. LTTE was a global terrorist organization. Although the LTTE's structured military organization was based in Sri Lanka, it maintained a very significant terrorist support network overseas. We had identified two centres of gravity. The first was the LTTE leadership. Until Prabakaran and his key leaders Pottu Amman, Theepan and many others were eliminated, the threat caused by the LTTE could not end. The security forces were very successful in containing the threat through security measures. The Secretary Defence played a very important role in co-coordinating the Army, Navy, Air Force, police, Civil

Defence force and the intelligence services. In many ways, the security measures posed a huge deterrent. The enemy was kept in isolation in the Wanni region. Finally, the threat shifted to the Mulative area when the LTTE infiltrated the no fire zone. The Government had created the NFZs for the civilians to migrate. Finally, the military breached the LTTE defences and rescued the civilian population. I myself travelled several times to that area.

After the LTTE in Sri Lanka was dismantled, there were a number of efforts on the part of the Sri Lankan government to stabilize the North and the East. Immediately after the war, many commendable initiatives were launched. First, the resettlement of IDPs after they were screened, Second, the rehabilitation of 11,500 LTTE leaders, members, helpers. Third, the government redeveloped the North and the East.



*Prof. Rohan Gunaratne making his Presentation at the Defence Session (IMG\_1719)*

Having visited Sri Lanka every month immediately after the conflict, and many of those travels to the North or the East, I want to share with you the idea that there are a very few countries in the world that have done what Sri Lanka has in these three areas. In less than two years, so much of work in the areas of rehabilitation, resettlement and reintegration has been accomplished. I accompanied a



counter terrorism specialist from the United States to the Vanni region and he made a very interesting remark. He said that what Sri Lanka has achieved in two years, former Yugoslavia took ten years to achieve.

What is remarkable here is that the Sri Lankan military was able to prevent a secession of the country, and after that they were able to progress very rapidly in nation building. The military forces that fought the war with a focus on kinetic operations adapted themselves very quickly. They transformed into a force that was able to rehabilitate the surrendered or captured terrorists, look after and resettle the internally displaced. Of the 280,000 IDPs, only about 9000 still remain and that also in open welfare centres where they can go in and out. The Armed Forces also play a very significant role in the socio-economic development of the North East. So there are three principle categories where the armed forces have invested in, other than in war fighting. First is in the humanitarian assistance, second is in socio-economic development, and third is in political engagement. Today, we have seen that a transformed military has been able to bring about very significant stability to the North East. They maintain their commitments towards the establishment of peace. It is essential for institutions like the KDU to constantly invest in the armed forces, to think of the changes on the ground, and prepare them for the new challenges.

Let me now focus on the international landscape. There were two centres of gravity: one was the LTTE leadership that was dismantled, the other is the international network of the LTTE. The latter cannot be dismantled by the Sri Lankan state itself because Sri Lanka's presence overseas is limited. It is largely a responsibility of other countries, their governments and of course, of working in collaboration and in partnership with their Sri Lankan counterparts. So after they defeated the LTTE in Sri Lanka, three principle notes have emerged. One is a faction that is led by a man called Father SJ Emmanuale who helps the global Tamil forum. He operates out of London and that is in many ways the **overt** organization, the superstructure of the LTTE that raised money for the LTTE and disseminated propaganda for the LTTE. Then the other **overt** structure that has emerged is led by the legal advisor of the LTTE called Viswanandan Rudrakumaran who is currently operating out of New York. Rudrakumaran uses the cover of the transnational government of Tamil Eelam. He has self styled himself as the Prime Minister of Tamil Eelam. But I want to say that his organization's principal mission is to lobby the United Nations, the US government, and the European governments. Then, we have seen a third LTTE faction led by Perimpanayagam Sivaparan, commonly known as Nediyan. He was the deputy of Casthro. Casthro was the man who headed the international network of the LTTE, based in Vanni. Casthro committed suicide in the final phase because he did



not want either to surrender or to be captured. But Nediawan who had studied in Moscow, went to Norway and he is currently operating as the man behind the underground infrastructure of the LTTE. That is the network engaged in human smuggling, credit card, bank and cheque fraud and other criminal activities. Nediawan controls the infrastructure that was responsible for raising money through criminal means and for procuring arms. Over 95% of the weapons for the LTTE came from three blocks of countries. The first shipment came from Lebanon. The second batch of weapons came from Eastern Europe. The surface to the air missiles came from Bulgaria. In 1994, a LTTE ship transported 50 tons of TNT and 10 tons of RDX from the black sea port of Nicholave from Ukraine. After 1997, 95% of the weapons came from North Korea. Most of the money was raised in Canada, some in the United States and some in Western Europe. The US response in this regard was very strong. I want to say that the FBI did a remarkable job in dismantling the LTTE network that existed in the United States. Karunakaran headed that **network**. The US played a very important role in arresting the deputy head of procurement of the LTTE Pradeepan Thavarasa, in Indonesia. He gave a lot of information that finally enabled the Sri Lankan Navy to develop, in parallel with the US intelligence, a capability to hunt those ships that were operating near the equator and south of equator. The destruction of those ships in many ways, was an effort by many countries working together to dismantle the LTTE network.

But today the challenges are very different. In today's context, the LTTE network has transformed into two areas. The LTTE is a propagandist organization; it lobbies diplomats, nongovernmental organizations, political leaders living in the west who are greedy for votes. Politicians are vote driven. So LTTE representatives under the cover of either human rights organizations, humanitarian organizations, social organizations, cultural organizations, would say "you go and make this statement for us in parliament I can give you this much of votes". In this particular scenario, some politicians of the western countries, particularly, the US, Britain are very vulnerable to lobbying and because of this lobbying capability, we have seen that some politicians have made some statements for their personal and political advantage.

There are three principal challenges that we are facing after the end of the war. One is, Sri Lanka needs to develop a very comprehensive communication strategy in the face of the contemporary challenges that the military, the police and other branches of the government are facing after winning the war. But the true reality of what has happened on the ground could not be projected. In the present context, internationally the Foreign Ministry did not have capability to counter the misinformation and the disinformation campaign of LTTE. As a result of that failure, the LTTE propaganda has

spread into NGOs, politicians and even into some segments of the international organizations. It is imperative today to build such communication infrastructure outside Sri Lanka to counter the LTTE propaganda.

The communication infrastructure in Sri Lanka that was used to counter the LTTE was brilliant. In fact there were many interesting concepts such as “Api Wenuwen Api.” Such concepts that were developed led people in this country to support the war. It prompted tremendous recruitment that was one of the main factors that led to the defeat of the LTTE. But, internationally there was a failure and as a result today Sri Lanka has to face the consequences of countering that propaganda. More recently, the Ministry of Defence produced a brilliant film *Lies Agreed Upon* to counter the Channel 4 film. But I want to say that this needs to be done more frequently and in a more systematic way and that message has to go outside Sri Lanka.

The second challenge Sri Lanka faces is a diplomatic challenge. The LTTE has now transformed into a propagandist organization, operating largely in the international sphere and in the diplomatic sphere. So how does one challenge Sri Lankan missions overseas? Sri Lankan associations overseas must become more active. The Information Ministry should have a strong communication capability in engaging those elements that may be misled by propaganda. Similarly, there must be an effort on the part of the government to re-engage certain NGOs. For instance, the Ministry of Foreign Affairs should create a Diaspora Affairs Division and a NGO Advocacy Division under an Additional Secretary for Public Diplomacy. If so, many of the present challenges in national security can be handled well.

Let me also say that there were many admirable things that happened in Sri Lanka. As Secretary Defence mentioned, I myself witnessed the rehabilitation centres. I spoke to almost all the senior detainees as well as the middle level detainees of the LTTE. I want to say that the LTTE members, who fought in the war, will not return to violence again because they know the futility of war. They have suffered from war. They are like our soldiers; they are like our officers who fought. They don't want to see war again. But those who campaign against Sri Lanka, a very tiny segment of the Sri Lankan community overseas, have not seen war. For them it was a game. It was an entertainment. They would say “ok how many people have been killed in Sri Lanka?” It became like a football match for them. We need to make the atmosphere that would enable the Diaspora community to visit Sri Lanka and see the unprecedented development in the North east of Sri Lanka.

Let me also say that I noticed something that I want to share with you. A unique relationship between the detainees and the soldiers developed. It is because our soldiers and the LTTE cadres came from the same socioeconomic background. On Christmas day 2009, I was in one of the rehabilitation centres in Vavuniya. On the day the World Food Programme assistance to the detainees came to an end, the soldiers decided to share their ration packs with the LTTE detainees. I saw a tremendous friendship developing between those detainees and between our soldiers. They ate the same food as the soldiers. I want to explain to you that the Sri Lankan ration pack is a very quality product. The detainees themselves expressed the view that there is really no difference between us and them. With the removal of the LTTE threat, we are seeing the tremendous effort the government is putting for development along with national reconciliation. The government also needs to invest in communications both at a national and international strategic level, including in a robust diplomatic campaign.

A final challenge. We need to groom a mainstream Tamil political leadership in the North and the East. The Tamil political leadership tree was cut by the LTTE not only at the branches but at the trunk by the LTTE. More than 200 Tamil leaders were killed. Most brilliant leaders including Neelan Thiruchelvam, Lakshman Kadiragamar were killed. So I believe that we are expecting too much if we expect this leadership tree to grow very suddenly. It's been only two years but the government needs to invest from now onwards to create a mainstream Tamil leadership.

I thank you very much.

## **Integration of Armed Forces in Development Efforts of Post Conflict Sri Lanka**

*Major General (Retd) GA Chandrasiri, Governor of the Northern Province, Sri Lanka*

The Secretary, Ministry of Defence Mr. Gotabaya Rajapaksha, The Vice Chancellor of Sir John Kotelawala Defence University Maj General Milinda Peiris, Distinguished Guests, Chief of Defence Staff, Tri Service Commanders, Ladies and Gentleman, Cadets, Good morning to you all!

The subject matter is very clear “*The integration of armed forces in development efforts of post conflict Sri Lanka*”. First of all, I would like to tell you that the integration of armed forces in the post conflict development in Sri Lanka has already taken place in the last two years. At present, the armed forces are supporting the government in doing most of the development activities, especially in war ravaged northern and eastern parts of Sri Lanka.

I think as you all know, Sri Lanka is the only country that has successfully destroyed a ruthless terrorist organization like LTTE after the Second World War, which prevented the country getting partitioned and facing the consequences of separatism. This was possible due to the excellent leadership given by His Excellency the President Mahinda Rajapaksa, with his political will and leadership. In this effort, the Secretary of Defence gave us the strategic and the prudent leadership to destroy the terrorists and it became a crucial factor in winning the war.

Ladies and Gentleman, now the next step is to develop the entire Northern Province and the Eastern province. It is a huge task and this has to be done properly according to the plan worked out by the government. The plan designed by the government for the Eastern province known as “Negenahira Navodaya”, was launched in line with “Mahinda Chinthanaya” soon after the liberation of Eastern province in 2007. The second step of the plan was done shortly after the liberation of Northern Province in May 2009.

Whenever a country needs to engage in development programs soon after a conflict, there is a major responsibility for the armed forces. According to the development mission of the government, there are several development projects going on with the assistance of World Bank and other countries like India and China. Therefore, it is the responsibility of the government with the support of the security forces and Non - Government Organizations, to develop social infrastructure, social harmony, and peace. The Non - Governmental Organizations are assisting in community development projects where the security forces are involved in demining as well as development work under the guidance

of the Secretary of Defence. These activities cannot be done through civilian outfits. In this endeavor, the security forces have made an enormous contribution to bring the North and the East to normalcy through the demining program. Secretary of Defence said that 95% of this entire demining effort is completed now. The security forces have played a significant role in this regard and have enabled to resettle more than 72,000 families in the entire Northern and Eastern provinces of Sri Lanka.

The second task of the security forces is to continue the resettlement program of the government. The resettlement was done within the expected period of time. The resettlement involves registration and giving required assistance for 300,000 of population. Up to now, 235,516 people are resettled. It is almost 95%. The Secretary of Defence said that rehabilitation, except for the combatants as per the government programme, is being done in line with the development plan. After doing the initial resettlement, there is a need of re-integrating them into the society. In this particular activity, the government administrative mechanism, as well as the security forces and other organizations need to work together. Here, the security forces have done their job to the maximum and given them life for the future. The security forces have also made the arrangements for them to engage in their religious activities just as in the past. Best examples for such contributions are the restoration of Madu Church celebration and Thirukovil religious ceremony.

The other effort that the security forces are involved in the North and East, is the contribution towards the social harmony in the society. In these particular aspects, the sport activities and other social functions are important. A society, which had been fed up with various anti human activities need to be transformed into a society with harmonious activities and generic human values.

During the transition of the society, security forces are the best institutional mechanism to run such a system. During the last two years, the security forces were functioning with the government objectives, and as a result, the security forces were complementarily joined in the efforts of development in Northern and Eastern regions of the country. In certain development activities, government provided financial resources where the security forces carried out the projects that contributed to development. Such activities on the one hand saved money for the government, and on the other hand, this enabled the government to carry out development activities effectively when making all those hiring arrangements under market mechanisms.

I am happy to note that the security forces have given their fullest cooperation in running “Divi Neguma” and other government development programmes. Under “Divi Neguma”, we have selected

100 families from each Grama Niladari division (*in Northern Province itself, there are more than 900 divisions*) and given all the support to develop agriculture and other productive economic activities. In this exercise, security forces are supporting in putting up various infrastructure facilities such as building irrigation canals, institutional arrangements etc.

Public and private sector partnership is another area in which the security forces have assisted. These programmes were carried out in areas like Kilinochchi, Mannar and Mullaitivu where terrorist activities were detrimental in comparison to the other parts of the region. These kinds of partnership programmes have been able to convert certain agriculture areas into farms and certain buildings into commercial companies.

As mentioned by the Secretary Defence and Prof. Gunaratne, security forces will have a major role to play in the future; firstly, to guarantee the peace and then to develop these areas. In the future, the security forces' support is imperative in mega development projects of the government in north and east. That could help the country in maintaining the momentum of the society without allowing people to be trapped in various movements with individual interests. Among such mega projects, development of road networks, irrigation systems; and development projects connected to the agricultural system, education sector and health sector are vital.

Finally, with the experience of working with the armed forces for last 02 years as the GA, I have found that whenever a request is made, they come to help, and accomplish the task effectively and efficiently. They also maintain the transparency in their activities and therefore there are no serious allegations against them in their activities. Therefore, the security forces and their contribution in the development of the North and East are very crucial in the future.

## **Role of Armed Forces in the Post Conflict Scenario - the Regional Experience: Pakistan a Case Study**

*Major General Javid Iqbal Ramday*

Honorable Secretary of Defence Mr. Rajapaksa, Excellencies, Chief of Defence Staff, Commanders of Army, Navy, Air Force, Ladies and Gentleman, Good afternoon!

I am thankful to the Vice Chancellor of Kotelawala Defence University for providing me with the opportunity to be here and share our experience and thoughts. After having seen the earlier presentations, it is actually me who has benefitted from presenting here in this symposium. Therefore, thank you for the opportunity.

Ladies and gentlemen, because of the time constraint, I am going to rush through the issues and flag the subjects of the issues. If there are further things that you may wish to discuss, we can take them up later on. I have to tell you that most of those issues or parts are going to be similar to the ones which we have seen earlier.

First of all, what we have to understand is that conflicts by their very nature are complex, and the post conflict situations are even more complex. When you come to that point, where you decide that you have passed the conflict and you are into the post conflict scenario or into that phase, you find three main actors in the field. Firstly, you find the state. But the state is going to be represented mostly by the armed forces because armed forces are going to be the major presence among other government mechanisms. Secondly, you find the society at large. Thirdly, you find the Militants on one side, which is opposed to the state and also to the armed forces. All these actors are going to have different states of mind. The society is going to be traumatized, wearied, cynical, and with a little bit of tinge of vengefulness. Then the militants are going to be having a state of mind where they are going to feel defeated, resigned, partly ostracized in the society, and of course fearful of their future. In this case, the civil law enforcement agencies are going to be either absent from the scene or not in the optimal state.

Likewise, the civilian administration is going to be absent or very weak. On the other hand, the armed forces are going to be robust and triumphant, organized, instrumental and extremely handy for the state and its political leadership.

So what is going to be the initial menu for the armed forces in the conflict areas? First of all, their responsibility is to provide a secure environment because they are the ones who have drawn the curtain on the conflict. In addition, they are the ones who are going to provide the security umbrella, not only against the terrorist acts but also against normal crime, because that is also going to happen in those areas. Therefore, certain activities in the socioeconomic and the political fields are going to take place and when they gain the critical mass, you go onto a point where you can hand over the transition to the civilian authorities completely.

The issue of displaced persons has been a very delicate subject. We have also handled this issue in Swarth, Pakistan. The issues with respect to displaced persons are extremely important because unless you are able to get them back to their homes in their respective areas, you simply cannot initiate other normalizing activities or steps. Therefore, this is probably the first steps towards normalcy. With respect to resettlement, there are plenty of agencies, which are going to be involved in the resettlement process as part time counter parts. Again, in this regard the armed forces will have to share the main burden in organizing the return of displaced persons and their settlement.

In this exercise, armed forces can utilize their specialties to correspond with the various services on the civilian side. Armed forces can employ the expertise immediately after the conflict to restore the services. Unless the people in the conflict areas do not get the electricity back, the water facilities back and other main services back, then they are not going to feel the difference from the days of the conflicts.

Some of the quick impact projects can be undertaken at the battalion level and platoon level of the respective forces. Such activities make a significant impact on the transformation of the society. When people in the conflict areas now see the soldiers, who had been firing may be a few days earlier, in the role of builders, engineers, health providers and so on, such programs make lots of positive impact on the minds of the people individually as well as collectively; that helps in establishing peace in the society.

With regard to the aspects of security, you will have to keep a visible profile in the area, just to tell the people who might have some wrong notions in their heads. However, this is not the complete role of the armed forces. It is just part of the job. Now such things are going to depend on the kind of intelligence you develop in the area and by being able to apprehend the people who might still be



hiding or who might have run away, but are still within the country. Then you will be able to get hold of them, bring them back, and have them available for their disposal.

Then of course, the police will have to organize themselves under that security umbrella, and police training will have to take place. Since the armed forces are going to be designated and are going to be present in conflict areas, they are suitable to provide at least the generalized training for the police. Joint operations with police will be a speedy way to move towards transition. Thereafter, the responsibility can be handed over to the police and then the police will be able to get lots of confidence and expertise that help in their duties in the future.

I want to integrate the experience of Swarth in Pakistan with certain important things at present that the armed forces need to consider in their operations, during the post conflict scenario. I have partly talked about these issues in the earlier part of my presentation. The important thing here is that the leadership of the armed forces will have to remember that most of the services that they provided for the society immediately after the conflict, cannot be continued in the long run. The leadership needs to revive their role and they will have to integrate with the critical leadership of the government and will need to deal with the issues, together with the relevant departments, to restore the respective services in the affected areas. Thereafter, in the long run, there will be a time in which the responsibilities of the respective services need to be handed over to the respective departments in order to run the services in line with their professional standards( For example, health services, education etc.) .When coming to markets, they are actually the symbol of normalcy in the area. The armed forces can encourage markets to be opened and the life to go about in a very normal fashion. Transport is another area that is going to be a part of the services that need to draw attention.

Apart from these, there are lots more that are not being covered here. Leaders and the commanders need to tap them on the spot and they will have to look at them in the ground level and will need to engage in such activities to ensure normalcy through appropriate remedies. These are again some of the snap shots I took. Especially when it comes to the infrastructure, even though the armed forces provide necessary infrastructure facilities very quickly, a permanent solution to infrastructure has to be implemented and the real professional standards should be incorporated. Therefore, in long run the government with the use of other departments, who are otherwise responsible for this kind of facilities, need to take over everything from the armed forces.

Coming to the detainees, there is a need of identifying them into two groups. The first group is one which is involved in very serious crime. With respect to this group, there is no other alternative than to accept them and to put them into the judicial pipeline. If you feel the cases are OK with regard to the information, you need to take them to court. However, you need to remember that it is very difficult as it takes a long time for the proceeding. Yet, I think in the long run, it is probably the best out of the probable options. In the meantime, as far as lesser crimes go, there can be people who were contaminated by the radical ideology, which led them to crime and other disastrous activities. In such a case, what you need to do is to de-radicalize them. Those individuals need to be re-integrated into the mainstream of the society. In this particular exercise, there is a need of considering the contextual features of the scenario. For example, the duration of the conflict, the nature etc. are different from country to country, from conflict to conflict, and from case to case. Nevertheless, what I can tell you with my own experience is that the de-radicalization and de-contamination is a resolved work and in the long run, it is much better than the prosecution for minor crimes. As far as the totality of the society is concerned, the re-integration of de-contaminated individuals into the society is more beneficial. In certain cases, the armed forces can undertake their own programs. However, most of the time, you will need not only the mandate of the government but you will also need the financial support. At the same time, you will also need expertise from the specialist of the respective professionals to help you to undertake decontaminating and radicalizing the people.

Furthermore, there is a need of monitoring them and in most cases, you have to support these individuals socially and financially for their families to stand on their own feet and become useful members of the society. In order for the society to move towards normalcy, you want the former enemies to actually end the curtain of the past and move forward into the future with proper social integration. Then there is a need of a transition in the system. The economy has to guarantee better psychosocial standards. In Swarth of Pakistan, the leadership over there and the army in particular helped in organizing certain events, certain forums with the people, which brought them together to engage in things that can lift the spirit of the people and get them to hold activities with positive mind sets.

Therefore, I think this is the way in which you can give a sufficient momentum to the society to move on. Now, I must tell you, there are two situations that need attention. One is the paradox that is linked with the nature and the other is the wild cards. According to the paradox, the armed forces need to be effective; they need to be visible with the required upfront with its profile in the conflict time and in the post conflict scenario. At the same time there is a need of allowing the civilian system to proceed

gradually in the post conflict scenario. The activities of armed forces in this regard are not going to be done in one day. It is a process. It is going to depend on critical military and civilian leadership and administration in the area. Somehow, the armed forces need to delicately manage these tasks and ultimately have to make a complete transition to the civil life enforcement agencies, with the gradual reduction the of armed forces' involvement in civil administration.



*Major General Javid Iqbal Ramday being presented with a commemorative plaque by the Secretary of Defence, Gotabhaya Rajapaksa (IMG\_1777)*

Apart from the paradox, the other aspect that one needs to look at, is the wild card, which comes to play in the post conflict scenario.

First the media as a wild card; it is a very delicate subject but from my personal experience, I can tell you that it can either require an enforcement during the transition or it can become a handicap for you. There are several ways of handling the media, I am not really an expert on it, so I do not want to get into the issue but I would like to say that you have to engage with the media frequently and you will be able to take advantage of their positive engagement. On the other hand, if you annoy media,

your performance in three months, six months with very positive effort can be ruined by just one article or one photograph.

With respect to NGOs, you have them in all kinds. There are good NGOs. There are bad NGOs. NGOs simply cannot compete with the state, but they can work at micro level. They can be effective and can do a lot. But you have to understand their capacities, their positives and negatives. Overall, if the armed forces in the area are able to engage positively with the NGOs they can act as a complementary force to restore peace.

In terms of natural disasters, I hope nothing is definite. We experienced such a wild card in Swarth of Pakistan. We had unprecedented floods that came and disturbed the whole dynamic of the post conflict situation. So natural disasters can really disturb the security operations. It can upset your development trajectory and so on. In the continuation, one needs to keep the balance to restore the earlier momentum and move on.

Diaspora is another important aspect, which is something that has been referred to by many with respect to the conflict and post conflict scenario. What we have to understand is that it can affect the post conflict situation in many ways. The diplomatic dimension and the political dimension are going to be tackled by the state or the government and its leadership. The armed forces' leadership is to guard their consumers who are basically the people in the conflict area. Therefore, they are the ones to talk to if you need to engage in a positive note. Yet, those consumers can be won from their leadership or their linkages by those who are residing abroad. This is only in the political dimension, but there are also some financial implications. In that case, the armed forces will again have to get back to the relevant aspects with appropriate agencies in the government to take care of those linkages. Nevertheless, believe me, if you want to bring the stability those linkages will have to be severed.

External linkages are the other wild cards. They can have either negative or positive impact during the transition. These linkages of course are both regional and global. They can be lucky or the other way. Lastly, the unknown unknowns need to be considered. Essentially, the message over here is that serious steadiness can affect the position of leadership. When you are tackling the post conflict scenario, retain the balance, retain a flexible mind to tackle the unknown, unknowns, and do not be upset by smaller negative events. Those events have to be taken in full spirit and one should maintain a trajectory that has to be followed with care and trust.

Lastly, when the army goes back to the cantonment or to the garrisons after handing over the respective socio economic and political activities to the respective civilian outfits, and if the people in the area wave you “good bye”, I think you have done your job. Therefore, it is extremely important that the political leadership choose the moment to transfer the responsibility at the correct time under correct conditions. You stay a week, a month, a year more than that, and then people are going to be fed up with you and become counterproductive with other circumstances. In these circumstances, there can be diminishing returns at the end, which you do not really want to have. Hence, this (transferring responsibility) should happen at the right time.

## **Role of Armed Forces in Post –Conflict Sri Lanka: Lessons for Sri Lanka**

*Alan I Hatcher*



*Professor Alan I Hatcher (UK) making his Presentation at the Symposium (IMG\_1732)*

### **Introduction**

During my research for this paper, I found some very interesting facts about this wonderful country. Sri Lanka has had many names over the centuries until 1972 when the official title of the island became The Democratic Socialist Republic of Sri Lanka. As a result of its location off the southern coast of the Indian subcontinent in the path of major sea routes, Sri Lanka is a strategic naval link between West Asia and South East Asia. It is a perfect place to act as a security guard over the maritime waters that are currently infested by pirates and this is something we should consider in the light of the title of this paper.

Other interesting facts are that Sri Lankans are amongst the best educated in the world with a literacy rate of 92%, and with 83% of the total population having had Secondary Education. The country is famous for the production and export of tea, coffee, coconuts, rubber and cinnamon, the last of which is native to the country.



A less attractive fact I found was a number of Tamil related websites that continue to create a threat of a return to violence by inciting actions by using inflammatory comments. This can lead to an obvious danger of radicalization of younger generations.

There has been significant progress in Government-led efforts towards resettlement. Due to difficulties in clearing landmines and the Explosive Remnants of War (ERW), combined with the lack of basic services in the home areas, there is a difficulty with people returning to their villages and homes.

There is a role here for the combatants on both sides of the conflict which will be discussed later in this paper. Although the Government has committed significant resources to infrastructure in the return areas, most of the returnees currently have limited access to basic services such as shelter, water, sanitation health care. These communities remained extremely vulnerable and need assistance that could be provided by well-disciplined Armed Forces.

### **External Interference**

Many external reports have now been written making several demands of the Sri Lankan government in terms of actions taken towards the end of the hostilities. International pressure can be helpful, especially if it propels a country to prioritize a specific course of needed action but undue pressure is unhelpful. I believe that it is down to Sri Lanka itself to resolve these issues with the **assistance** of the International community – but only if they ask for it. We have all seen how South Africa resolved its issues internally after acknowledging condemnation of its practices from international sources and I believe Sri Lanka can achieve resolution also. Piling unreasonable pressure on Sri Lanka is counterproductive and the country and its people have to go through a healing process that is not best served by external interventions. However, there is also a need to strengthen partnerships between United Nations agencies, NGOs and the Sri Lankan government.

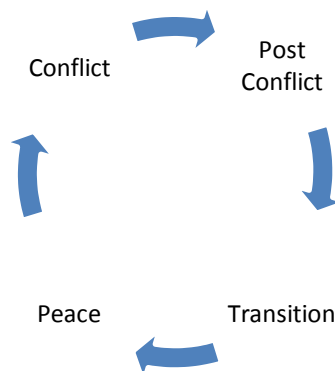
Post conflict scenarios are very heavily dependent on getting the strategy correct from the beginning. From a Global perspective, there have been numerous instances of conflicts that have never been truly resolved, leading to many generations living in fear. For any real lasting peace, it is imperative to get all warring factions, as well as financial and political supporters, to buy

into the peace proposals. In my opinion this has only ever been achieved through diplomacy and communications regardless of military victories. Unless all parts of the opposing forces come together there will not be a lasting peace. It is important that both sides have a voice and that the victors are magnanimous in victory. Otherwise there is a danger of marginalizing groups who will eventually return to violent means in an effort to have their opinions heard.

## Process

Once political neutrality has been achieved the process of decision making with regard to the Armed Forces can begin. The initial starting point should be to reduce numbers in order to reduce costs whilst maintaining the protection of the country and its assets.

Define the process:





## Peace

To achieve a form of total peace, it requires:

- ☐ Political will, the will of the people and commitment on both sides
- ☐ Strong military and political leadership to maintain any peace agreement
- ☐ Achievable goals in all aspects of the peace process

The primary political objectives should be:

- ☐ To encourage the combatants to transfer their opposition to the political arena instead of resorting to armed force
- ☐ To reduce military involvement and influence of politics to ensure that a full democratic process takes place with no external influences.
- ☐ To make the Armed Forces subservient to the people, thereby strengthening civilian control over the armed forces. The Armed Forces must come under the control of the Government and not the other way around.

In accordance with the United Nations definitions, the prerequisites for a war-torn society transiting into peace are:

- ☐ Total cessation of hostilities
- ☐ A degree of stability and a clear national directive and authority
- ☐ Movement toward national reconciliation
- ☐ Mechanisms to minimize any perception that a group is being favoured or victimized
- ☐ A combination of disarmament and credible security guarantees for those who give up their arms. Combatants on the losing side especially, need to be reassured they will not be discriminated against or suffer reprisals
- ☐ Incentives for combatants to demobilize

The best examples I can give in terms of reconciliation and rehabilitation are those of the warring ~~factions~~ in Northern Ireland and, of course, the anti-apartheid movement in South Africa, where the man, now world famous and viewed as a country's saviour, initially classed as a terrorist by one faction and locked up for 20 years, became the President of his country and was feted by world leaders and celebrities.

There are many similarities between the conflict in Northern Ireland and Sri Lanka. The use of

force in controlling Northern Ireland had been prevalent for more than 300 years. The British Armed Forces were deployed to Northern Ireland in 1969 to protect the catholic minority who were coming under attack from the protestant majority. This was very quickly reversed when the IRA started to represent the catholic minority and started their major bombing and assassination campaign (Black Friday). Many attempts were made at reconciliation to no avail until inevitable meetings took place between our politicians and known terrorists. Gerry Adams and Martin McGuinness are now seen as elder statesmen despite their violent and unsavory backgrounds. Under the “Good Friday” agreement Prime Minister Blair agreed to the release of hundreds of political prisoners, some of whom had committed acts of terror including murder. Whilst abhorrent to a lot of people, it is the only method that truly works and passes the tests of time. Problems in Northern Ireland do persist but there is no doubt that the agreement remains in force and it is this that removed the majority of the conflict from the streets of Northern Ireland and the UK.

## **Conflict**

During conflict it is easy to define the role and purpose of the Armed Forces; however it is during this volatile time that things happen that are often difficult to understand. Soldiers who are normally peaceful, law abiding citizens can become cruel and barbaric. How does this happen? Do these individuals already have psychopathic tendencies? Is it the result of a long held grudge or discriminatory beliefs that lead to feelings of superiority? Is it a case of revenge for other atrocities committed by the combatants? Many social and psychological studies have provided some, but not all, answers to these questions. Certainly, attribution plays a major part.

Regardless of how or why this might happen, the result is often a rapid, and oft times uncurbed escalation of conflict. It is almost impossible to predict how people will react during such stressful times but it may be possible to “weed” some of them out using some form of psychometric testing as part of the recruitment process. You have in this country, a leading specialist in this area Dr Mal Hettiararchi who is far better qualified to make comments in this area than me.

All humans have a natural flight or fight instinct and training in the military works at channelling our body’s natural hyper arousal response towards fighting. In the military the flight instinct is rarely an option!

In the case of Sri Lanka, the conflict has occurred in country and therefore it has inherent

social problems that other countries in post conflict do not encounter. This is a similar scenario to the conflict in Bosnia and the Former Republic of Yugoslavia where neighbours were pitted against each other and feuds were re-enacted from decades ago. Even today in the FRY many small villages retain memorials to their heroes and many villagers refuse to recognise the rights of the “other” side.

On the positive side from a public’s perception the Sri Lankan population in the main, will have seen first-hand the destruction and death brought by conflict and they will have appreciated what the Armed Forces have been doing for them. This has to be compared with the US and UK public who are distanced from the current conflict in Afghanistan and other countries. When troops return home they can feel alienated because the public do not fully comprehend what they have gone through. Looking around the audience I am sure many here remember the issues faced by many US soldiers returning from Vietnam in the 60’s and 70’s to face peace marches by the public denouncing what the troops had done, entering a foreign country and murdering the inhabitants.

All Armed Forces personnel are trained to fight and it can be difficult to switch from using such aggressive responses to those more suited to peacekeeping duties after a period of intense conflict. However, during Post Conflict, nowadays it is more likely that the Armed Forces will be employed as peacekeepers, diplomats and negotiators – something they did not join for, were not trained for, and may not comprehend the reason for.

## **Post Conflict**

During times of conflict, we increase the numbers of our Armed Forces for obvious reasons; during post conflict we have to reduce these numbers very quickly for political and financial reasons. It is a fact that in post conflict times most countries will need a period of time to regenerate economies and to start to rebuild society, relationships and infrastructures such as roads, buildings and hospitals. In some countries Armed Forces personnel are used to rebuild the infrastructure using the skill mix within battalions for specific jobs and their physical abilities for laboring work. This is a cheaper option for the government as they have a fixed work force at a fixed price. It also allows the soldiers to take pride in making a significant contribution to the rebuilding (or regrowth?) of their country. The public like to see members of the Armed forces during conflict as this provides a sense of security. However the converse applies during post conflict, in that the public very quickly forget the

contributions made by the Armed Forces and would prefer them to disappear into the background until the next time they are needed. All returning troops should undergo some form of debriefing and/or assessment to identify psychological consequences of conflict, for example anxiety, depression or PTSD. Once identified, such conditions can then be treated. We need to use the Armed Forces to rebuild our societies and to give them an opportunity to make a life for themselves after they have served their country and to become useful members of society outside of the Armed Forces.

## **Transition**

Transition to peace can be very complex and difficult due to the fact that humans are involved in the process. Many mistakes have been made in the past by conquering countries or organisations. The most recent was the disbandment of the complete Iraq military system by the USA and the allied forces. The result was absolute chaos and could have been avoided by clever use of the serving Iraqi military structure. I believe that here in Sri Lanka you have gone a long way to try and integrate these opposing forces and for that you should be commended.

According to the United Nations a successful demobilization and resettlement programme for ex-combatants is one of the requirements for an effective transition from conflict to peace. Transition from military to civilian life should not be seen as a separate part of a combatants Armed Forces employment but rather as a closing chapter on a successful career.

Perhaps it would be useful here to define demobilisation as understood by the United Nations:

- ☐ A reduction of the number of combatants in the Armed Forces and the disbanding of enemy forces
- ☐ Resettlement programs to help ex-combatants return to the civilian society.
- ☐ Objectives of demobilisation could be related to political, security or socio-economic factors.
- ☐ Most socio-economic objectives are to reduce military spending and to produce a Defence Dividend
- ☐ Should provide long-term, productive employment for ex-combatants.

During transition there are always security concerns. These include the return to violence by

combatants who have no desire to return to society or who think they still have a battle to fight. There are also those who will use their military training and experience to foster a life of crime.

A successful transition requires different actions:

- ☐ All ex combatants should be classified by transferrable skill levels. Some will be better suited to an immediate transition whilst others may need more support
- ☐ Delivery of resettlement processes should be kept as simple as possible with as little bureaucracy as possible.
- ☐ Minimal cost to the individual and the State
- ☐ Maximum conduit benefits to the ex-combatants
- ☐ Deliver presentations to communities on the need for them to assist in the resettlement and re-integration of ex-combatants

### **What is the Role of the Enemy Forces in the Reconstruction of Post Conflict Scenarios?**

In the case of Sri Lanka the role of the opposing forces should be to act as a peaceful conduit and to maintain security in those areas that may still be a little fragile to the government authorities. These individuals must undergo some form of a deradicalisation process but this should be conducted in such a way as to be inclusive and not in any way isolating. The leadership of these Forces should be brought into the main body of the Armed Forces with a view to using them to maintain security in the North of the country and to ensure that any mutinies by individuals who cannot come to terms with peace are dealt with very quickly.

### **What is the Role of the Armed Forces in Post Conflict Scenarios?**

The following is by no means an exhaustive list and we can expand on them if we have time:

- ☐ Security of the country
- ☐ Training to protect the sovereign state of Sri Lanka
- ☐ Provision of peacekeeping forces in support of the International Community
- ☐ Security of government and other buildings
- ☐ Ceremonial duties

- ☐ Military Aid to the Civil Powers (MACP) : eg: bomb disposal, fires, natural disasters
- ☐ Security at major events
- ☐ Counter Terrorism operations
- ☐ Anti-Piracy – support through either an independent deterrent or provision of land and sea based infrastructures to support International actions in response to the maritime pirates.

## **Role of senior Officers and Government in Post Conflict**

It is normal for Generals and other senior officers to find roles to transfer into, during post conflict activities with ease. These range from political appointments through to executive positions in large corporate organizations. In recent years during coups, we have seen the leadership of countries taken over by the military to the exclusion of political/democratic reforms. Examples range from as far a field as Argentina and Chile through to Libya and Burma.

**INSERT PAGE 64 – THE BOX DIAGRAM**

## **Use of the Armed Forces in Post Conflict Scenarios**

What is the first thing we see as tourists coming to this wonderful country? Uniforms and police almost every 30 metres along the roads. Is this indicative of a safe country? Should we be worried? Are we still in a conflict threatened country or simply a country that has too many military and police and does not know what to do with them?

The first priority must be to identify the strategic directions for the Armed Forces from the Government. This will then dictate the size of the Armed Forces for future generations. The reduction of the force must be done in a way that creates a steady flow of “qualified” personnel out of the Armed forces and into productive positions in civilian life. There are many ways of reducing the size of the Force such as:

- ☐ Creating redundancies for posts in which the serving personnel already have easily transferable skills, such as construction engineers and administrators. The problem with

this is that you will normally lose the brightest individuals during this process

- ☐ Developing resettlement programmes for serving personnel to attend during their last year of service
- ☐ Providing career advice based on the individual's and the country's requirement
- ☐ Providing some form of financial resettlement such as one off payments or even pensions.
- ☐ Setting up an ex-servicemen support mechanism similar to the British Legion in the UK and the Veterans Association in the USA.

There is a danger that too many ex-servicemen could be released/discharged from the Armed Forces at the same time, resulting in a huge social and economic problem.

There is a saying "Give a man a fish and he will feed his family for a day but give him a fishing net and he will feed his family forever" We need to equip the combatants to become useful members of society – working for themselves and their families and not becoming dependent on the State for financial support. An example, which has worked in other countries similar to Sri Lanka, is the provision to ex-combatants of reintegration support, which includes training in a chosen livelihood, such as fishing, and providing associated start-up kits such as fishing rods or tools for mechanics.

### **Some General Lessons Learned from Global Experience**

- ☐ Resettlement programmes require long term commitment and financial investment.
- ☐ Try to avoid placing too many ex-combatants into public service employment as this can lead to a military solution to civil problems, which is not always acceptable to the population.
- ☐ Avoid setting up a dependency network, it should be supporting but not dependent
- ☐ All combatants from both sides will include those with a "winners and losers" mentality, some will be skilled workers and others may have no skills. We must be careful not to treat all combatants as a single group.
- ☐ Each combatant will have individual and distinct needs and potential.
- ☐ Officers' who have attended formal Command and Training courses as well as gaining experience during combat will have leadership and organizational skills that can be invaluable to the reconstruction of society.
- ☐ Combatant skills can be applied to military or criminal ends.

- ☐ It is the opinion of this author that benefits for combatants should not be offered Based on rank and position; they should be equitable across all ranks.
- ☐ Resettlement training should be relevant to the individuals' aspirations, where possible, but also relevant to the available job market.
- ☐ When downsizing, it is essential to consider a potential recruitment drive in order to maintain an ethnic balance. This is not always possible but efforts should be taken to demonstrate a willingness to work with all ex combatants from both sides. In the UK for example at one time we had very few black people in our Armed Forces and very few women. We have now integrated these minorities into our Services.
- ☐ Resettlement planning should include families of the combatants and also community leaders
- ☐ Resettlement should take place in normal colleges/schools and should not be completed in "special" camps
- ☐ Resettlement is not finite and combatants should be advised that this is their opportunity to take now
- ☐ A good strategy is essential to making the resettlement process work

## **Problem Areas**

- ☐ A fast reduction in the Armed Forces can create a major unemployment problem, which in itself can develop into further instability and violence.
- ☐ Nations such as Sri Lanka, which are just emerging from a long period of conflict, are likely to have few opportunities for income generation or employment, inhibiting the reintegration of ex-combatants.
- ☐ The majority of the ex- combatants will have a low education with relatively few skill levels and no experience of civilian life.
- ☐ It is possible that the economy may not have recovered enough and will therefore not sustain many of the ex-combatants, even if they are provided skills.
- ☐ Education and training provided to the ex-combatants may not be appropriate to the employment opportunities available.

## **Conclusion**

There is no doubt in my mind that during the Post Conflict period, there is a major role for the Armed Forces. The difficulty, especially for Sri Lanka, is to get all of the combatants into one



room where they can develop a lasting peace that will be acceptable to both sides. The role of the Armed Forces in this scenario is to protect these talks and to prevent distracting attacks from either side. There will be many pressures as you move forward, from the International Community, the NGOs and more worryingly from the media. There will no doubt be discussion that the Armed Forces in Sri Lanka are too large and now that there is no threat, you can reduce the numbers. This is a ridiculous argument and should not be taken seriously at this stage for when you reduce the numbers too quickly you cannot always get the strength and the experience back quickly. Look at the UK in 1983 when the government of the day reduced the size of our Maritime forces and then had to commandeer cruise ships to get to the Falklands.

At some point we must develop the reduction of the troops and this should be through a well thought out resettlement campaign. An easy objective at this stage is to identify the skills the troops have and match them directly into positions where they are urgently needed; for example structural engineers and construction workers.

A successful resettlement strategy can contribute greatly to social reconstruction, reconciliation and mitigating future violent conflict. In time, this form of demobilization reduces government spending on defence measures. In the short term, the financial investment on resettlement training can be expensive but it is a worthwhile investment in the country's future.

The Post Conflict use of the Armed Forces will be affected by the way the conflict was finalised and this may take some very clever diplomacy as in this conflict, there was a very clear victor which was the Sri Lankan Armed Forces. The use of the Armed Forces must be seen to be in the interests of all communities and not protecting one side from the other.

The whole process depends on the trust and integrity of both sides to accept political agreement and to protect the peace through non-violent means. This will involve the potential recruitment of Tamil personnel into the SL Armed Forces as well as their acceptance by the serving soldiers.

An area that will have been considered is the fact that some Tamils will return to violent means in the future as have certain splinter groups from the IRA and other such terrorist organisations. It is very easy to overreact at these times and I hope that the Sri Lankan

Government will have the mature character that they have shown in recent years to be able to guide the country through these rocky times and into a very calm and peaceful future.

It is my belief that the answers to any problems come from within the country and not from without it. Final post conflict decisions remain with the country and the ex-combatants who will continue to serve their country as they have always done with pride and honour.

And finally a quote from Buddha that is quite appropriate:

*"Do not dwell in the past, do not dream of the future, concentrate the mind on the present moment."*

## **“The Role of Armed Forces in Post-Conflict Sri Lanka: Lessons Learned from a Global Perspective”**

*Mara E Karline*



*Mara E Karline (USA) Addressing the Symposium Gathering (IMG\_1745)*

This paper examines issues to consider and potential lessons learned from other post-conflict state militaries, for Sri Lanka’s Armed Forces (SLAF) in light of the LTTE’s defeat two years ago. Given the watershed nature of the SLAF’s success in 2009 following nearly three decades of war with the LTTE, it is now appropriate and worthwhile to examine its impact on the state military’s future. As Sri Lanka becomes increasingly stable, the Sri Lankan Armed Forces’ mission, role, and requirements have and will surely continue to evolve. Issues such as the appropriate role the military should adopt throughout the country, its size now that the mission has evolved, how to conduct a deft process of reduction and integration, and how to sufficiently account for Sri Lanka’s future needs, should be examined.

Since the civil war started in 1983, the SLAF has focused wholly on defeating the LTTE through varying stages of hot and cold war.<sup>1</sup> With the conclusion of this decades-long conflict—one that

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<sup>1</sup> Eleanor Pavey and Chris Smith, “Post-Conflict Reconstruction and Security Sector Reform in Sri Lanka,” in *Security*

saw the deaths of nearly 100,000 and the displacement of many more—it is an understatement to say that the threat environment has changed markedly.<sup>2</sup> Given these changed circumstances, it is worthwhile to consider what impact they might have on the SLAF and what reforms the SLAF would subsequently like to consider. In this vein, other post-conflict situations provide useful case studies to examine. As is necessarily the case with effective security sector reform, a broader process of examination and reform would likely translate into more transparent and representative Sri Lankan institutions. Such an examination following a longstanding situation of internal war, is critical for identifying factors that may facilitate or inhibit effective security sector reform in Sri Lanka. This paper, therefore, probes how the SLAF can best adapt lessons learned from other situations in reforming its security sector.

The war's conclusion was a watershed event for Sri Lanka. While this piece examines broader issues—it is beyond its scope to delve into the very challenges inherent in sufficiently countering violent insurgents like the LTTE who do not follow international norms—it is not possible to ignore very real and serious concerns about how this conclusion was effected.<sup>3</sup> Indeed, beyond the international community's legitimate concerns about human rights violations during the war, there is actually another relevant lens through which to view the war's conclusion: specifically, the implications it has for security sector reform in the post-war environment. A transparent, serious discussion of these affairs is necessary not least because it informs the post-conflict environment.

This is a critical moment for Sri Lanka's future. Studies of armed conflicts demonstrate the very real dynamic of “conflict trap” in which nation states that experience civil wars are more likely to face further violence in the future.<sup>4</sup> Indeed, conflict is five times more likely in post-conflict countries than in the “typical marginalized country that has not had a war for 10 years.”<sup>5</sup> Further, countries that fail to conduct a sufficiently representative and frank dialogue on their post-conflict environment, often face resurgence in violence.

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*Sector Reform in Challenging Environments*, eds. Hans Born and Albrecht Schnabel (Münster: LIT, 2009), 190.

<sup>2</sup> Kristine Höglund and Camilla Orjuela, “Winning the peace: conflict prevention after a victor's peace in Sri Lanka,” *Contemporary Social Science* 6:1 (2011), 20.

<sup>3</sup> A host of studies, including the 2011 report of the United Nations Panel of Experts, the 2009 U.S. State Department Report to Congress on Incidents During the Recent Conflict in Sri Lanka, and reports by organizations such as International Crisis Group and Human Rights Watch have documented human rights violations by both the LTTE and the Sri Lankan government during the conflict.

<sup>4</sup> Paul Collier and Nicholas Sambanis, eds., “Understanding Civil War: A New Agenda,” *Journal of Conflict Resolution* 46(1) (February 2002): 3-12.

<sup>5</sup> Paul Collier, et. al, *Breaking the Conflict Trap: Civil War and Development Policy* (A World Bank Policy Research Report) (New York: Oxford University Press, 2003), 107.

The Sri Lankan government's dialogue to date, therefore, is extremely important for the efficacy of security sector reform. Issues like accountability and reconciliation, which may seem beyond the scope of security sector reform, inevitably impact it. A failure to sufficiently conduct such a dialogue has hindered Lebanon since its civil war ended more than two decades ago whereas a robust effort enabled South Africa and Rwanda to make much progress in moving beyond their civil conflicts.<sup>6</sup> Efforts by the Sri Lankan Armed Forces to bring together some of those Sri Lankans most personally affected by the war are a start, although non-governmental organizations should also play a substantial role.<sup>7</sup> It is therefore both timely and necessary to consider how the Sri Lankan people can best undergo a transparent process of reconciliation and accountability. An energetic process of security sector reform could minimize a return to violence in Sri Lanka.

### **Security Sector Reform: An Overview**

The security sector reform field is relatively young; it emerged after the Cold War from two different strands of literature: civil-military relations and international development.<sup>8</sup> Given the magnitude of post-Cold War political transitions, the nature of these transitions, and the involvement of external actors, scholars in these two fields began drawing linkages between development and security as it grew increasingly clear that a synergistic relationship exists between the two arenas. In examining civil-military relations in new democracies, Huntington considered the substantial progress that these states made in reforming civil-military relations compared to other aspects of nation-building.<sup>9</sup> Both Huntington and Kohn identify some of the key challenges these states faced in reforming civil-military relations; in particular, they emphasize the need to re-define roles and re-structure chains of control.<sup>10</sup> Except for a short foray into security issues in the 1960s, the development field shied away from security issues out of fear that it would taint perceptions of its work. With the end of the Cold War and the emergence of numerous fledgling democracies, these fears were overcome by a realization that the close

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<sup>6</sup> Kristine Höglund and Camilla Orjuela, "Winning the peace: conflict prevention after a victor's peace in Sri Lanka," *Contemporary Social Science* 6:1 (2011): 29.

<sup>7</sup> Ibid.

<sup>8</sup> Timothy Edmunds, "Security Sector Reform: Concepts and Implementation," in *Towards Security Sector Reform in Post Cold War Europe: A Framework for Assessment*, eds. Wilhelm N. Germann and Timothy Edmunds (Geneva: Geneva Center for the Democratic Control of Armed Forces, 2003), 11.

<sup>9</sup> Samuel Huntington, "Reforming Civil-Military Relations," *Journal of Democracy*, no. 4 (1995): 9-17.

relationship between providing security and development could no longer be ignored; they are inexorably tied to broader issues of governance.

There is much agreement in this literature, particularly regarding foundational beliefs on security sector reform. It is based on the notion of ultimately creating a security sector (and its attendant institutions) that resembles established, traditional democracies. Edmunds offers a helpful definition that manages to capture both the letter and spirit of security sector reform: “the provision of security within the state in an effective and efficient manner, and in the framework of democratic civilian control.”<sup>11</sup> In disentangling this definition, two ideal elements emerge about the very nature of security sector reform and its administration. In Edmunds’ explanation, it should emphasize “democratization and civilian control” and should be conducted with “effectiveness and efficiency” which he sees as two iterative phases.<sup>12</sup> This emphasis on targeting a state’s provision of security and the manner in which it does so, particularly subsumed under civilian authority, resonates throughout this literature.<sup>13</sup> Notably, Ball cautions that security sector reform should be considered as one part of a larger effort to establish functioning institutions in a fledgling or post-conflict state.<sup>14</sup> Her argument is particularly salient when one considers the impact that economic development and political reform programs can have on overall improvement of a state’s institutions.

## Implementing Security Sector Reform

Not only is there much agreement in the literature about what security sector reform entails, but

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<sup>10</sup> Ibid. Richard Kohn, “How Democracies Control the Military,” *Journal of Democracy*, no. 4 (1997): 140-153.

<sup>11</sup> Edmunds, “Security Sector Reform: Concepts and Implementation,” 12.

<sup>12</sup> Ibid., 12-16.

<sup>13</sup> Other examples of SSR definitions that resonate with Edmunds’ definition include:

Organisation for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC), *Handbook on Security Sector Reform: Supporting Security and Justice*

(Paris: OECD-DAC, 2007, accessed 16 February 2010); available from

<http://www.oecd.org/dataoecd/43/25/38406485.pdf>; Internet. U.S. Agency for International Development, *Security Sector Reform: USAID, DOD, DOS Policy Statement* (Washington, DC, 2009, accessed 16 February 2010); available from [http://www.ssrnetwork.net/document\\_library/detail/4532/security-sector-reform-usaid-dod-dos-policy-statement](http://www.ssrnetwork.net/document_library/detail/4532/security-sector-reform-usaid-dod-dos-policy-statement); Internet. *Towards a Better Practice Framework in Security Sector Reform: Broadening the Debate* (Clingendael: International Alert and Saferworld, August 2002, accessed 16 February 2010); available from [http://www.ssrnetwork.net/document\\_library/detail/3140/towards-a-better-practice-framework-in-security-sector-reform-broadening-the-debate](http://www.ssrnetwork.net/document_library/detail/3140/towards-a-better-practice-framework-in-security-sector-reform-broadening-the-debate); Internet.

<sup>14</sup> Nicole Ball, “Strengthening Democratic Governance of the Security Sector in Conflict-Affected Countries,” *Journal of Public Administration and Development* 25 (2005), 26.

also about how it should be conducted. Appreciating the variance in local contexts is of critical importance. Taking a broad view of the security sector—and the institutions that influence it—can enable better reform processes and results. This point is especially worth considering, since it places successful security sector reform within the broader issue of good state governance. Developing civilian control and professionalizing the security sector, particularly by defining its roles and missions, is necessary. Appropriately building militaries in line with perceived requirements and threats, and in a coordinated and logical manner, is important. Finally, security sector reform efforts require an intensive, sustained measurement and assessment effort. The OECD-DAC provides a simple and thorough delineation of appropriate reform objectives; they should be “specific, measurable, achievable, realistic (in terms of resources available), and time-bound.”<sup>15</sup>

It’s necessary to offer caution, however, about the implementation of security sector reform. Indeed, in this regard, the literature can best be understood as diagnosing the disease, but failing to identify the appropriate remedy. Chanaa tackles this issue in her brutal acknowledgement that the history of security sector reform to date is less optimistic than the vision offered by the literature.<sup>16</sup> Instead, in many ways, security sector reform remains an “underdeveloped concept” that lacks defined, operationalizable policy strategies.<sup>17</sup> Though difficult to implement appropriately, post-conflict societies require some degree of security sector reform to realign roles, responsibilities and resources. Bluntly stated, “in post-conflict societies, the remnants of wartime military and security apparatuses pose great risks to internal security: inflated armies with little or no civilian control; irregular and paramilitary forces; an overabundance of arms and ammunition in private and government hands; weak internal security forces; and a lack of trust in and legitimacy of the government’s control over police and military forces.”<sup>18</sup>

### **Security Sector Reform: Issues to Consider for Sri Lanka**

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<sup>15</sup> Organisation for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC), *Handbook on Security Sector Reform: Supporting Security and Justice*, 69.

*Towards a Better Practice Framework in Security Sector Reform: Broadening the Debate*, 6-12.

<sup>16</sup> Chanaa, *Security Sector Reform: Issues Challenges and Prospects*, 8.

<sup>17</sup> *Ibid.*, 10.

<sup>18</sup> Albert Schnabel and Hans-Georg Ehrhart, “Post-conflict societies and the military: Challenges and problems of security sector reform,” in *Security Sector Reform and Post-Conflict Peacebuilding*, eds., Albert Schnabel and Hans-Georg Ehrhart (New York: United Nations University Press, 2005), 1.

Given that frameworks exist in terms of how militaries might reform and evolve post-conflict, it's worth examining militaries that have faced these problems elsewhere, in other post-conflict contexts, to see if there might not be some lessons learned for Sri Lanka. "We are the same Army that fought the LTTE for over 27 years," explained Army Commander Lt. Gen. Jagath Jayasuriya earlier this year.<sup>19</sup> Given the changed circumstances in light of the LTTE's defeat, it is worthwhile to consider what Sri Lanka might learn from other countries' experiences as it seeks to implement post-conflict security sector reform. Broadly a "more representative, efficient and accountable" security sector can have positive, far-reaching implications for Sri Lanka as it has for other post-conflict environments.<sup>20</sup>

*Mission and Roles:* For robust security sector reform, it is first necessary to broadly consider what the SLAF's mission and role should be. After nearly three decades with an unwavering focus on countering the LTTE, the SLAF is now in a position where it needs to determine what appropriate future role it should and hopes to play. What should be the contours and parameters of its national security policy?<sup>21</sup> Underneath this paradigm, it is appropriate to nest and consider defense reforms. An active dialogue between and among Sri Lanka's political and military leaders about the SLAF's mission post-conflict is critical since its mission is invariably evolving. Similarly, civil-military relations may benefit from a greater delineation of roles and responsibilities. Evidence has demonstrated that a robust dialogue on these issues helped facilitate a more peaceful post-conflict environment in Colombia and a lack of such dialogue may have played an important role in a return to violence in Timor-Leste.<sup>22</sup> Specialization and prioritization is necessary, though it can have some inadvertent and attending complications. Israel, for example, had focused on counter-terrorism and low-intensity conflict in response to the second Palestinian *Intifada* that erupted in fall 2000. Doing so atrophied its conventional abilities that were necessary for countering Hizballah in a hybrid conflict during summer 2006.<sup>23</sup>

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<sup>19</sup> Shanika Sriyananda, "Army has nothing to hide, says Army Commander," *Sunday Observer (Sri Lanka)*, January 30, 2011.

<sup>20</sup> Eleanor Pavey and Chris Smith, "Post-Conflict Reconstruction and Security Sector Reform in Sri Lanka," in *Security Sector Reform in Challenging Environments*, eds. Hans Born and Albrecht Schnabel (Münster: LIT, 2009), 191.

<sup>21</sup> Pavey and Smith assert that one reason for the 2002 Defence Review Committee's failure was the lack of a national security policy. Eleanor Pavey and Chris Smith, "Post-Conflict Reconstruction and Security Sector Reform in Sri Lanka," in *Security Sector Reform in Challenging Environments*, eds. Hans Born and Albrecht Schnabel (Münster: LIT, 2009), 196.

<sup>22</sup> "World Development Report 2011: Conflict, Security and Development (Chapter 5: Transforming Institutions to Deliver Citizen Security, Justice, and Jobs)," *The World Bank*, 15 April 2011: 149.

<sup>23</sup> David E. Johnson, *Military Capabilities for Hybrid War* (Santa Monica: The Rand Corporation, 2010).



In the north and east, for example, the SLAF is intimately involved with maintaining order. As Army Commander Lt. Gen. Jagath Jayasuriya noted, “we are stabilizing and consolidating the areas that were liberated.”<sup>24</sup> Over the last two years, the SLAF has helped resettle hundreds of thousands of Internally Displaced Persons, minimize security zones, and de-mine millions of square meters of land, according to the U.S. State Department.<sup>25</sup> With much of this work completed, it is worthwhile to consider how the SLAF’s mission should evolve in this regard. To what extent should this be a permanent part of the SLAF’s mission? If not, when should it begin diminishing and how? In Egypt, for example, there have been unhelpful repercussions and distortions due to the military’s deep penetration of the development and business sector. The SLAF’s involvement in this arena is perhaps best epitomized in the issue of vegetable sales.<sup>26</sup> In this vein, it may be prudent for other entities, including non-governmental organizations, to play an increasingly involved role.

What are the Sri Lankan Armed Forces’ comparative advantages regionally and globally? A thoughtful process to ascertain this will enable the SLAF to more deeply specialize and contribute to the international warfighting community. At a minimum, its disaster response skills and lessons learned (honed by the terrifying tsunami in 2004) and its maritime counterterrorism capabilities and experience in littoral combat (honed by its extensive efforts to counter the LTTE’s sophisticated Sea Tigers) are particularly worthwhile. For example, it makes sense for the Navy to actively share its expertise in this arena, which could be particularly useful for countries countering maritime challenges in places like the Horn of Africa and the Strait of Hormuz.

*Planning:* Because for much of the last three decades or so, the SLAF focused on either active conflict with the LTTE or its inevitable resurgence, planning appropriately for the military’s needs was understandably difficult. In Sri Lanka, “rapid and unstructured responses to conflict dynamics

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<sup>24</sup> Shanika Sriyananda, “Army has nothing to hide, says Army Commander,” *Sunday Observer (Sri Lanka)*, January 30, 2011.

<sup>25</sup> Robert Blake, “Transcript of the Press Conference by Assistant Secretary Robert Blake in Colombo.” Press conference, American Center, Colombo, 4 May 2011.

<sup>26</sup> According to the Sri Lankan Army Commander: “When the vegetable prices were soaring, the Army was given the responsibility of selling vegetables at low prices. The main aim of the project was to bring down the prices of vegetables and to give a fair price to the farmers who had been duped by the middlemen. We wanted to give relief to the farmers as sometimes they don’t get a price to cover the initial cost of production. In this project there is no middlemen and the Army doesn’t add the transport cost to the selling prices. The Army has proved that vegetable prices can be brought down.” Shanika Sriyananda, “Army has nothing to hide, says Army Commander,” *Sunday Observer (Sri Lanka)*, January 30, 2011.

tended to take preference,” explains Pavey and Smith.<sup>27</sup> In the United States, for example, between the Global War on Terror and the wars in Iraq and Afghanistan, it has been similarly challenging to plan appropriately for the U.S. military. In American national security circles today, a robust dialogue is taking place. With the wars in Iraq and Afghanistan winding down, to say nothing of the extremely constrained domestic fiscal environment that the United States faces, it will be necessary to strike a balance—in a thoughtful and considered manner—between re-calibrating defense forces and ensuring they are adequately prepared to counter potential threats. In many ways, the United States is now in the throes of an active security sector reform effort, working to “right-size” the U.S. military and to appropriately posture it in a dynamic threat environment.

*Services:* Security sector reform requires a penetrating examination of the military’s components. Some preliminary thoughts to consider:

*Army:* What should the Army’s structure be, now that the LTTE is defeated? Which capabilities must it retain, which can receive less attention, and what training and equipment is appropriate for doing so? As some security analysts have quipped, “the postmodern soldier is not only a fighter but also a peacekeeper, policeman, diplomat, social worker, and Peace Corps worker.”<sup>28</sup> Which of these roles is most appropriate for the Sri Lankan Army and why?

*Navy and Air Force:* Given Sri Lanka’s strategic location in the Indian Ocean, maritime security invariably will continue to be critical. Together, the Air Force and Navy will almost surely continue to play an important role in maritime surveillance. What is the best way to structure and equip the Sri Lankan Navy and Air Force to appropriately conduct maritime surveillance? What is the best way to facilitate aerial reconnaissance capability, both for ground and maritime situational awareness? Should UAVs play an increased role? How should responsibilities and resources be allocated? This can be a challenge—delineating missions between and among services—as the U.S. military’s discussion in recent years over unmanned aerial vehicles (UAVs) illustrates. What other responsibilities are required; for example, should the Navy conduct maritime patrolling further from the Sri Lankan coastline?

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<sup>27</sup> Ibid.

<sup>28</sup> Albert Schnabel and Hans-Georg Ehrhart, “Post-conflict societies and the military: Challenges and problems of security sector reform,” in *Security Sector Reform and Post-Conflict Peacebuilding*, eds., Albert Schnabel and Hans-Georg Ehrhart (New York: United Nations University Press, 2005), 3.

*Personnel:* The appropriate size of the SLAF will necessarily stem from how its mission and roles are defined. The Sri Lankan Army, for example, is now composed of more than 200,000 personnel, nearly doubling in recent years.<sup>29</sup> Such a number may need to be adjusted in light of the changed threat environment. The United States military is wrestling with a similar dynamic: the U.S. Army and U.S. Marine Corps have grown in size by nearly 100,000 in the last decade.<sup>30</sup> Such decisions are not easy for a host of reasons, not least because militaries can often serve as a public employment project particularly buoyed by difficult fiscal circumstances. This is a perpetual dilemma for post-conflict militaries. Indeed, more than 60 years ago, the Greek military underwent a painful, but necessary reduction in its personnel following its defeat of the communist insurgency. While hesitant at first, the Greek leadership was cognizant that the state simply could not sustain—but more importantly, did not *need* to sustain—such a robust force now that the threat environment had changed markedly. More recently, El Salvador’s military underwent a comprehensive security sector reform effort which dramatically changed its force structure—including reducing its military to one-fourth of its size during the conflict and disbanding units that were no longer required—and was relatively successful in doing so.<sup>31</sup>

Once serious consideration is given to the SLAF’s appropriate size, a deftly coordinated demobilization and reintegration effort will be necessary. Importantly, these personnel need to be brought into society as productive members, a difficult process. Given how all-encompassing the conflict with the LTTE has been over the years, some element of societal militarization may have invariably occurred and if so, how should it be best stemmed? In Nicaragua, for example, one element of its holistic security sector reform effort included additional resources and support for community-based efforts to deter violence.<sup>32</sup> A slightly less painful way of reducing the SLAF’s size in the near-term could be increased SLAF participation in peacekeeping missions. Doing so would enable attrition to naturally reduce the size of the SLAF as long as personnel are not replaced at a comparable rate. Further, participating in peacekeeping missions, benefits contributing state militaries by providing opportunities to hone certain skills and improve

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<sup>29</sup> “Cornered Tigers—the LTTE evolves as guerrillas,” *Jane’s Intelligence Review*, 22 March 2009.

<sup>30</sup> Greg Jaffe, “Pentagon in cross hairs of debt ‘trigger,’” *The Washington Post*, August 1, 2011.

<sup>31</sup> “World Development Report 2011: Conflict, Security and Development (Chapter 5: Transforming Institutions to Deliver Citizen Security, Justice, and Jobs),” *The World Bank*, 15 April 2011: 173. Thomas C. Bruneau, “The military in post-conflict societies: Lessons from Central America and prospects for Colombia,” in *Security Sector Reform and Post-Conflict Peacebuilding*, eds., Albert Schnabel and Hans-Georg Ehrhart (New York: United Nations University Press, 2005), 225-242.

<sup>32</sup> “World Development Report 2011: Conflict, Security and Development (Chapter 5: Transforming Institutions to Deliver Citizen Security, Justice, and Jobs),” *The World Bank*, 15 April 2011: 173.

“jointness” through experience in coalition warfare situations.<sup>33</sup> Importantly—and this is an issue that reaches beyond the SLAF’s size—it’s worth considering to what extent the SLAF would be interested in expanding its participation in non-United Nations peacekeeping operations. Are there other missions that do not fall under a UN umbrella that the SLAF might be amenable to participating?

The composition of the SLAF is also worth examining in light of the substantial impact a military’s composition has on effective security sector reform.<sup>34</sup> Given that “the vast majority of the Sri Lankan security forces do not speak Tamil” and there are few Tamils in the Sri Lankan Armed Forces, is there a need to re-examine its composition and training in order to ensure a representative military?<sup>35</sup> The Lebanese Armed Forces have made significant strides in this regard and, even though Lebanon’s diversity is an order of magnitude more complicated than Sri Lanka’s, it is rare to hear arguments that the Lebanese military is unrepresentative of its populace. National militaries can and often do play an important role in integrating diverse members of a country’s population and facilitating a national ethos. Both the Israel Defense Forces and the Lebanese Armed Forces are two notable examples in this regard. Striking a balance between a meritocratic and representative military, which is often necessary in post-conflict environments, is difficult and requires a holistic review of military personnel affairs, including systems of recruitment, promotion, and retirement.<sup>36</sup>

*Budget:* All of these issues, among others, demonstrate that serious consideration is necessary in a post-conflict environment regarding defense funding. What level of investment is appropriate for the SLAF? Should the defense budget be maintained at the extremely high levels that it has been for years or is it now an appropriate time to reconsider these figures? These are, of course, sensitive issues but their sensitivity should in no way, mask their significance.

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<sup>33</sup> Fernando Isturiz, “Military forces training for post-conflict peacebuilding operations,” in *Security Sector Reform and Post-Conflict Peacebuilding*, eds., Albert Schnabel and Hans-Georg Ehrhart (New York: United Nations University Press, 2005), 74-90.

<sup>34</sup> Jean-Marie Guehenno, “Public Security, Criminal Justice, and Reforming the Security Sector,” Security and Justice Thematic Paper: World Development Report 2011, *The World Bank*, 27 January 2011: 4-5.

<sup>35</sup> Eleanor Pavey and Chris Smith, “Post-Conflict Reconstruction and Security Sector Reform in Sri Lanka,” in *Security Sector Reform in Challenging Environments*, eds. Hans Born and Albrecht Schnabel (Münster: LIT, 2009), 204.

<sup>36</sup> Jean-Marie Guehenno, “Public Security, Criminal Justice, and Reforming the Security Sector,” Security and Justice Thematic Paper: World Development Report 2011, *The World Bank*, 27 January 2011: 4-5.

*Politics:* Security sector reform is an inherently political and sensitive effort; ignoring this influence is misguided. East Timor took a limited view of security sector reform and failed to consider the different—and therefore immensely significant—political affiliations of its security apparatus elements, rendering it unable to sufficiently reform its security sector.<sup>37</sup> In Sri Lanka, the Defense Review Committee established in 2002 to deal with security sector reform-related issues lacked sufficient political involvement; for example, neither the Sri Lankan President nor the Commander-in-Chief of the Sri Lankan Armed Forces was involved with it.<sup>38</sup> An effective security sector reform effort will sufficiently take into account the meaningful role politics plays.

### **Beyond the SLAF:**

The SLAF plays an outsized role in ensuring that Sri Lanka does not return to violence. However, other elements of Sri Lankan government institutions are critical. For example, Brazil and Colombia have both inhibited violence by facilitating collaboration between and among their security sectors and civilian agencies. These teams, which are established at both the national and local levels, “work together. . .to address all aspects of local crime reduction and violence prevention.”<sup>39</sup> Such collaboration is difficult, but often worthwhile.

Other institutions whose role may seem peripheral to the security sector play a notable role in facilitating or impeding security sector reforms. In particular, the judiciary, law enforcement and the legislature are critical actors. In this vein, it is worth considering to what extent the Sri Lankan judiciary requires improvements in terms of its transparency, resource allocation and distance from politics. Similarly, is the legislature sufficiently involved in and substantively aware of defense affairs?<sup>40</sup> Numerous cases demonstrate that security sector reform conducted without legitimate, respected judicial and law enforcement sectors faces very real challenges. For example, both Haiti and the Democratic Republic of Congo failed to develop these institutions sufficiently and this

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<sup>37</sup> Ibid. David Kilcullen, “The Global Context of Counterterrorism: Strategy, Ethics, and Sustainability in Sri Lanka’s COIN Experience,” Conference Presentation, Sri Lanka Conference on Defeating Terrorism, 1 June 2011.

<sup>38</sup> Ibid., 190-191.

<sup>39</sup> “World Development Report 2011: Conflict, Security and Development (Chapter 5: Transforming Institutions to Deliver Citizen Security, Justice, and Jobs),” *The World Bank*, 15 April 2011: 148.

<sup>40</sup> Pavey and Smith assert that this is not the case. Eleanor Pavey and Chris Smith, “Post-Conflict Reconstruction and Security Sector Reform in Sri Lanka,” in *Security Sector Reform in Challenging Environments*, eds. Hans Born and Albrecht Schnabel (Münster: LIT, 2009), 203.

failure has dramatically affected the state's ability to provide security.<sup>41</sup> There are different scenarios for facilitating accountability and a "one-size-fits-all" approach is inadvisable. However, it is necessary to have a process grounded in the state's unique situation, in sync with its historical and cultural framework, and that receives "buy in" from all relevant parties.

Looking beyond traditional governmental organizations may offer some unique areas for cooperation. In this vein, the Colombian Ministry of Defense took an intriguing step in conducting its security sector reform effort. Then-Minister of Defense Marta Lucía Ramírez de Rincón worked with outside actors, including diverse members of the business and academic communities, when Colombia was putting together its national security policy.<sup>42</sup> She explained, "the goal was both to increase the legitimacy of the policy and to build confidence in the armed forces," and doing so further enabled outside actors to improve Ministry of Defense processes.<sup>43</sup> Such a robust collaborative effort can help enhance the ministry and the military's work.

In conclusion, it's worth recalling that Sri Lankan institutions, including in the security sector, command high domestic support. Polling demonstrates that Sri Lankans have relatively high confidence in their national institutions and the majority believes the country is moving in the right direction.<sup>44</sup> Robust security sector reforms as part of a broader reform package can facilitate this positive dynamic. To better position Sri Lanka in a post-conflict environment, both the SLAF and the Sri Lankan government would benefit from considering the experiences of others in conducting security sector reform.

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<sup>41</sup> Jean-Marie Guehenno, "Public Security, Criminal Justice, and Reforming the Security Sector," Security and Justice Thematic Paper: World Development Report 2011, *The World Bank*, 27 January 2011: 6.

<sup>42</sup> *Ibid.*, 150.

<sup>43</sup> *Ibid.*, 148.

<sup>44</sup> "Survey of the Sri Lankan People: Findings From a Public Perceptions Survey," *Asia Foundation*, November-December 2010.

**DEFENCE**

**TECHNICAL SESSION I**

CHAired BY PROF. ROHAN GUNARATNE

## **Summary**

*With reference to speakers of the technical session 1 defence, Prof Rohan Gunaratne gave an introduction to the proceeding of the seessio,n and invited the first speaker Mr S Chandima Padmakumara of the Department of International Relations of the University of Colombo. He presented his paper on Post Conflict Sri Lanka from Human Security Perspective, and stated that security has become a dominant component that shapes the international system and that it is no longer limited to national level. Further studies on security from the traditional view, emphasizing components such as responding to anarchy and maintaining national security through military entities are becoming obsolete as contemporary literature on security speaks in a broader sense, along a multi dimensional framework. In recent years the concept of Human Security based on a people-centered model of security has become a fresh approach to security studies. He emphasized that the UN Human Development Report, includes safety from chronic threats such as hunger, disease and repression as well as protection from sudden and harmful disruptions in the pattern of daily life. He elaborated the possibility of utilizing the Human Security concept in post conflict Sri Lanka to meet its development agenda, expanding the military focused security.*

*Lt. Col. (Retd) Shiam Vidurupola presented a paper on Understanding Conflict, Transition and Recovery in South Asia: The speaker expressed complexities of post war transition and recovery within the context of Security Sector Reform in South Asia. In May 2009, the Sri Lankan government militarily defeated the Liberation Tigers of Tamil Eelam, to end the bloody civil war of twenty six years. Earlier in April 2006, a vicious anti state campaign of eleven years by the Communist party of Nepal-Maoist ended in Nepal, with transfer of power from the monarchy to the people followed by a Comprehensive Peace agreement. The speedy growth of insurgent violence, impositions of conflict on social structures, and demands in meeting post war aspirations in both cases, place heavy demands on the post war governance. End of war fighting provides opportunity to assist war ravaged communities struggling to recover from seemingly hopeless socio-economic conditions and to address healing. Sensitizing and assisting communities to new realities, practical programs on integration and rehabilitation of the war affected, increase the visibility of the state among the people. The security forces of both Nepal and Sri Lanka played pivotal roles to end conflict and misery. As actors of the state they need to develop an additional capacity to assist national strategies related to transition and recovery leading to sustainable peace. Post war security and development strategies should travel hand in hand, as the end to war fighting creates aspiration to better and safer livelihoods.*



*Dr Susantha Goonatilake of the Royal Asiatic Society of Sri Lanka presented on LTTE Ideological War still Continues Locally and Internationally: He stated that the LTTE propaganda war was the propagation of the separatist perspective as correct and as a legitimate attempt to regain the self styled exclusive traditional homeland of Tamils. He cited ebsites propagating ideology of LTTE, with the aim of depicting that Northern and Eastern provinces which were arbitrarily demarcated by the British, had existed from time immemorial as an exclusive Tamil only region unconnected with the rest of Sri Lanka, based on "Cleghorn Minute" which also made an announcement stating that the Sinhalese originated in Siam. Further there was deliberate misleading in identifying Buddhist archeological finds in Jaffna as belonging to an invented Tamil Buddhism, during the LTTE control of Jaffna. He further stressed that such untenable ideological claims for the separatist war as published in Tamil Net are still being advocated by academics in the North as well as by a few in the South. He particularly mentioned of a professor giving an interview expressing the view that the LTTE war was like the war of the Mahabharata epic and Tamils should never forget it. He emphasized that such action forces the ideological preparation for the next separatist campaign.*

*The last speaker of the Technical Session 1 on Defence was Professor Shantha Hennayake who presented his case on Enemies of None and Friends of All, Realistic Geopolitics for Future Sri Lanka: He stated that his paper is based on critical interpretation of the past and current geopolitical behavior of Sri Lanka, as revealed in various national and international secondary sources and the theoretical basis from both realist and idealist postulations in international relations. He emphasized that geopolitics is a game played within a closed system of states and that the parameters are defined primarily by globally and regionally powerful states as opposed to equal sovereignties. The geographical location of Sri Lanka gives an inherent geopolitical significance which the nation can exploit to its advantage and yet Sri Lanka being located within the Indian sphere of influence, has a limited scope of geopolitical freedom, and its smallness also limits its geopolitical freedom. The speaker outlined the status of Sri Lanka as a small state and then presented the global and regional geopolitical realities that Sri Lanka has to operate within. The fundamental dictum proposed was "Enemies of none and friends of all"*

**DEFENCE**  
**TECHNICAL SESSION II**

CHAired BY MAJ GEN (RETD) NA RANASINGHE RSP VSV USP NDC PSC ISC

## **Summary**

*Ms UAT Udayanganie of Faculty of Law, University of Colombo of Sri Lanka presented her paper on Rehabilitation of Child Soldiers in Post Conflict Situation in Sri Lanka: She expressed that some issues related to the subject remain to be addressed even though two years have passed after the conclusion of the thirty year war. She explained her views on the present situation of rehabilitation of child soldiers and challenges, and provided certain suggestions to achieve effectiveness in that process. The rehabilitation process is aimed at facilitating a change in thinking and successfully reintegrating the former LTTE child soldiers into the community. she further stated that the programme should be comprehensive and it should cover many areas such as educational, vocational, spiritual, recreational, psychosocial, creative, and family and community rehabilitation. There is a necessity to identify that education is the key issue to be addressed. Finally, the domestic legal framework on rehabilitation of child soldiers should satisfy the principles of International Law and International Humanitarian Law. She further stated that the main sources of her research were based on secondary sources such as library and internet that included books, journal articles, cases, and other related statutes. She also stated that she interviewed stakeholders who are aware of this issue and a comparative study has been also done on similar cases in other countries.*

*Lieutenant Colonel SD Udayasena presented a paper on “GIS Modeling with Rapidly Changing Data Sets – An Application of Model Builder to Assess Public Accessibility in Colombo City”: He expressed that Geographic Information System modeling with rapidly changing datasets requires systematic development of analysis sequences, incorporating sufficient details and establishing a flow of each process. Absence of a structured approach would consume a significant time for recalculations to accommodate datasets that require consistent and frequent updating. A GIS modeler needs the vision to structure a particular application enabling the generation of output maps on each occasion of changes effected either on one or all data layers. Model builder is a component of Arc GIS software which enables creating, editing and management of GIS models. He emphasized that his study is an application of Model Builder to assess the spatial variability of accessibility in the city of Colombo, and applications enable the public to identify locations suitable for access as a result of various scenarios which may periodically occur within a day such as morning and evening office rush periods or school traffic durations.*

*Colonel Sujeewa Amarasena, the Dean of the Faculty of Medicine of KDU presented his case on Stress Fractures among Officer Cadets: Case Study at KDU. He elaborated the environment in which Officer Cadets are faced with challenges both physical and mental, as they are enlisted and*

during the phase of induction. Further, all physical tasks put trainees at the risk of injury, which could be considered as a major concern for trainers. He stated that surveillance and surveys have been critical factors in determining the magnitude of the injury problem, and allow tracking of injury rates and trends over a period of time and alert investigators on injury rates. He also stated about the clinical assessment carried out amongst cadets who were having persistent limb pain for more than four weeks and reported sick within the specified period 1<sup>st</sup> January to 15<sup>th</sup> February 2011, to identify stress fractures and probable causes. He pointed out figures and facts on the state of injuries involved in lower limbs. He further stated that all cases with stress fractures are from urban communities. It was suggested to introduce a specially designed shoe and to improve training surfaces as a preventive measure.

Ms HMI Herath of the Department of Social Science of Faculty of Social Science, Rajarata University presented her paper on Importance of central Highlands as a Key factor in Organizing Kandyan Wars in Kandyan Kingdom- A Case Study of Kandy, Balana, Gannoruwa, Hanguranketha and Galagedara: She explained that the Kandyan kingdom was the last independent monarchy of Sri Lanka, located in the central highlands of Sri Lanka. The Kingdom faced many invasions and insurrections by Europeans; the Portuguese, Dutch and British and by natives within the period from 1594 to 1815. Topographical features such as mountain ranges with various altitudes, plateaus, valleys, undulating mountains and dip slopes of the central highlands were utilized to thwart those insurrections and invasions. She explained the ways that were used in engaging in guerrilla warfare with many of its inherited methods at many topographical features of central highlands in the Kandyan kingdom. Observations were presented as were the findings of the study, that the Kandyan Kingdom protected itself by using its natural boundaries located in central highlands. Evidences of Danthure battle in 1594, the Balana battle in 1602 reveal that Kandians have applied guerrilla military methods such as falling trees and rocks on attackers assaulting secretly, making death traps and pit-falls along roads and jolting attackers by playing musical instruments. The kingdom has owned a well planned communication system connecting the pinnacles of the mountain ranges. There were “out posts” (“Balum Gala”) with a particular fire alarming system.

Dr A Munasinghe of the Department of Accident & Emergency of the Teaching Hospital, Karapitiya presented on Concept of Medical Rapid Deployment Force (MRDF); Sharpening the Leading of Health Care Provision: He expressed the Concept of Rapid Deployment forces that was initially developed in the United States following a report published by Research and Development Cooperation in 1979, which intended to break post-Vietnam War inertia of US

*Forces and develop capabilities to project the US military power nationally and internationally, as rapidly as possible. The concept was broadened and branched over the years to cover a wide variety of threats such as wars, insurgencies, epidemics and natural disasters. Naturally both military and civil institutions were involved in activities of Rapid Deployment Forces but the cutting edge was always provided by Military due to its training, discipline, cohesion and dependability in reacting quickly to a given threat. He emphasized that Armed Forces and the Police will benefit by developing Medical Rapid Deployment Forces in view of actual and potential threats we may face. Special equipment which is effective and easily transportable has to be designed. Smaller committed MRDF Units consisting of regular forces, which can negotiate any obstacles including air and water could be considered essential. Larger units consisting of Regular and Volunteer Forces should be available at short notice, which will be mobilized as the situation demands. Independent command structures, efficient communication systems and regular rehearsals will be vital to ensure an optimal final outcome.*



*Vice Chancellor General Milinda Peiris awarding souvenir to Maj Gen (Retd) NA Ranasinghe RSP  
VSV USP ndc psc Isc for his contribution as the Chairperson in Defence - Technical Session II*

## **Rehabilitation of Child Soldiers in Post- Conflict Situation in Sri Lanka**

*Ms. U.A.T. Udayanganie, Probationary Lecturer, Faculty of Law*

### **Introduction**

Sri Lanka has experienced a pathetic situation of internal conflict between the government forces and an armed group which was the Liberation Tigers of Tamil Elam (LTTE) for more than two decades. However, it ended with the government's military victory over the LTTE in May 2009. In the context after the civil war, the country has to face significant hardships on the population, environment and the economy of the country. "End of war brought a negative peace."<sup>45</sup> For the purpose of positive peace, it is necessary to overcome many issues such as resettlement of IDP's, rehabilitation of child soldiers, ensuring economic opportunities for war victims etc.

Children have been seriously affected by the armed conflict and as a result of that, their childhood has been completely disrupted in many ways. Their homes, schools, grounds were destructed. Specifically, most of the children who were living in war affected areas had to join LTTE armed groups. Although thirty years of armed conflict ended with a military victory relief, rehabilitation, resettlement and reconciliation of ex-child soldiers in the post conflict situation have become vital issues to be addressed for the purpose of ensuring positive peace.

### **Definition of Child Soldiers**

According to the definition of United Nations, a child Soldier is "any person under 18 years of age who is a part of any kind of regular or irregular armed force or armed group acting in any capacity, including but not limited to cooks, porters, messengers and anyone accompanying such groups."<sup>46</sup> In addition to this definition, a broad definition of child soldiers was declared in the Cape Town Principle and Best Practices in 1997 and it is as follows:

*"Any person under 18 years of age who is a part of any kind of regular or irregular armed force or armed group acting in any capacity, including but not limited to cooks, porters, messengers and those accompanying such groups other than purely as*

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<sup>45</sup>.Prof. Nayani Melegoda, Return to Normalcy: New Directions for Positive Peace in Sri Lanka, *Journal of International Development and Cooperration*, Vol.17, No.1, 2011, P.155

<sup>46</sup>.Micheal Odeh and Colin Sullivan, Children in Armed Conflict, Youth Advocate Program International Resource Pape, P.1

*family member. It includes girls recruited for sexual purposes and forced marriage. It does not only refer to a child who is carrying or has carried arms.*<sup>47</sup>

This definition has provided protection to a child who is taking part or has taken an active part in hostilities. It includes direct and indirect activities which support the war. Further, there is a special protection for girl child soldiers under this definition. Considering the Optional Protocol to the Convention on the Rights of Child, on involvement in armed conflict it does not specifically define child soldiers.<sup>48</sup>

### **Involvement of Children in Armed Conflict in Sri Lanka**

In this context, we have to discuss factors in which children are involved in armed conflicts. In North and North East Sri Lanka children have been traumatised by common experiences such as shelling, helicopter strafing, roundups, cordon and search operations, deaths, injury, destruction, mass arrest, detention, shooting, grenade explosions and landmines<sup>49</sup>. Therefore, war trauma and psychological effect on ethnic minority Tamil children are influenced to join armed groups as child soldiers.<sup>50</sup>

Deprivation from their necessary needs has become an inducing factor as well because many of them are poor, separated from their families, displaced from their homes, limited or having no access to education and income.<sup>51</sup>

Not only voluntary recruitment but also forced recruitment can be identified within Sri Lankan context. Many children in war affected areas and IDP camps are abducted and or recruited and then forced to follow orders of the organization, under threat.

This issue goes back to the 1990's. In June 1990 Indian Peace Keeping Force (IPKF) left the North and East of Sri Lanka. Serious recruitments of children into the LTTE were carried out during this period. In May 1998, Mr. Olara Otunnu, the United Nations secretary General's special Representative for children in Armed Conflict came for a country visit to Sri Lanka.<sup>52</sup> However he s

<sup>47</sup>. Cape town Principles and Best Practices on the Recruitment of Children in to the Armed Forces and on Demobilization and Social Reintegration of the Child Soldiers in Africa (Cape Town, 27-30 April 1997)

<sup>48</sup>. Optional Protocol to the Convention on the rights of Child on involvement in Armed Conflict 2000

<sup>49</sup>. Prof. Daya Somasundaram, Child Soldiers: Understanding the Context, Published in pub Med Central.....

<sup>50</sup>. *Ibid*

<sup>51</sup>. *Ibid*

<sup>52</sup>. Lakmini Senewiratne, Child Combatants: Victims of Circumstances, LST Review, Volume 13, Joint Issue 181 & 182, November and December 2002, P.64

succeeded and the LTTE publicly pledged that it would not recruit children under the age of 17 and that it would cease the recruitment and use of child soldiers.<sup>53</sup> But they did not implement this pledge in practice.<sup>54</sup>

Concerning the methods of recruitment, the LTTE was strategic and opportunistic. They were continuing to enlist school age children as cooks, messengers and clerks. In 2001, Amnesty International Report had mentioned,

*“The organization has received disturbing reports of an intensive recruitment drive in areas controlled by the LTTE in the north and East of Sri Lanka. In Batticoloa district, hundreds of people have been recruited over the last month or so in the divisions of Vakarai, Vavunativu, Pattipalai, Porativu, Eravurpattu and Koraliapattu. There have also been reports of intensified recruitment in the Vanni, the area to the South of the Jaffna peninsula largely controlled by the LTTE. Several reports also indicate that many families in the Batticoloa area were coerced with threats into letting their children be recruited. Other families who refused were forced to leave their homes and have now taken shelter with relatives in Batticoloa town.”*<sup>55</sup>

With the effect of the ceasefire agreement between the Government of Sri Lanka and the LTTE, the issue of child soldiers and their forced conscription by LTTE had become a focus of attention. This agreement prohibited “hostile acts against the civilian population including such acts as: abduction, harassment and intimidation of civilians.”<sup>56</sup> In terms of Action Plan for Children Affected by War, between the government of Sri Lanka and LTTE by June 2004, 133 children had been released through the transit centre in Kilinochchi.<sup>57</sup> In October 2007, LTTE submitted an action plan to the office of the SRS for children and armed conflict in which it committed to raise the minimum age of recruitment to 18 years and release any one in its ranks under the age of 18 years by 31<sup>st</sup> December 2007.<sup>58</sup>

During the final phase of the conflict, the level of recruitment of children who were less than 18 was increased by LTTE. “After March 2009, the LTTE was reported to have introduced a quota

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<sup>53</sup>. *Ibid*

<sup>54</sup>. Gunaratne, R., “LTTE Child Combatants”, *Jane’s Intelligence Review*, July 1998

<sup>55</sup>. <http://www.amnestyusa.org/news/2001/srilanka10112001.html>

<sup>56</sup>. Art. 2:1, Agreement on a Ceasefire between the GOSL and LTTE, Coalition to stop the use of Child Soldiers, Sri Lanka, April 2010

<sup>57</sup>. UNICEF, “Fact Sheet in Action Plan for War Affected Children”

<sup>58</sup>. *Supra note 12*



system in which teams of cadres were instructed to return with 30 conscripts. If they failed, they were subjected to severe punishments.”<sup>59</sup>

### **Child Recruitment under International Law**

The convention on the Rights of the Child in 1989 provides provisions in relation to children's participation in hostilities. Article 38 of the CRC stated that “State parties shall take all feasible measures to ensure that persons who have not attained the age of fifteen years do not take direct part in hostilities.” Although, in this article the age of requirement for military is 15 years; the optional protocol to the Convention on the Rights of the Child on the Involvement in Armed Conflict, has explicitly provided that the minimum age of children regarding recruitment as child soldiers is 18 years. In case of voluntary recruitment of those who are under 18, the government should set out the minimum age for recruitment. But in relation to non-governmental forces recruitment of children under 18 is prohibited.<sup>60</sup> Furthermore, the Additional Protocols of 1977 to the four Geneva conventions, provides that children under 15 should never participate in armed conflict.<sup>61</sup> Additional protocol I prohibits the recruitment of children (under 15) from participation in direct hostilities in international conflicts. Protocol II prohibits children under 15 of non-international conflict from being recruited or allowed to participate directly or indirectly in hostilities including voluntary enlistment (Art.04)

Some international conventions have addressed this issue indirectly. The International Labour organization Convention No. 182 on the prohibition and Immediate Action for the Elimination of the Worst forms of Child Labour defined forced and compulsory recruitment of children in armed conflict as one of the worst forms of child labour.

The Rome Statute of International Criminal Court of 1998 (ICC) states that it has the jurisdiction to prosecute the war crime of conscripting or enlisting children under 15 years into national armed forces or armed groups as well as the use of children to participate actively in hostilities, in both international and non-international armed conflicts.<sup>62</sup>

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<sup>59</sup>.Ibid

<sup>60</sup>.Art.3(1) &(2)of the Optional Protocol to the Convention on the Rights of the Child on the involvement of Children in Armed Conflict(2000)

<sup>61</sup>.Art.77(2) of the Additional Protocol I to the four Geneva Conventions(1977)(API) and Art.4(3) of the Additional Protocol II to the four Geneva Conventions (1977)-(APII)

<sup>62</sup>.Art.8(2)(b)(xxvi) of the ICC

Further, it has mentioned that rape, sexual slavery and other forms of sexual violence perpetrated in non-international wars can be considered war crimes and prosecuted in the ICC.<sup>63</sup>

For the purpose of the fulfilment of international obligation, domestic law has provided some provisions in relation to children in armed conflict. The charter of the rights of the child 1992 in Sri Lanka has incorporated the child rights convention's standards with regard to protection of children in armed conflict.

In addition to the charter, the Penal code amendment Act no. 16 of 2006 was specifically introduced to prohibit child recruitment.<sup>64</sup> Army, navy and Air force Acts prescribed the age limit of recruitment to the national armed forces.

### **Child Soldiers in the Post Conflict Situation in Sri Lanka**

According to the estimates produced by the Human Rights Watch, there are 300000 child soldiers world wide.<sup>65</sup> But they are neglected once they leave the group or once the conflict is over. Therefore in the post conflict situation, rehabilitation of child soldiers and reintegrating them into their societies is playing a vital role. Disarmament, demobilisation and reintegration (DDR) intervention programmes are intended to bring security and stability to a region after a conflict.<sup>66</sup>

In Sri Lanka the experience of former child soldiers in the LTTE are brutal and stern. They have undergone emotional changing under the LTTE, and a special programme if necessary to develop their emotions in a positive way. Sri Lanka has signed the Optional Protocol to the Conventions on the Rights of the Child and the country has a duty to ensure the rehabilitation and reintegration of those engaged in armed conflict.

Four areas of rehabilitation have been identified by commissioner General for rehabilitation such as vocational training, spiritual rehabilitation, psychosocial rehabilitation and social integration. The children between the ages of 12 to 18 years have already been separated from the group of IDP's in the centres.

### **Child Soldiers in Rehabilitation Centres**

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<sup>63</sup>.Art.8(2)(e)(vii) of the ICC

<sup>64</sup>.Sec. 7(d) of the Penal Code (Amendment) Act No.16 Of 2006 in Sri Lanka

<sup>65</sup>.Human Rights Watch,<http://hrw.org/campaigns/orp/index.htm>

<sup>66</sup>.Supra note 02



- The magistrate can decide whether the child is returned to the care of his or her parents or guardians.
- The child remains in a protective Child Accommodation Centre for a period not exceeding one year
- If there is evidence that the child has committed an offence during any period as a combatant, he or she is placed in a protective child rehabilitation centre for a period not exceeding one year.

Objectives of these centres are to provide “care, Psychical support and vocational and other training to facilitate reintegration.”<sup>70</sup>

Emergency regulations 22A provides for visits by and contact with the families of Children held in accommodation and rehabilitation centres. But many shortcomings could be encountered. No procedure is established to ensure that only children meet the regulations. Requirements are kept in the “Protective child Rehabilitation Centres. Moreover, the decision of the magistrate’s review cannot be challenged before a higher authority and former child soldiers are not allowed to get assistance of legal counsel during the review. They have no right to be provided with a copy of the social inquiry report or to be informed about the evidence examined by the magistrate. They are not allowed to submit additional evidence in their favour.

Further the security of the children in some accommodation centres is another issue. Some centres are overcrowded and there is not enough facilities for gender based separation. It leads to unnecessary problems.

Ambepussa rehabilitation centre was set up initially with 76 children. “The routine programme at this centre starts the day at 7.30 a.m. and follows a school curriculum of learning Maths, Computer Science, English, Sinhala Language and vocational training courses. Children are given daily rations of a soldier. Then the group games like cricket, netball, follow with afternoon spent on reading and watching television. The light goes out at 10.00 p.m.”<sup>71</sup>

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<sup>70</sup>. *Ibid*; Sec.22(A)(1)

<sup>71</sup>. *Supra note 01*

James Elder stated that “*the centre genuinely attempts to help child soldiers learn how to be civilians.*”<sup>72</sup> In other IDP centres General Certificate of Examination Advanced Level was held in August. The progressive factor of the rehabilitation of child soldiers was that 166 ex child soldiers were qualified to sit for these examinations.

### **Legal Framework on detained child soldiers**

The Convention on the rights of the child 1989 is the most important international instrument. Article 37(b) of the CRC makes a provision that:

*“No child shall be deprived of his or her liberty unlawfully or arbitrarily .The arrest, detention or imprisonment of a child shall be in conformity with the law and shall be used only as a measure of last resort and for the shortest appropriate period. The hidden meaning on this section is that detention of children should be a last resort in the absence of any other alternatives.”*

In addition to CRC Geneva Conventions in 1949 and their additional Protocols in 1977 who have given protection for detained children during the armed conflict.

The issue of detention of the child is dealt with the penal code of 1883, the code of criminal procedure Act, and the prevention of Terrorism Act of 1979. Code of Criminal Procedure Act, section 452 also provides that a person under sixteen years of age who has been remanded, shall be committed to custody in a remand home or in a residence of a fit and proper person. The prevention of terrorism Act is not specifically dealing with children. But the section 07(2) of the Act states “where any person connected with or concerned with nor reasonably suspected to be .....in the commission of any offence under this Act appears or is produced before any court.....such court shall order the remand of such person until the conclusion of the trial”. This provision is unable to indicate special reference to children regarding detention. Although there exists many legislations, no one has directly addressed this issue in domestic law.

### **Conclusion**

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<sup>72</sup>.Ibid

Arbitrary detention, torture and ill treatment can be identified in the process of rehabilitation and reintegration. “Boys and girls under the age of 18 were among those believed to have been taken at this time”. These practical situations are illustrated by some incidents.

The environment of some IDP camps is exposed by various aspects, to sexual violence. The contributory factors are high numbers of separated and unaccompanied conflict affected children, severe overcrowding in IDP camps, lack of physical barriers between girls and boys,<sup>73</sup> disproportionate numbers of male to females officers in others and restrictions in access to IDP camps and other places of detention.

Further, government of Sri Lanka has a responsibility to take necessary steps to rehabilitate the child soldiers in an effective manner in a shortest possible time.

In the post conflict situation in Sri Lanka, a country has to face many challenges in returning and reintegrating into their families and communities. Re-establishing the dignity of child soldiers is an important task in post conflict societies.

State as the trustee of the citizens, has a duty to take measures to provide ex-child soldiers with adequate opportunity for rehabilitation and access to welfare facilities. Without discrimination it is specifically suggested that 2008 regulations should be amended and magistrate’s review procedure should be consistent with international standards of right to fair trial and governing juvenile justice.

The absence of a legislative or policy framework to protect victims and witnesses, has caused to disrupt effective investigations into Human Rights abuses in Sri Lanka. It is equally necessary to adopt and implement separate legislations on witness protection and reparations for victims also.

In the context of transitional justice, reconciliation is very important. In this process, accountability in an appropriate setting may facilitate the reintegration of child soldiers by helping them to deal with guilt and promoting reconciliation with their communities. Amnesty International states, *“Failure to bring such children to justice may contribute to a culture of impunity, deny justice to their victims and may even encourage the use of children to commit atrocities.”*<sup>74</sup> This statement demonstrates that the need for accountability for violations should be brought before justice even if the violation is committed by a child. This is relevant to the Sri Lankan context as well.

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<sup>73</sup>.Concerns was raised about the physical layout of Poonthottam technical College Rehabilitation Centre in Vavuniya because of lack of physical barriers between boys’ and girls’ accommodation and because military responsible for the security of the Centre had easy access to the area where the girls were located.

<sup>74</sup> .Amnesty International Child Soldiers: Criminal or Victims(London Amnesty International,2000)

Moreover, education is a vital factor for rehabilitation. Therefore, it should be strengthened among the displaced population. For example, the International Rescue Committee has developed structures in Indonesia to supplement the Local School System in order to provide for the influx of the displaced population. As a country if we are able to overcome these tasks, effective and efficient rehabilitation of child soldiers and reintegration of them into their societies is not difficult in the post conflict situation in Sri Lanka.

## **GIS Modelling with Rapidly Changing Data Sets – an Application of Model Builder to Assess Public Accessibility in Colombo City**

*Lieutenant Colonel S D Udayasena RSP , SL Army, Professor N.T. Sohan Wijesekera B.Sc.Eng. Hons.(Sri Lanka), PG.Dip. (Moratuwa), M.Eng.(Tokyo),D.Eng. (Tokyo), MICE(UK), FIE(SL), Chartered Civil Engineer*

### **Introduction**

Geographic Information Systems are cutting edge information technology tools that facilitate the modelling of geographic information to arrive at rational decision making. In the case of geographic data modelling or commonly known spatially distributed modelling, there are two kinds of data. They are relatively static data and dynamic data. The relatively static data are such data that can be taken as static within a short time span of about six months or one year. Data corresponding to places of public safety mobilization, similar to locations of meetings, incidents, movement of working population in and out of cities etc., falls into the category of dynamic data. Sometimes even zoning demarcations fall into the category of dynamic data. In modelling efforts, it is of great importance that model inputs are suitably adjusted whenever changes have taken place.

GIS model inputs can change in many ways. The geometric feature and their attributes may vary in one layer or in many layers, thus causing a modeller to perform many operations repeatedly to achieve the appropriate output. In case of real life scenario modelling in GIS, a modeller has to carryout many operations involving both single layer and multilayer computations to arrive at acceptable results, which require great care. Such GIS work consumes significant time. Once a particular GIS model is developed scientifically, then changes in the geographic environment would cause only a change in the base data while the process would remain constant. A decision maker therefore would expect the analysis of a particular system at a very short time if only a few changes for the base data are to be incorporated. Under these circumstances a modeller needs to find ways to customize his/her model in such a way that once changes are made to the base data, the execution of processes would take place with minimum time.

The model builder of ArcGIS software is a tool that enables model components to be first defined as input output modules consisting of process operations and then facilitating the combining of components to a single system. In this assembly, the system flow direction and sequences are clearly defined and therefore once a system is designed to operate with ModelBuilder tool, it would



function efficiently when changes to base data are effected. There are many advantages of using model builder, listed in literature. Along with significant easiness to work, use of model builder would also ensure that the GIS databases adhere to the rules of operations. The process sequence would be made fixed and static, would be specially declared, would enable making changes, to each and every component to a section of the model without causing much labour to others, and would enable easy parameter or layer changes with reliability. (<http://www.esri.com>, <http://www.nysgis.state.ny.us> [1]) In adhoc model computations on ArcGIS platform, the incorporation of a unique process with a set of base data is not possible. Therefore repetitive model computations in an adhoc system would consume a significant time thus making calibration and verification of a complex model, a cumbersome task. Though it seems obvious that the advantage of model builder is in the saving of time and its reliability, there lacks a comparison of time advantage against the conventional, adhoc, step by step modelling while attempting to incorporate a real life case study. The present work is a case study of Colombo city accessibility in an environment of changing unwelcome incidents.

Colombo city often experiences unwelcome incidents such as public meetings, political rallies or protests etc. They are often treated as unwelcome incidents by many, because of the traffic congestions created by such incidents which are unacceptable due to loss of time and increase of fuel expenditure. If a decision maker could identify the effects of changes causing public accessibility in a geographically distributed manner, then there are opportunities to provide many rational resource mobilization solutions. The case study using information of land use, road network, administration boundaries, etc as static data and unwelcome incidents as dynamic data, applies a conceptual GIS model to assess the accessibility. The case study application is carried out with and without the model builder in order to critically evaluate advantages in the use of ModelBuilder for GIS modelling.

## **Objective**

Objective of the study is to develop a GIS model for the assessment of public accessibility in Colombo city with and without incorporation of ModelBuilder tool and to make a critical evaluation.

## **Study Area**

Colombo the capital of Sri Lanka is located on the west coast of the country. Colombo city lies in between 07° 12'N and 07° 20'N of North latitude, and between 80° 11'E and 80° 14'E of East longitude. Colombo is considered as heavily urbanized when compared with the rest of the country. With the recent security concerns, the law enforcement officials have incorporated a modified boundary for Colombo zoning. Since accessibility studies too need to be closely linked to security, the present study considers the boundary of the law enforcement units as the study area. In the North, study area is bounded by the Kelani River, West by the sea, South by Dehiwala, East by Sri Jayawardanapura and Kolonnawa DS divisions.

The study area (Figure 1) consists of 02 complete Divisional Secretary administrative units called DSD. Many important roads and rail communication systems link the Colombo city to other parts of the country. Total spatial area covered by Colombo city is approximately 42 km<sup>2</sup>. Tarrred road network of 285 km (Table 2) serves a total resident population of about 710,000 and an approximate migrant population about 2 million.

The land cover distribution and the road distribution in each of the administrative divisions within study area are shown in Table 1 and Table 2.

The traffic congestion experienced in most roads of the area is considered as extremely high and this is especially during office and school hours. The city's commercial centre Fort and Pettah are considered locations that should be avoided at any time of the day except late night, in case one desires to access a location in these areas. Locations such as Maradana, Borella, Town Hall, Maligawatta also fall into such a category.

There are many cricket stadiums, theatres and public meeting places such as Torrington Square and Hyde Park Corner, which attract a significant number of public and private vehicles creating accessibility problems. The present study covers the accessibility of the road network in relation to the unwelcome incidents that occur at or adjacent to the road network.

## **Methodology**

The methodology flow of the study area is shown in Figure 2. Model concept development included identification of the objective function for the assessment of road accessibility. Accessibility is concerned with the opportunity that an individual at a given location possesses to participate in a particular activity or a set of activities. Accessibility is usually measured in terms of

travel distance, time or cost. (Zhu et al [2]). A literature survey revealed that accessibility depends on the road network, land use, constraints on road network, population distribution and terrain (Michael et al [3]) In a spatial assessment of accessibility, if one would identify an accessibility indicator that could be assigned to land parcels which have to be crossed between the source and destination, then the sum of individual land parcel accessibility indicator over the spatial units crossed by the travel route, would be indicating the accessibility. In this study, a GIS model computes aspatial accessibility indicator for land parcels in the study area, through simple overlay computations. In the GIS model the spatial accessibility indicator was taken to be directly proportionate to the population density, road network distribution, land use, Entry Exit points and spatial distribution of the unwelcome incidents. A questionnaire survey was carried out to identify the existence of other parameters which govern accessibility indicators. Users were requested to rank the parameters according to the influence on accessibility. A sample of 51 persons who move in and out of Colombo city and who frequently access Colombo were involved in the survey. User indicated parameters and their importance are as shown in the Table 3.

Ratio Estimation Procedure (Jacek [4]) was used to compute the normalized weights for each parameter and these values were used in the model to incorporate relative difference in the influence during overlay operations (Table 4). Each influencing parameter characteristic was extracted from base data layers (Table 3) to develop individual data layers for each parameter. This was because threshold influence values, corresponding to spatial zoning of the selected parameters were not available, and especially because such variations depend on the locality and users.

The determination of spatial variation pertaining to each layer characteristic was identified through the user survey. Spatial zoning of each layer that was determined through an analysis of responses, is shown in Table 5. Each layer was zoned into several quantitative classes. In the Table user percentage indicated the frequency of user responses corresponding to the selection of a particular spatial zoning. In the direct overlay method, each layer was reclassified and GIS overlay using georeferencing tools of ArcGIS was carried out to arrive at the Accessibility Indicator layer.

Since the objective of the work was to identify the difference between the direct overlay method of ArcGIS, and the use of ModelBuilder, a time count was taken at each operation to facilitate comparison. In both methods, the GIS modelling used a weighted averaging method to quantitatively assess a combined effect of selected data layers.

### **Model Builder**

Conceptual model components identified for the direct overlay method was systematically taken into the model builder tools. The model building units in ArcGIS are coded as input output units and they require clear instructions to perform computations. Each unit of Model Builder, facilitated menu driven operations through the identification of input output parameters, input data and output storage locations on the spaces allocated in the GUI of each element. This enabled an easy assessment and an easy assembly of model flow chart which had a drastically reduced process flow diagram when compared with that of the direct operation method. The Model Builder assembly ensured clarity and easy maneuverability, thus ease of operation. Each assembly was checked for logical functionality, process execution error, and accuracy of results, in a stepwise manner. This methodology proved to be the best option for easy project completion. Model Builder standard colours were used to ensure clarity of model process identification. The process model on the Model Builder is shown in the Figure 3. During each computational step, Model Builder computation results were compared with the direct overlay method and the operational errors and process errors were verified for accuracy and differences. The result at each operation was compared through a comparison of feature numbers at the end of each land mark process. The landmark process comparison revealed that the results had no differences. The landmark process selected for comparison, are listed in the Table 6.

## **Results and Discussion**

Result of the user survey with respect to data layer preferences and the computation of weights for the GIS overlay model is shown in Table 3. The computed weights indicated a 25% and 22% value for incidents and roads respectively. Since the influence of waterways on accessibility of a particular land parcel is relatively small, the user rank was the lowest for the waterway dataset.

Spatial zoning of various parameters are dependant upon the stakeholder opinion though a judgmental assessment could be made based on common knowledge, available literature and experiences with respect to other spatial references. Therefore suitable stakeholder surveys should be carried out using well designed questionnaires (Tan,[5]). The present study incorporated a sample of 51 persons for the values used in the computations. Appropriate and suitably identified samples satisfying the objectives must be used for similar studies. The present study used a judgmental approach together with a frequency analysis of user responses to identify spatial zoning parameters for the model. The user frequency values obtained for each parameter are shown in Table 5. In the case of population, the natural breaks of the spatial data frequency of population in Grama Niladari Divisions (GND) was utilized. The details such as land cover and population can

use the parameter values of data occurrence frequency for spatial zoning. These capabilities are available in off the shelf GIS software.

Land mark process locations were identified for model accuracy checks. This enabled the checking of computations, base data layers and the model structure. At the end of each land mark process, the results were compared visually and also through checks on the number of polygons, areas and distances. Manual methodology results were compared with the Model Builder calculations and this enabled a mutually beneficial model check for both methods thereby ensuring computation and result accuracy. Present work identified five land mark processes where a direct flow of computations up to the end was checked. Land mark 6 was taken to carryout the performances of the model after a parameter modification. Land mark locations and their brief descriptions are shown in Figure 3 and Table 6. As the model computations and process flow accuracies are very important components when modeling the reality, it is necessary to have cross checks for model performance. The method used in this work which iteratively carried out mutual checks was on both methods found very satisfactory towards the achievement of reliable results.

Computation time assessment of model builder method and manual method are shown in Table 7a. The assessments were approximate assessments based on user logs. Comparison of time consumption for model development shows a lesser number of days required for the manual method (Table 7b). During repeated model runs, the model builder showed a significant advantage (Table 7b). This indicates the importance of a tool such as model builder for real life applications, where parameter changes or conceptual model changes need to be affected whenever organizational hierarchy requirements insist on GIS project improvements. Model Builder tool required 3/2x100% more time during model development and carrying out a single model run. In case of repeated computations the model builder consumed only about 1-2% of the time required for a dataset modification and a manual GIS calculations.

Computed accessibility indicator values for various land parcel extents are shown in Figure 4. Figure 6 shows that for the selected incidents, the accessibility indicators on a three class qualitative grouping has 23% for Low accessibility regions within the study area. The accessibility indicator status averaged for each Grama Niladhari Division, shows that out of 74 GN divisions, 17 have very low accessibility.

The Model Builder output for a different set of incidents is shown in Figure 5. The computations consumed 30 minutes minimum for data layer modifications, overlay operations and output map

generation. This indicates the ease in the use of model builder when the data set is changed to suit dynamic concerns of the base data.

## **Conclusion**

GIS model development to identify stakeholder requirements, should utilize appropriate methodologies to identify parameter prioritization and spatial zoning requirements with a suitable incorporation of stakeholder input assessments and state of the art methodology.

The study with the use of a mutually beneficial checking of land mark process ensured the reliability of model computations.

Though GIS database preparation and model development in both methodologies consume similar time periods, repetitive computational requirements are better dealt with Model Builder tool.

GIS model developed to compute the spatial variability of accessibility indicator, displayed the potential of Model Builder tool to save significant time during real life applications for spatially distributed resource planning and management.

The study clearly indicated the speed at which the model builder could incorporate a change in the incident layer.

## **Acknowledgement**

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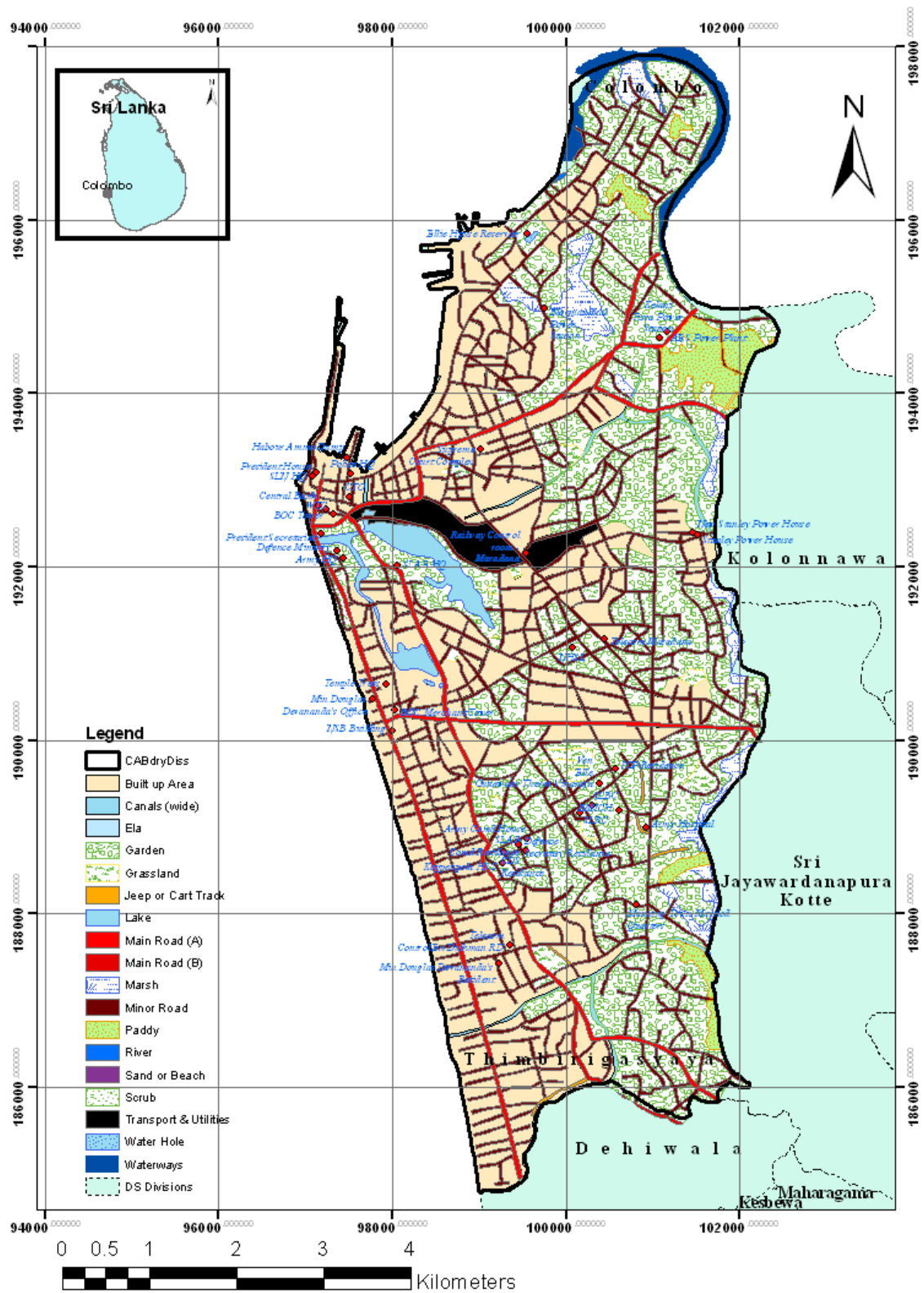
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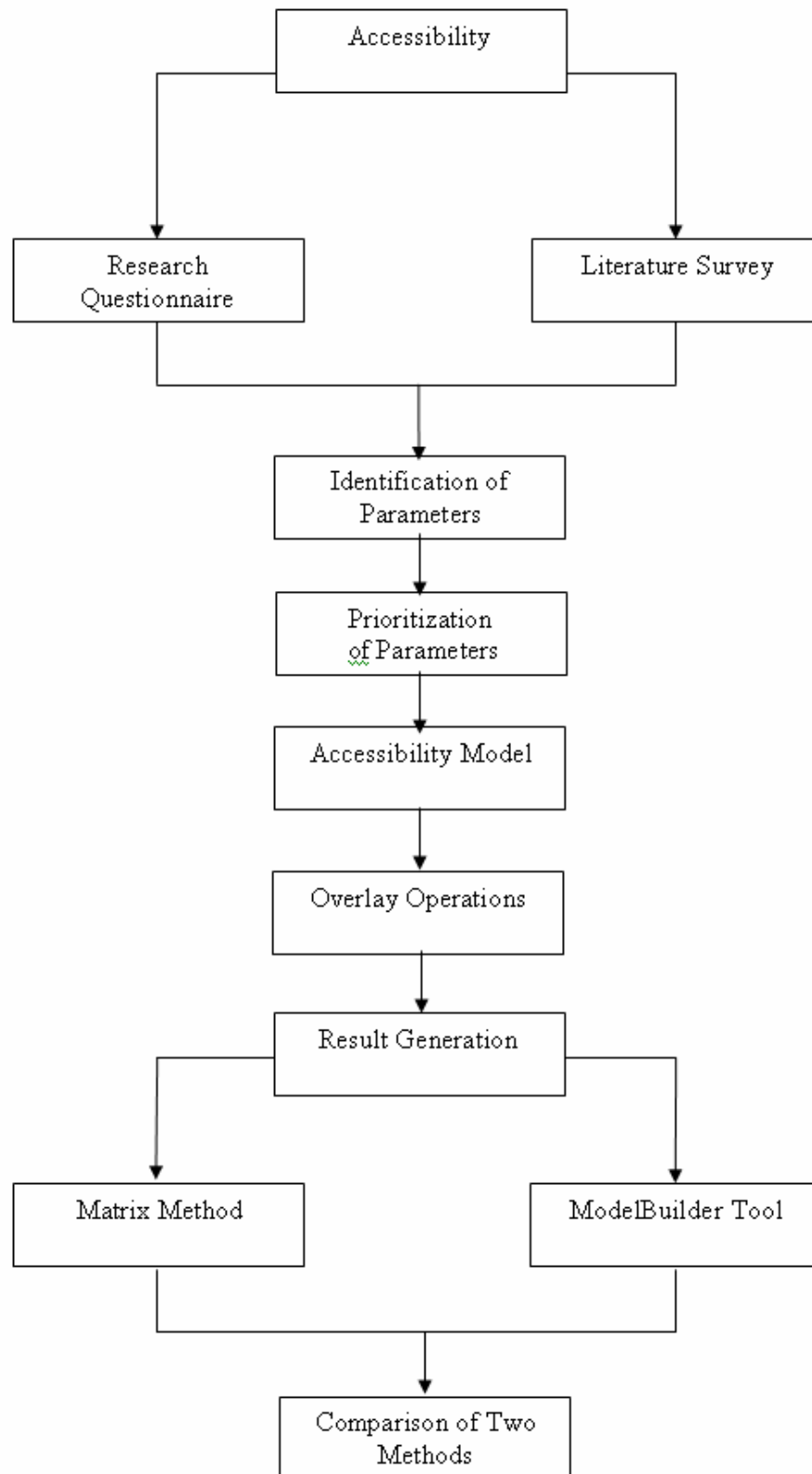
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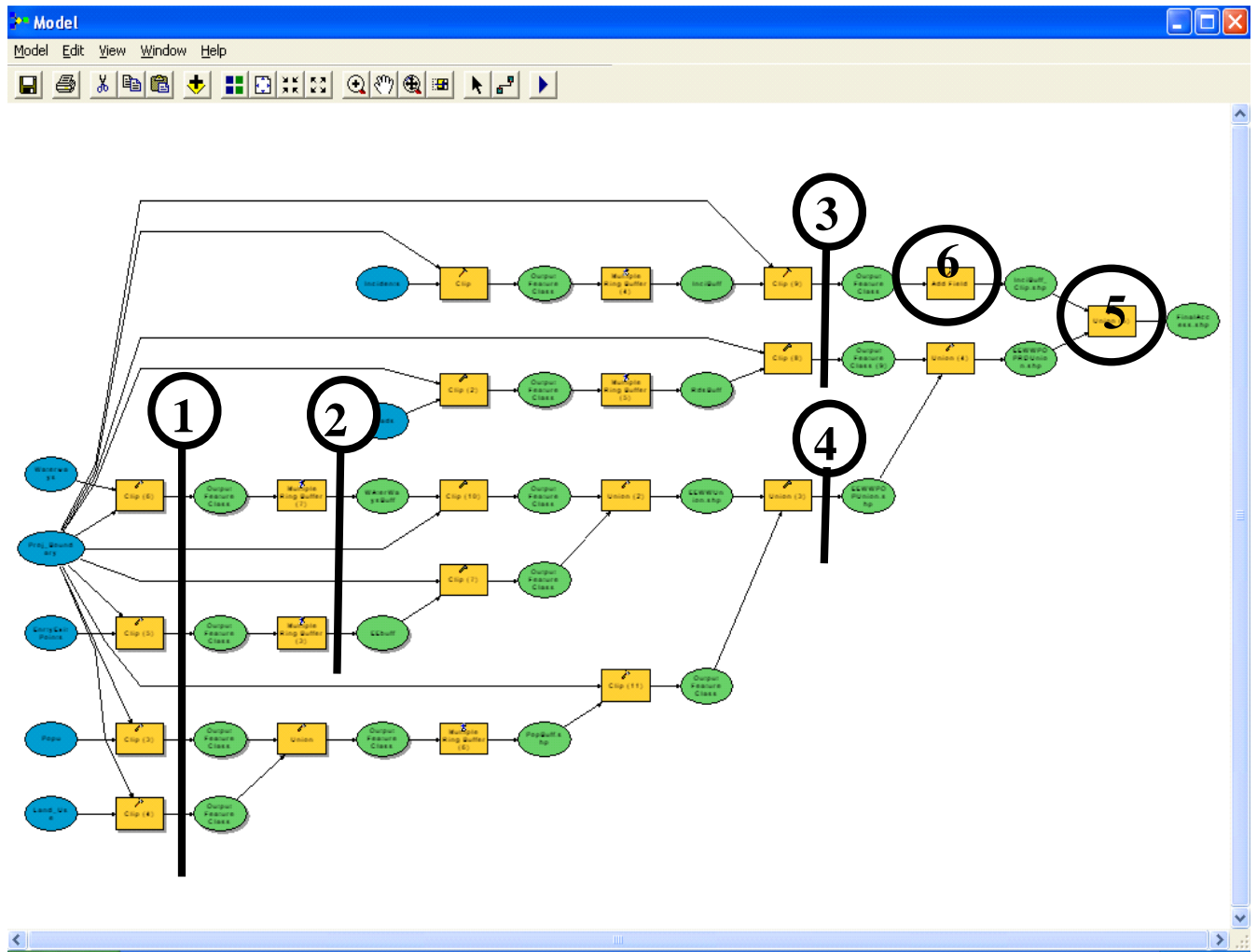
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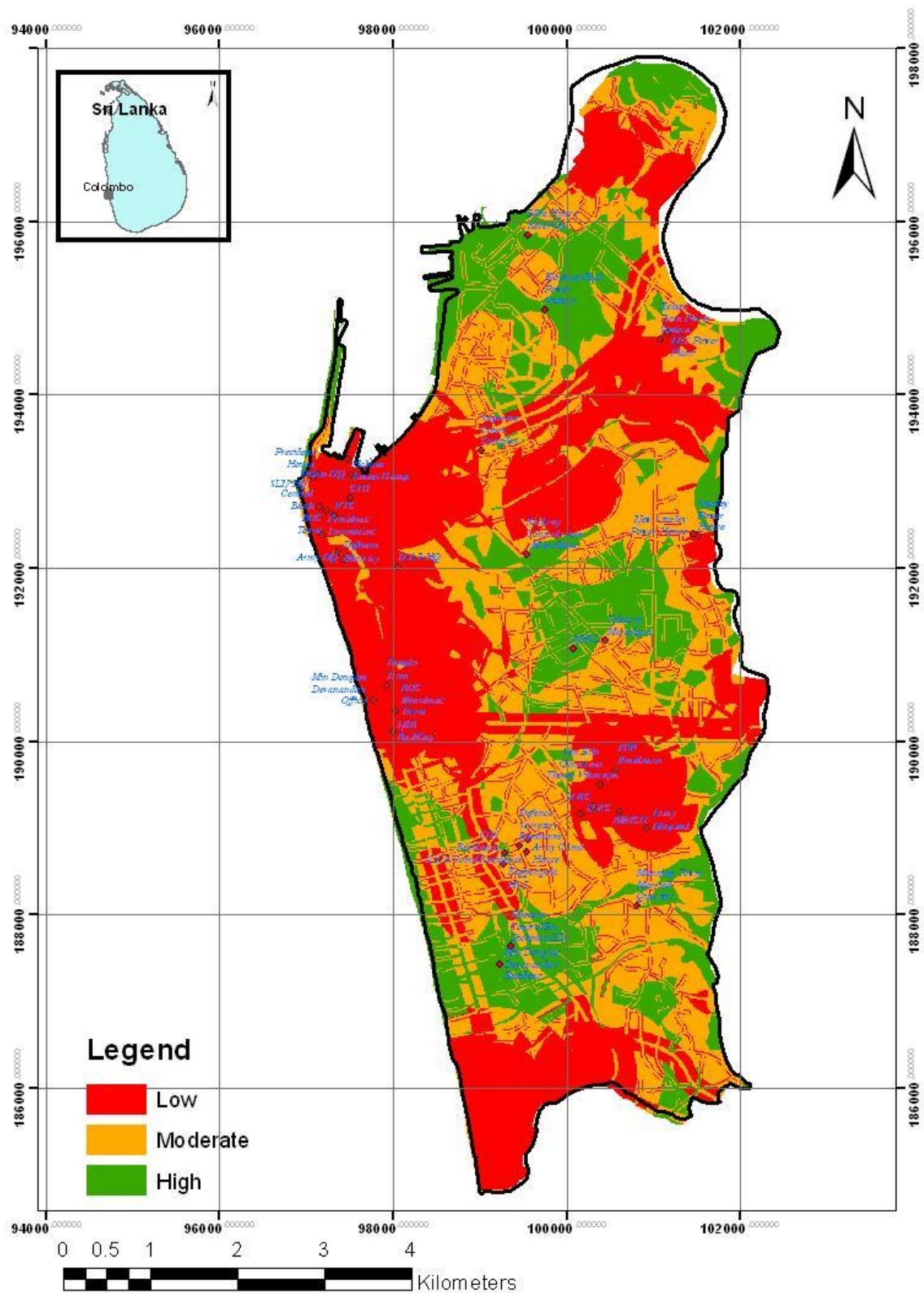




**Figure 2**



**Figure 3 – Process Flowchart, ModelBuilder**



### Figure 4 – Computed Accessibility

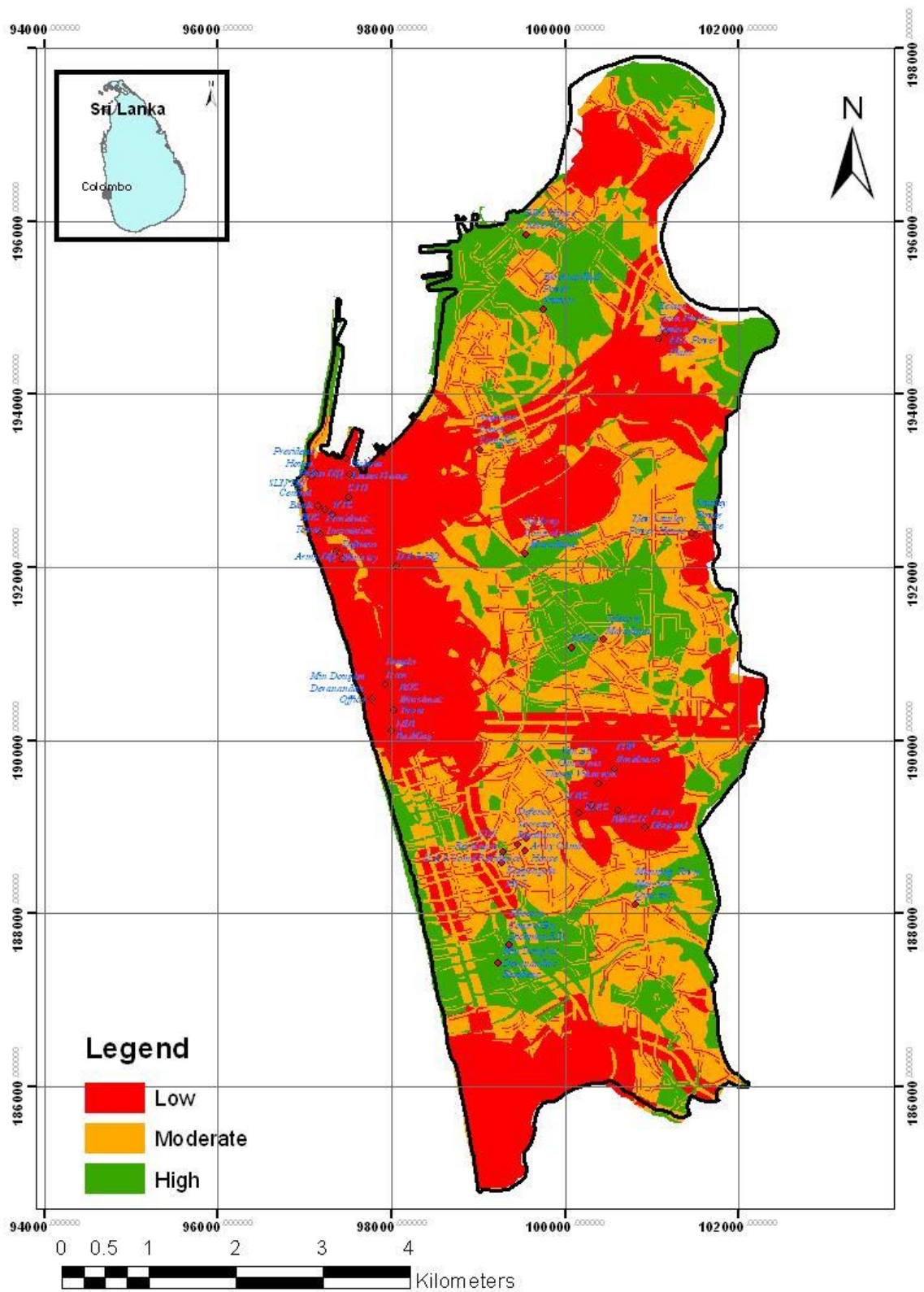
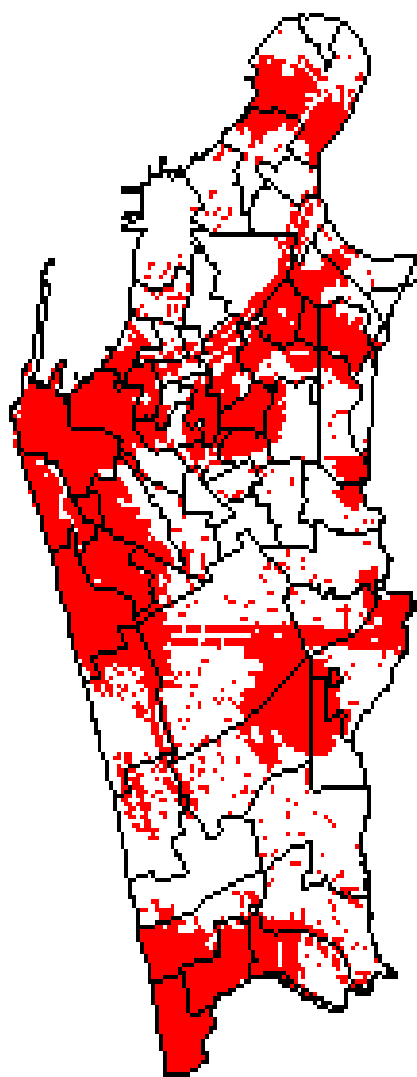


Figure 5 - The ModelBuilder output for a different set of incidents



**Figure 6 - Low accessibility regions within the study area**

**Table 1 - Land cover Distribution in each of the Administrative Divisions**

Item	Description	DSD			Total Area(sqkm)	Percentage %
		Colombo	Thimbirigasyaya	Kolonnawa		
1	Built up Area	5.79	7.37	0.01	13.17	31.13%
2	Canals (wide)	0.10	0.19	0.06	0.35	0.83%
3	Water	1.15	00.02	0.08	1.25	2.95%
4	Garden	5.62	9.05	0.99	15.66	37.01%
5	Grassland/Scrub	0.39	0.46		0.85	2.01%
6	Jeep or Cart Track		0.07		0.07	0.17%
8	Main Road (A)and (B)	0.49	0.82	0.09	1.40	3.31%
11	Minor Road	2.86	3.62	0.09	6.57	15.52%
12	Paddy	0.14	0.26	0.66	1.06	2.51%
14	Sand/Beach/Marsh	0.59	0.52	0.10	1.21	2.86%
16	Transport & Utilities	0.72			0.72	1.70%
	Total	17.84	22.38	2.09	42.32	100.00%

**Table 2 - Road Distribution in each of the Administrative Divisions**

Item	Road Class	DSD (km)			Total	Percentage
		Colombo	Thimbirigasyaya	Kolonnawa		
1	Main Roads	12.34	18.95	2.81	34.10	11.97%
2	Minor Roads	108.56	136.76	5.37	250.69	88.03%
	Total Length	120.90	155.71	8.18	284.79	100.00%

**Table 3 – Influencing Parameters and the Ranks**

Item	Parameter	Responses /Preferences						Ratio Scale	Original Weight	Normalized Weight
		Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6			
		6	5	4	3	2	1			
1	Incidents	31	4	5	2	3	5	243	1.59	0.25
2	Roads	6	26	7	5	2	4	217	1.42	0.22
3	Population	4	5	26	5	5	5	183	1.20	0.19
4	Entry Exit Points	6	7	4	23	8	2	174	1.14	0.18
5	Waterways	8	6	2	3	27	4	153	1.10	0.16
									6.34	1.00

**Table 4 - User assigned Weight computations using Ratio Estimation Procedure.**

Item	Description	DSD			Total Area(sqkm)	Percentage %
		Colombo	Thimbirigasyaya	Kolonnawa		
1	Built up Area	5.79	7.37	0.01	13.17	31.13%
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4	Garden	5.62	9.05	0.99	15.66	37.01%
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8	Main Road (A)and (B)	0.49	0.82	0.09	1.40	3.31%
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	Total	17.84	22.38	2.09	42.32	100.00%
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**Table 5 - Spatial Zoning of Data Layers  
Parameters**

Item	Influencing Parameter	Rank	Data Layer Description	Data Type	Attributes
1	Waterways	5	1:50,000 digital maps by the Survey Department	Polygon	Area Length
2	Entry Exit Points	4	Field survey map for Entry Exit Location (scale 1:10,000)	Point	Location Size (strength)
3	Population Density	3	Population and land cover maps (1:50,000 digital maps by the Urban Development Authority)	Polygon	Total Population Area Land Cover Type
4	Road Network	2	1:50,000 digital maps by the Survey Department	Line	Class A Class B Jeep Cart Tracks Rail Roads
5	Unwelcome Incidents	1	Web details (scale 1:250,000)	Point	Incident Type
6	Law Enforcement Boundary	6	1:50,000 maps by the Law Enforcement Agencies	Polygon	Boundary

Table 6: Landmark Process for selected comparison

Item	Landmark Process for comparison	Verification
1	Base data layers clipping with project boundary.	Visual checks and attribute table values check carried out to for the verifications of number of polygons, area and distances etc.
2	Assigning of respective Buffer distances to prepared base layers.	
3	Prepared data layers again clipping with project boundary.	
4	Each overlay operation (Union) and output feature.	
5	Final result	
6	Modification to attribute table and rerun the selected process	

Table 7a - Time Consumption comparison - Model Development

No	Process	Time Consumption	
		Manual Method	Model Builder Method
1	Development of Model Builder application		2 1/2 Days
2	Preparing of initial GIS layers (Clipping to project boundary)	6 hrs	3 hrs
3	Defining of Buffer Distances a. Layer 1 b. Layer 2 c. Layer 3 d. Layer 4 e. Layer 5	1 hrs 1 hrs 1 hrs 1 hrs 1 hrs	3 hrs
4	Overlay Operations	6 hrs	3 hrs
5	Get the Final Result	6 hrs	3 hrs
	Total Time for preparatory works and initial Result	2 Days	3 Days

**DEFENCE**  
**TECHNICAL SESSION III**

**CHAired BY PROF. SHANTHA HENNAYAKE**  
**HEAD OF DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF PERADENIYA**

## Summary

*Giving reference to the speakers in the session, Prof. Shantha Hennayake Head of Department of Geography, University of Peradeniya invited Rear Admiral Jayanath Colambage, Commander Northern Navel Command. Rear Admiral Colombage presented his case on Maritime Threats and Maritime Security – Way Ahead for Sri Lanka: He explained that the major East-West trade routes are passing very close to the Southern port of Sri Lanka and the Indian Ocean, a fact which has drawn the attention of the world in the recent years due to the chaotic situation prevailing off the horn of Africa due to piracy. He emphasized the concept of Maritime Security that includes Military Science, Political Science, Security Management, Sociology, Domestic and International Law, History and World Trade. Sri Lanka has defeated the most innovative, ruthless terrorist organization in the world which had even developed an international maritime capability with a merchant fleet under various flags of convenience and used purpose built crafts to carry out attacks against military as well as civilian targets. They pioneered the black sea tiger suicide craft and were determined to take control of the sea from the Sri Lanka Navy. However, the Sri Lanka Navy was able to maintain dominance at sea whilst denying the same to the LTTE sea tigers. He stressed the importance of maintaining the security of our ports and Sea lanes of Communication so as to ensure that free flow of trade to and from our country and on the shipping lane passing south of our country, continues to be free from any threat. This will definitely help in our objective to be the ‘Wonder of Asia’. He further explained various threats to the country’s maritime security and ways and means of countering them by paying attention to some of the best practices developed by us and by analyzing practical experiences.*

*Commodore J. J. Ranasinghe presented his case on Strategic Alliances within the Indian Region to deter Maritime Conflict that may arise from islands and chokepoints: He emphasized the conflict issues of Islands and Choke points and transnational threats affecting them, relating to safety at sea, regional cooperation, and security concerns. He stated in the research that there has been considerable scope to construct security through strategic alliances around areas of common interest, especially on choke points and Islands to protect the environment and sea lanes of communication from traditional and non-traditional threats. This strategic alliance concept will serve best if it is not in the form of power presence in the Indian Ocean, but through capacity building, exchange of information, in support of Navigation, Hydrographic survey, getting information through Vessel Monitoring System and surveillance and most importantly adhering to mutual security pledges promoting confidence-building measures.*

*Prabha Jayasinghe presented on Emerging Geopolitics- Placing Sri Lanka in the Indian Ocean Geopolitical Rivalry: In this study, an attempt was made to identify and critically evaluate the factors defining the place of Sri Lanka in the emerging Indian Ocean regional cold war. Generally 'geopolitics' implies the relationship between politics and geography with respect to foreign policies of nations. The study of geopolitics basically concentrates on understanding the power bases of competing states and their interactions with one another. "State" is the fundamental unit of study of geopolitics. Every state in the world tries to maximize its national interest and maintain sovereignty internally and externally. Generally in geopolitics, the super powers and regional powers compete for power in global and regional theaters and search for geopolitically, geo-economically and geo-militarily significant friendly states. Mostly these friendly states are "small states" and in general they happen to be at the center of attraction or hubs geopolitically. Sri Lanka is one such small state located centrally within the Indian Ocean. The current Indian Ocean geopolitics, characterized by growing Sino-Indian rivalry, has given a new boost to geopolitical significance of Sri Lanka. The thirty year old ethno nationalist crisis marked its end in 2009 and Sri Lanka now stands as a war free nation in the world political system. The entry of China into the Sri Lankan geopolitical space and their immense interest over the Sri Lankan state has signaled a new phase of geopolitics. The growing U.S-Sino-Indian geopolitical rivalry in the Indian Ocean has intensified the significance of Sri Lanka and thus the present geopolitical space has drawn Sri Lanka into the regional cold war in the Indian Ocean.*

*Lt Cdr Rohan Joseph presented a paper through video visuals in absentia, on the subject of How Sri Lanka Navy can Assist in Eradicating Maritime Piracy in the Post Conflict Scenario: In his recording he expressed that Sea piracy has become a serious threat to the maritime industry as well to the Navies around the world. A large number of ships sailing especially off the seas of Somalia have become victims of these armed pirates and have thereby lost considerable amount of cargo and, on certain occasions, lives of many onboard those ships as well. In finding an effective solution to the issue, emphasis was to indigenous tactics which the Sri Lanka Navy introduced and achieved results with, in the face of LTTE's maritime elements out at sea. These tactics came into force with the introduction of a concept named "Rapid Action Boat Squadron" where a large number of small fast attack craft were put into the sea domain. This in the first phase confused the sea tigers and then outnumbered them, and importantly they were taken by total surprise during confrontations. Looking at the piracy issue, even though world navies operate in pirate threatened sea areas, they are more or less carrying out radar surveillance in the sea areas and escorting Merchant Vessels during their passage through the endangered sea areas. Patrolling in large warships will only make pirates aware*

*of the presence of navies in the region and they will then take evasive actions to prey in another sea area. Navies should be there to eradicate piracy and not just to chase them away. He emphasized that the tactics used and proved effective by the SLN remain to be the most crucial set of tactics that the world navies need to adopt if they are to end sea piracy, especially in the Somali sea areas in order to make the global sea trade safe.*

*All papers have made a comprehensive analysis of the selected areas of defence related issues and contributed in improving the existing national defence capabilities to play its role in national defence in the post conflict scenario. Out of the papers, two papers on the geopolitical condition of Sri Lanka have drawn attention to the Indian and Chinese involvement in Sri Lanka's territory, to which Sri Lanka needs to pay careful attention while giving consideration to "Enemies of None and Friends of All". The maritime security, when given emphasis, will be an investment for Sri Lanka in its prospective development journey as an island nation. A paper on national defence in a human security perspective was also presented.*

## Maritime Threats and Maritime Security-Way Ahead for Sri Lanka

*Rear Admiral Jayanath Colombage RSP, VSV, USP, rcds, psc, MSc (DS), MA (IS), DISS(USA), Dip in IR, Dip in CR, Dip in IT, Commander, Eastern Naval Area, Sri Lanka Navy*



*Rear Admiral Jayanath Colombage Presenting his paper on “Maritime Threats and Maritime Security-Way Ahead for Sri Lanka”(IMG\_2199)*

### Introduction - Importance of Sea borne Trade for an Island Nation

It is a well known fact that oceans connect the world and 70% of the earth's surface is water, whether it is the ocean, rivers, lakes or estuaries. Even those countries which are landlocked are dependent on the ocean for their sustenance. Sri Lanka is situated geographically, in a very advantageous position. The major East –West trade routes are located very close to the southern part of the island. We have a long history of maritime traditions and our fore-fathers have shown a great maritime affinity and ventured into faraway lands by sea. We have gone through three decades of conflict but our ports were never closed and sea lanes were always kept open. Now that the biggest ever humanitarian operation has delivered the country out of war and the LTTE combat power is completely diminished, should we still be concerned about security, especially in the maritime domain? I believe that we have a two way responsibility, i.e. for internal security as well as for international security, to maintain secure ports and freedom of sea lanes so as to maintain the hub status of the country in the region. We should harvest the expertise that we gained by fighting with the most ruthless terrorist organization, the LTTE, so as to be ready for any contingency.

Rudyard Kipling, in his poem 'Big Steamers' (1914-1918) depicts the predicament of an Island nation, he said that *"For the bread that you eat and the biscuits you nibble, the sweets that you suck and the joints that you carve, they are brought to you daily by all of us big steamers-And if any one hinders our coming, you will starve"*<sup>75</sup>. His Excellency the president Mahinda Rajapakse stated in 'Mahinda Chinthanaya- 2005'<sup>76</sup>, *"I am determined to make our country the centre of Asian silk route once again taking advantage of its unique geographical location"*. These statements clearly show the predicament of an Island nation, and commitment and the maritime affinity of the leader of the country which is considered as an essential element of Maritime Power.

## Maritime Security

Maritime security can be defined as "Measures taken by owners, operators, administrators of vessels, port facilities, other maritime organizations or establishments to protect against; terrorism, sabotage, stowaway, illegal migrants, asylum seekers, piracy, armed robbery, smuggling or theft of vessels". It is a concept that includes military science, police science, security management, sociology, domestic and international law, history and world trade. Maritime security policies can be issued by the International Maritime Organization (IMO), various international conventions, own legislations or bi-lateral or regional conventions.

When one considers the threats to the maritime domain, terrorism tops the list. Maritime terrorism obviously takes place in the maritime environment and is not a new phenomenon. The famous terrorist attack on cruise ship Achille Lauro in 1985 has given birth to the IMO convention 'for suppression of unlawful acts against maritime navigation of 1988'<sup>77</sup>. This convention's preamble stated that the world is deeply concerned about the world wide escalation of acts of terrorism in all forms.

A maritime terrorist is one who, for political purpose or in order to affect the exercise of another state's or political entity's rights, attempts to do any of the following; Seize or exercise unlawful control over a ship or other maritime structure by threat or force, perform or threaten an act of violence against a person on board which is likely to endanger safe navigation, destroy or damage, or place a device likely to destroy or damage, a ship, maritime platform, cargo or navigational facility ,

<sup>75</sup> Rudyard Kipling, **Big Steamers**, 1914-1918, [http://www.poetryloverspage.com/poets/kipling/big\\_steamers.html](http://www.poetryloverspage.com/poets/kipling/big_steamers.html)

<sup>76</sup> Mahinda Chinthanaya 2005

<sup>77</sup> 'Convention for Suppression of Unlawful Acts against the Safety of Maritime Navigation 1988'. <http://www.imo.org/conventions/mainframe.asp?topic>,



knowingly communicate false information which endangers safe navigation. LTTE was considered as a terrorist group which had developed international maritime capability. They operated a merchant fleet under various flags of convenience with front offices in many capitals in the world. LTTE used purpose built craft to carry out attacks against military as well as civilian targets. They pioneered the black sea tiger suicide craft and was determined to take control of the sea from the Sri Lanka navy. However, the Sri Lanka Navy was able to maintain dominance at sea whilst denying the same to the LTTE sea tigers.

In 2000, a US Navy destroyer, USS Cole was attacked by a suicide boat launched as a port service boat when the ship was berthed at port of Eden, Yemen. A similar attack was carried out against Very Large Crude Carrier MT Limburg when the ship was entering port of Dhaba in Yemen in 2002. The world maritime community was greatly worried about the safety and security at sea and the freedom of the commerce by sea. The terrorists attacked targets in the USA in September 2001, which included the world trade centre and Pentagon. The terrorists used hijacked passenger air craft to carry out these devastating attacks on US targets and, the ship itself was seen as a possible weapon. USA was greatly concerned about the possibility of a ship arriving at a port carrying Weapons of Mass Destruction, which are capable of destroying not only the port but the adjacent population. When analyzing past terrorist incidents at sea, following key lessons could be drawn; terrorist plan well ahead of an operation, they observe the ships and port facilities before launching an attack, they will try to recruit crew members or port employees, all ships and port facilities are vulnerable to terrorist attacks, sparsely manned cargo ships are more vulnerable than passenger ships, and, access control to ship or port is most important.

### **Non Terrorism Maritime Threats**

Terrorism is not the only threat to maritime security. Cargo theft, human smuggling and stowaways, drugs and weapon smuggling, sabotage and arson, poaching, and piracy and robbery at sea, depletion of marine resources, climate change maritime accidents, Weapons of Mass Destruction and toxic/environmental waste, Cyclones/Typhoons/Hurricanes/tsunamis, disrupting of Sea Lanes of Communication etc could be considered as non terrorism related threats. Piracy is a crime of opportunity and an economically motivated activity<sup>78</sup>, which is a major threat to international

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<sup>78</sup> Martin N Murphy, *Contemporary Piracy and Maritime Threats; The Threat to International Security*. Oxon: Routledge, 2007.

shipping. If the LTTE was not defeated, they would have used their maritime capabilities to pirate ships passing Sri Lanka and that would have been a major threat to maritime commerce in the Indian Ocean. Somali pirates, who operate from the horn of Africa and long distances away from the Somali mainland into the Indian Ocean, are a major threat to maritime trade at present and concentrated efforts of the international community will be needed to curb this menace. The LTTE was involved in large scale smuggling of weapons, explosives and other ordnance by sea. Two questions are relevant about these large scale smuggling operations. How was it possible, for the LTTE to acquire large quantities of weapons and other war fighting materials from various parts of the world, despite strict international control regimes in place? And how was it possible, for the LTTE ships to transfer these items on board their ships and sail in the oceans, and dock them in various ports, without being detected by law enforcement authorities?

The argument in the case of non-terrorism related maritime threats is that, if a criminal, drug trafficker, pirate or armed robber can breach your security, a terrorist certainly can and it can also be observed, that measures needed to combat terrorism, will assist in combating other illegal activities. This was clearly evident in Sri Lanka ports; maritime crime went down to a very low level due to counter terrorist action taken by the Sri Lanka Navy. However it is important to understand that a balance must be made between security and trade and trade has to continue. In the case of Sri Lankan ports this was balanced very well. Despite the threat posed by the terrorists and enhanced security measures, our ports were never closed and sea lanes were kept opened.

### **Threats Faced By Sri Lankan Ports**

Sri Lankan ports have experienced suicide craft attacks, under water saboteur attacks, threat from sea mines, moored and limpet mines, attacks by under water craft, attacks against Merchant Vessels at anchorage, alongside berths and at sea, Improvised Explosive threat, indirect fire from distant areas, and attacks by light air craft. These acts go on to prove that Sri Lankan ports have been under terrorist threat for a long time.

### **Shipping and International Maritime Organization**

Shipping is perhaps the most international of all the world's great industries and one of the most dangerous. Since mid 19<sup>th</sup> century, there had been many treaties adopted to improve safety at sea. The

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International Maritime Organization (IMO) is the agency for introducing maritime legislations to the world. There are about 40 such conventions and protocols adopted by the IMO thus far. These have been updated from time to time so as to ensure that they are in line with the changes taking place in the world. IMO has seen a renewed focus on security since the terrorist atrocities in the USA in September 2011. This led to a diplomatic conference in London in 2002<sup>79</sup>. This gave birth to the International Ship and Port Facility Security Code (ISPS Code). ISPS Code is applicable to all Passenger ships, including high speed passenger craft, cargo ships, including high speed craft of 500 gross tonnage and upwards, mobile off shore drilling units and Port facilities serving such ships engaged on international voyages. It can be concluded that due to the implementation of the ISPS Code, we achieved enhanced Maritime Security, Access Control, better co-ordination among agencies, enhanced Security Consciousness, good international image as a secure port, effective implementation of Customs and Immigration /Emigration laws.

## **Ocean and Jurisdiction**

Ocean is a vast unregulated place and no nation can, alone secure the world's oceans and waterways. The Maritime Domain remains secure for the free and legitimate use of all and it is in the vital interest of every Nation. It is very difficult to impose any jurisdiction as ships belong to many nationalities and flags of convenience. The interagency coordination and planning is necessary to uphold commercial maritime activities function with no conflict. It is necessary to adhere to various international /regional/bilateral conventions and must be understood /agreed by all stake holders. There must be incentives for ships & port facilities when they are working in secure environments and business of such operators must be made easier. Also their turn around must be made quicker so that they benefit from doing the right thing. Legalizing various international conventions into own legislation should be considered, as then, the implementation aspect will be much easier. Having legal personnel who will be expert in maritime law and various instruments of conventions in the respective country will certainly be an advantage. Various control measures for those who are not complying with the jurisdiction must also be implemented. Integration and getting on board all the relevant agencies dealing with port/ ship operation and other service providers is also very important. Conducting various seminars, workshops and other training programs for all the stake holders is important in this effort. There has to be a joint approach towards implementation of jurisdiction. Security must be made everybody's business. Jurisdiction means security and safety, for oneself as

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<sup>79</sup> IMO resolution A 924 (22) "*Prevention and suppression of acts of terrorism against shipping*"

well as others. The fundamental requirement is to find the mechanism of global trade which can work while maintaining efficiency and enhancing security. Technology can be used to track offenders and to prove that they are violating the law. It can be Automatic Identification Systems, CCTV in port facilities, Vessel management systems, Vessel tracking systems. Data bases to prescreen high-risk containers. Obtaining details on line from various agencies and ships regarding their intentions, last port details, general description of cargo carried, can help in accepting ships to ports without delay. Layered security with multiple opportunities to mitigate threats is better than a single point defense. The ability to identify threats earlier in the supply chain is desirable, particularly before the cargo enters the Maritime Domain. The more we can integrate security into common business practices and modern information systems, the better we will be able to sustain increased levels of security. Therefore the Maritime Commerce Security Plan is; to improve the security of the maritime supply chain, to eliminate the risk of terrorism, to repel unlawful hostile acts, reduce the vulnerability of the Maritime Domain, protect and facilitate lawful maritime commerce. The absolute enormity of the global supply chain constrains US ability as a nation to prescribe and enforce security standards across its full breadth.

## **Conclusion**

There is no doubt that the future of our country depends heavily on sea borne trade and the other uses/exploitation of the sea. We have a duty to keep our ports secure and Sea Lanes of Communications free from any threat and also to assist/protect those exploring the ocean for living and non-living resources. Some of the recommendations in this endeavour are as follows:

### **a. Strengthen International Conventions Dealing with Maritime Domain**

Many states tend to relax implementation of international conventions with regard to the maritime domain, the vastness and complexity of which provides many opportunities to exploit legal weaknesses. Historically, it has not been subjected to proper and continuous policing, and crime at sea has not drawn the attention of the international community sufficiently. These international conventions should have more enforcement authority, and governments or any party contravening them should be dealt with, with tough punitive action. The countries where corrupt officials and practices thrive should be made to clean up their acts or to face consequences internationally.

### **b. Regulation of Conventional small arms and Explosives**

Despite various internationally ratified conventions on control of sales of small arms, ammunitions and explosives, terrorist groups like LTTE have shown a remarkable capability at acquiring war fighting materials in international markets. There should be stricter laws and stringent punishments for companies violating the laws and regulations. These companies should be black-listed if any violations of controls are proved. An international effort must be made to arrest illegal arms dealers, wherever they are, and their organized rackets should be busted.

c. Cooperation to Curb Trans national crimes

There is no doubt that transnational crime gangs are often linked with terrorist groups as they can be one of their best customers. Groups like the LTTE were engaged in many forms of transnational crimes in order to collect finances to run their war effort. There should be a concentrated effort by the international community to identify such transnational crime groups and not to allow territories of any countries to be used by them to launch their activities. There should be a comprehensive and integrated effort in curbing these groups.

d. International Partnerships in Intelligence Sharing

There is no doubt that timely intelligence is essential in order to prevent any crime. This is far more important in the maritime domain due to the much wider scope of the maritime trade and other activities at sea. Intelligence could be considered as the ultimate deterrent weapon that individual states and the international community must possess. There should be intelligence gathering, sharing, and analyzing mechanisms, internationally, regionally or bi-laterally. Efforts must be made to identify possible terrorist capabilities and to share such knowledge with other governments so as to make evaluation and identifying vulnerabilities and risks more effective.

e. Prevention of Terrorist Financing

Any terrorist organization needs funds in order to survive and to carry out their terror campaigns. Groups such as the LTTE depended heavily on forcible and voluntary contributions from the Tamil Diaspora. They were able to collect funds and transfer them or use them to purchase war fighting materials to sustain the war effort. When these organizations are banned in a particular country, they use various charitable organizations and other front organizations to collect the money. This money is helping the continuation and prolongation of conflict rather than solving it. No country should permit her soil to be used to collect terrorist financing and international conventions in this regard should be strictly imposed.

#### f. Regional Maritime Initiatives

No single government can protect the SLOCs, ports and maritime trade passing through its waters alone. International and regional cooperation and initiatives in the maritime domain are a must for the freedom of seaborne trade. Regional initiatives, maritime assets, expertise, manpower and maritime intelligence could be utilized to the optimum and hence should be encouraged.

#### g. Diplomatic Pressure to Dismantle Maritime Capabilities of Non state actors

The west's tolerant attitude towards the LTTE's maritime terrorist capability was seen as another indicator of its double standards in the fight against terrorism. Terrorist groups like LTTE who had International Maritime Capabilities should be forced to give up maritime capabilities as it could be a threat to the freedom of the seas. The maritime domain should be limited only to agencies operating under a state's authority as clearly mentioned in the United Nations Convention on the Law of the Sea (UNCLOS).

#### h. Port Security and Coastal Domination

Ports are the key to maritime trade and many other economic activities. It is necessary for us to continue to secure our ports against possible terrorist acts or any other maritime crime. Implementation of International conventions dealing with port security and other security measures that we developed has to continue. We should appreciate from time to time to relax some of the restrictions in place in our ports, so as to facilitate freedom of sea borne trade whilst maintaining necessary levels of security. The coast is the frontier of an Island nation. We have to maintain surveillance along the coast, so as to ensure that our coast will not be used for various nefarious activities by terrorists or criminal elements.

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## **Strategic Alliances within the Indian Region to Deter Maritime Conflicts that may Arise from Islands and Chokepoints**

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### **Introduction**

The safety and security of shipping are back on the international agenda, and properly so because of an increase in maritime terrorism which emerged due to a decade of comparative inattention. The international community is now awakening to the fact that the prevention measures are inadequate and thus not effective and maritime terrorism is continuing and approaching an apex. Threats on shipping are increasing and the urgency for reinvigorating progress to reduce the maritime threats is compelling.

With globalization the world has become a distinctively maritime region. The archipelagic nature of certain states, lack of land-based connectivity with continents and islands mean that shipping is extremely important in world affairs, State to State and Nation to Nation. The ocean voyages of ships have to fall inevitably astride key choke points which are economically and strategically important to the economies of the countries. Maritime interests of littoral and regional powers are different from one to another. Interstate relations and co-operation is fundamental to the good order and safety at sea but is subjective to the difference between each other. These different interests may inhibit good order at sea and may occur due to inadequate resources, poor co-ordination and co-operation between nation states and the lack of proper boundary demarcation. A struggle towards independence, emancipation of bondage and lost sovereignty also invite maritime terrorism and has been evident through many parts of the world. Developed countries using the hegemonic powers have been stakeholders to many maritime conflicts but are now emphasizing safety by maintaining good order at sea, but this depends on the interests and actions of regional powers to ensure it. This paper is intended to discuss the Islands and choke points issues on a very different conceptual framework by using theories of conflict and peace studies. This will focus grass roots on maritime conflicts in a general manner with a non military perception, thus its peaceful resolution and solution to maritime threats using the conflict and peace theories, more relevant to islands and chokepoints

### **Aim**



The main aim of this paper is to identify some of the conflict issues of Islands and Choke points and transnational threats<sup>80</sup> affecting them, relating to safety at sea, regional cooperation, and security concerns. During the conceptualization the writer felt the need to focus the subject more on the Indian Ocean since this will be the problem area in the near future. However, before doing this, a brief, discussion is undertaken of the question of Indian Ocean regional definition.

### **The Indian Ocean as a Region**

The Indian Ocean region is a very large region of considerable ethnic, religious, economic, political and cultural diversity with little apparent commonality and in geographical perspective, one of the broadest definitions of the region is that it includes 47 littoral and land-locked states bordering on the Indian Ocean<sup>81</sup>. Emerging powers in Indian Ocean have heralded the strategic importance of sea lanes. Also the diversified interests of states in the region is the fragile interdependent relationship between the states, which has been the issue emerging through the power struggle caused by the vulnerability of maritime trade. This contributes to a relatively low level of functional cohesion among the states in the region; the orientation to the ocean creates a degree of common interest and forms the basis for a potentially greater degree of functional interaction in the future to avoid conflicts arising through the choke points and Islands. Furthermore, apart from the colonial heritage, one critically important commonality of Indian Ocean States is that the majority of them are members of the developing world and few of them are contesting for the power struggle to be the regional power.<sup>82</sup>.

The Indian Ocean region facilitates almost half of the world's shipping and most of the energy transfers through sea transportation. The problem with the maritime industry is vast, given that the entire operation needs to be secure; this entails improving security on ship, container and port security. Ports in the region are now moving swiftly to implement the requirements of the International ship and port facility security (ISPS) code which came into effect on 01<sup>st</sup> July

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<sup>80</sup> **Paul J Smith and Don Berlin**, "Transnational Security Threats in Asia," Conference Report, Asia Pacific Centre.

<sup>81</sup> **IFIOR (Instructional Forum on Indian Ocean Region)** Current Economic Characteristics and Indian Ocean Linkage, Instructional Forum on Indian ocean Region. Working Paper , No.2 Perth,1995

<sup>82</sup> **Dennis Rumley** . Paper on securitizing the Indian Ocean and Its Concrete entity and geopolitical imaginations

2004. Under the code, states, ships and ports are required to have enhanced security measures to ensure better control and monitoring of the sea farers and cargo<sup>83</sup>

### **Significance of Straits, Passages, and Chokepoints<sup>84</sup>**

The whole issue of sea dependency among nations that lack political stability or reliability opens the door to occasional disruptions to their economy, price changes and a transfer of wealth. Chokepoints are a common concept in transport geography, as they refer to locations that limit the capacity of circulation and cannot be easily bypassed, if at all. This implies that any alternative to a chokepoint involves a level of detour or use of an alternative that translates into significant financial costs and delays.

They can also be perceived as a resource whose usefulness varies with the ebb and flow of the geography of circulation. Considering the characteristics of maritime transportation, maritime chokepoints are particularly prevalent. Many of them are the result of the constraints of physical geography while others, namely Suez and Panama, are artificial creations. Three core concepts thus define a chokepoint as a resource<sup>85</sup>:

### **Physical Characteristics**

To begin, a chokepoint is a location that forces traffic to converge and, by virtue of its physical characteristics, namely depth, width or navigability, limits movement. Its physical capacity to accommodate maritime circulation is thus limited<sup>86</sup>.

### **Usage**

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<sup>83</sup> What is the ISPS code , available at [www.imo.org](http://www.imo.org) accessed 4<sup>th</sup> Dec 2010.

<sup>84</sup> Author acknowledge that some of the contents of this sub topic has been placed upon on the article referred in foot note 6.

<sup>85</sup> **Jean-Paul Rodrigue.** Straits, Passages and Chokepoints A Maritime Geostrategic of Petroleum Distribution Hofstra University, Hempstead (N.Y.)

<sup>86</sup> Ibid

The value of a chokepoint is proportional to its degree of usage and the availability of alternatives. The fact that a chokepoint acts as a limit to circulation imposes a threshold to its use. The closer the traffic is to this threshold, the more the resource is deemed to be exhausted<sup>87</sup>.

## Access

As a valuable resource, some degree of control must be established to ensure access to the chokepoint. This requires agreements to regulate, use and settle disputes if access becomes contested. Tolls can also be levied if the chokepoint falls within a well-defined jurisdiction to control access to infrastructures such as locks<sup>88</sup>.

Although the physical characteristics of most chokepoints are very stable, implying a fixed capacity, their use and value can fluctuate significantly. With the growth of maritime circulation and global trade, many have become extremely valuable resources, and represent some of the most important strategic locations in the world. Like all fixed supply resources, however, there is a limit to which they can be used. The closer they come to exhaustion, the more unstable their use and the more effort required to secure access.

## Changing Geopolitical Orientations in the Indian Ocean

Traditionally the world has focused on the Malacca Strait as a strategic sea lane due to energy related concerns in the region due to the fact that the bulk of oil imported by China, Japan and south Korea transit the Malacca Strait. But it is important to look beyond this and protect the entire supply chain especially the Indian Ocean region, because of the critically important geo political and strategically valuable trade corridor of the Indian Ocean which is the connecting passage for the Asia Pacific region with the Middle east and the Europe<sup>89</sup>. The security of this region is of paramount importance and symbolizes the connection and inseparable integration of the world economy and demands a high level of coordination and cooperation between nearby regions and Indian Ocean region.

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<sup>87</sup> Ibid, P 43

<sup>88</sup> **Donna J.** Sea Lane Security and U.S. Maritime Trade: Chokepoints as Scarce Resources, Washington (DC), National Defence University, Institute for National Strategic Studies, pp. 143-170, 2002.

<sup>89</sup> **Hubert J.** The West in the Geopolitics of the Indian Ocean and India. In Rumley and Charurvedi, op.cit, 46-64, 2005

The western trend of underestimating the geopolitical importance of the Indian Ocean region has been evident until the last century but has had a changed perspective due to the threats from emerging giants like India and China in the region. Both China and India are classical rising powers in and around the Indian Ocean. Their complex relationship with other global powers on economic ties, political rivalry and military wariness, combined with unresolved conflict dynamics of the Indian Ocean, opens the playground for major power conflicts. Islands and chokepoints of the Indian Ocean are the potential flashpoints for the power conflicts of emerging powers and wield great influence on the littoral and Island nations of the Indian Ocean region. However in common with the diversified cultures, different interests and strategic concepts the oceanic thread binding has not been visible in the oceanic affairs of Indian Ocean. Littoral and Island states cooperation on maritime issues has not received their due concerns and primacy as it deserves. Big brother attitudes of emerging powers and smaller nations pulling lines as per the predilection of emerging powers may contradict the security interests of another. Therefore obtaining a common base and a convergence of interests that should be mutually beneficial to all states in the region, has been inherently difficult.

The developed Nations nurtured the concept of “Third world” and thus, by implication, it is of lesser significance. But now and the looking down on the Indian Ocean region has now changed its outlook due to the emerging giants of India and China. Now they cannot neglect the geopolitical importance of the region, Some Western observers simply remain ignorant about the Indian Ocean and about the geopolitical orientation of regional states due to the existence of other ocean priorities, such as the Pacific or the Atlantic<sup>90</sup>. But the war against terror implanted the geopolitical importance of the Indian Ocean

Sustainable peace at sea is the means for safety and security of shipping thus allowing countries to maintain maritime domain of their own by pursuing maritime interest as per the grand strategy of their standards. In the world every state has their own stakes in the maritime domain, either owning ship or sea fearer providing, or facilitating sea passage; more importantly littoral states should recognize the value of the freedoms and rights of Navigation as per the UNCLOS to facilitate seaborne trade in the world

Nations, as states, like to be independent, judged like single individuals and wanting their grand strategic to be exercised and being independent of external laws that might injure each other merely

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<sup>90</sup> **Hideaki Kaneda.** Article on Maritime Coalitions to protect vital sea lines of Communication in Australian maritime affairs Paper 2010

because they exist nearby and side by side, purely on internal security and for safety's sake<sup>91</sup>. Regional powers and developed countries astride choke points and Islands are very concerned about asymmetric threats posed on them. However, perhaps not surprisingly, various facets of security can be in conflict and result in contradictions. In potential conflict environments between states, the involvement of other states in security matters, for example, in arms supply, can potentially exacerbate the situation. The extent to which involvement is seen to be acceptable can produce what might be regarded as a kind of security hypocrisy. Certain states perceiving a double standard in some of the state affairs have created and nurtured terrorism which has naturally led to "great disappointment" by the other, especially to a neighbor. Certain powers perhaps contributed and groomed terrorism by a significant upgrading in its military hardware. A fine example is the Indian approach towards Sri Lanka. From an Indian perspective, such a decision must also be interpreted in the context of India's approach to security matters, which has been characterized as "modified structuralism" that is, on the one hand, India seeks to maximize its own conception of power based on military strength, economic development, and internal order, while on the other hand, being willing to yield concessions to rival interests<sup>92</sup>. Even in "Non-threatening" state-state relations, fear of reprisal often governs the nature of inter-state interaction. Unspoken threats can therefore arise due to asymmetrical relations between more powerful states and those wishing to guarantee their own economic security<sup>93</sup>. Guaranteeing a state's economic security in these circumstances may result in states jettisoning principals related to human security of other states<sup>94</sup>. Particular dilemmas can arise when there is a contradiction between maximizing traditional security and maximizing a state's economic security. The interested parties and stake holders of the violent conflicts may prefer a chaotic freedom rather than reasonable liberty deserved by the suffered and victimized state. Hence resolution of a wider and broader conflict is not easy.

### **Constructing Security through Non Traditional and Traditional Security Threats**

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<sup>91</sup> **Immanuel Kant.** *Second definitive article of Perpetual Peace: The law of nations must be founded on a federation of free states*

<sup>92</sup> **Bajpai. K.** . "India Modified Structuralism" In Aliquippa, 1998

<sup>93</sup> **Nicclo Machiavelli.** *The Prince and the Discourses* , random House, Inc , 1950

<sup>94</sup> Op.Cit.:57-97

It is well-known that maritime security has prevailed to master the seas for three key reasons: to defend against invasion, to project power and influence and to secure resources and trade to fuel economies<sup>95</sup> Although these have been contested in a multidimensional concept, it can embody traditional concerns and Nontraditional concerns on oceanic affairs outlined as oceanic threats which will have an effect on Indian Ocean security. The first traditional threats are the remnants of the Cold War era in the form of confrontations on the Korean peninsula and across the Taiwan Strait and its significance on the Indian Ocean region<sup>96</sup>. The second threat is the rapid buildup of Chinese and Indian military power mostly in Air and Naval forces, which may create a military imbalance in the region. The third may be the territorial, religious, and ethnic disputes due to the direct, structural and cultural violences of the region. Inherited issues acclaimed to the region such as territorial issues over remote islands that are likely to obstruct SLOC and its security, may cause general instability in the region. The fourth threat is confrontation over maritime interests which overlay the previously mentioned island territorial disputes. In addition, there are non-traditional threats like proliferation of small arms<sup>97</sup> and weapons of mass destruction and ballistic missiles. International terrorism is where international shipping may be attacked or involved in human smuggling, money laundering, and drug trafficking. Thus, security threats can take many forms like reorganization of crime groups, taking advantage of globalization to be truly transnational in nature.<sup>98</sup>

Fear has also been a key feature of the Indian Ocean region. Many states share some imagined fear and a fear of the unknown. Some might even fear freedom itself. The UN Secretary General, however, has argued stonily for the global realization of a fundamentally different goal, “freedom from fear’ as part of a broader vision of collective security<sup>99</sup>. The imagining of fear can also be both constructed and manipulated. They can be constructed by governments, by intelligence agencies, by the media, and by education systems; indeed, fear is often a function of a lack of knowledge. Fear can also be manipulated by states during election times on change of regimes whether the government to be elected is friend or foe to the policies of neighbor states. The primary threat to maritime security in Indian Ocean is the inadequate marine domain awareness and such lead to both dangerous and illicit

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<sup>95</sup> **Thomas B Fargo.** Paper on Securing sea lanes appeared in Papers in Australian Maritime Affairs 2010

<sup>96</sup> **Gal Luft and Anna Korin.** “Terrorism goes to sea” , Foreign affairs, Nov/Dec 2003

<sup>97</sup> **David Capie** "Small Arms Production Transfers in South East Asia," *Canberra Papers on Strategy and Defence* No.146, 2002, p.20.

<sup>98</sup> **Rumly Gopal.** Paper on Maritime Coalitions to protect vital sea Lines of Communication by Hideki Kaneda

<sup>99</sup> **Annan, K..** In Larger Freedom towards Development, Security and Human Rights for all, New York, United Nations 2005

transnational activities through the sea thus undermining security. The most possible transnational threats like terrorism and proliferation are the shadows of the world being unipolar and the dark side of disintegration and globalization. Nurturing terrorism by emerging powers for the advantage of achieving their strategic goals is the standpoint which brings uncertainty to the sea of today. Each state or nation today is trying to secure its interest at sea and protects its SLOC unhindered through the transnational threats which are making wholesome efforts to provide security on its own shipping not bothering much about the other. In today's scenario all states are concerned with piracy but no respect is given to proliferation. It is the transit of weapons of mass destruction and their delivery systems that pose the danger in laden conflicts. The impending threats of proliferation could be seen easily if a North Korea progress to war, and then it's their nuclear material that will be the great concern. Not only North Korea but many rough states wish to strengthen their power through whatever means and in this context the threat of trafficking nuclear weapons or fissile material on sea lanes is possible and that will easily undermine international treaties and norms against proliferation. The fear of this is the possible nexus between terrorist and weapons of Mass destruction. Acts of terror can and do occur on the high seas and are due to the maritime movement of terrorists. Large sea platforms of today will give enough opportunity for terrorists to have the mobility and transportation to achieve their aims and inflict enormous surprise, damage and destruction. Sea lanes of today are subjected with some impunity, to move drugs and human trafficking and are also crimes at sea. In the Indian Ocean there are many strategic lanes that are important to Men of War and also merchant shipping. A large ship sunk at one of these strategic choke points would prevent the required delivery and provide enough time for terrorists to achieve their aim. Hence approaches to maritime security for choke points and Islands need more proactive and a more multinational and unique approaches to provide 'thinking out of the box'. Maritime security in choke points and islands is important as explained but these are possible areas to pose a threat from traditional and nontraditional means from terrorists and insurgents. These atrocious mini organizations, some of whom are insurgents, increasingly engage in illegal economic activities either directly or through links with international criminal networks. A good part of it is that these insurgency groups need the support of regional and global support to exist, or have been nurtured by interested countries to pose a threat to another. In the maritime context, maintaining SLOC is important and thereby provision of security and safety through choke points and island territories for the innocent passage of ships is necessary. Island Nations and littorals that are astride choke points have a great deal of responsibility on this aspect and should take all evasive measures taking interdiction and law enforcement as important policy tools to prevent maritime terrorism.

Most of the maritime conflicts are attributed to power and resources. Poor economic governance and state weakness are the critical mediating factors between resource abundance and vulnerability to armed conflict; the first engenders popular grievances, the second makes separatist and non separatist insurgencies politically and militarily feasible. Policy responses need to focus on structural conflict prevention efforts by, inter alia, designing and supporting tools and strategies for more effective, equitable, and accountable systems of resource management, complemented by longer term strategies of economic diversification and poverty reduction<sup>100</sup>. Some of the maritime conflicts have strong regional and even global linkages. By increasing the number of potential war profiteers and peace spoilers and multiplying the points of conflict, these broader dimensions not only affect SLOC but are also vulnerable in the global economy. Solutions to maritime conflicts are very complicated in both conflict resolution and post-conflict stability. All those who are interested in bringing peace to ocean areas need to address these conflict dimensions by strengthening the economic management through the ocean and ad hoc alliance, complementing and thus strengthening – national and global conflict management strategies to keep the sea a safe haven.

### **Beyond Greed and Grievance – Struggle on Resources and Power**

Sea transportation has become one of the most strategically important circulations of resources in the global economy. Its role cannot be overstated. Container Transportation and feeder concepts have become “strategically invisible” commodities as the flow has been continuous with limited, but eye-opening, disruptions through piracy. Petroleum supplies through SLOC are virtually taken for granted. Since approximately two-thirds of the world’s petroleum production is shipped by sea<sup>101</sup>, there are inherent distribution constraints, which require navigating through straits and passages; chokepoints of maritime circulation. This paper presents an overview of impending conflicts and conflicts in the making due to resources, its supply and demand, and the strategic issues that are linked to its maritime circulation. Chokepoints are perceived as resources, the value of which varies according to the degree of use. As the era of sea dependent transportation of valuable large quantities of goods and energy distribution and petroleum domination, draws to a close, the importance and vulnerability of strategic passages will increase.

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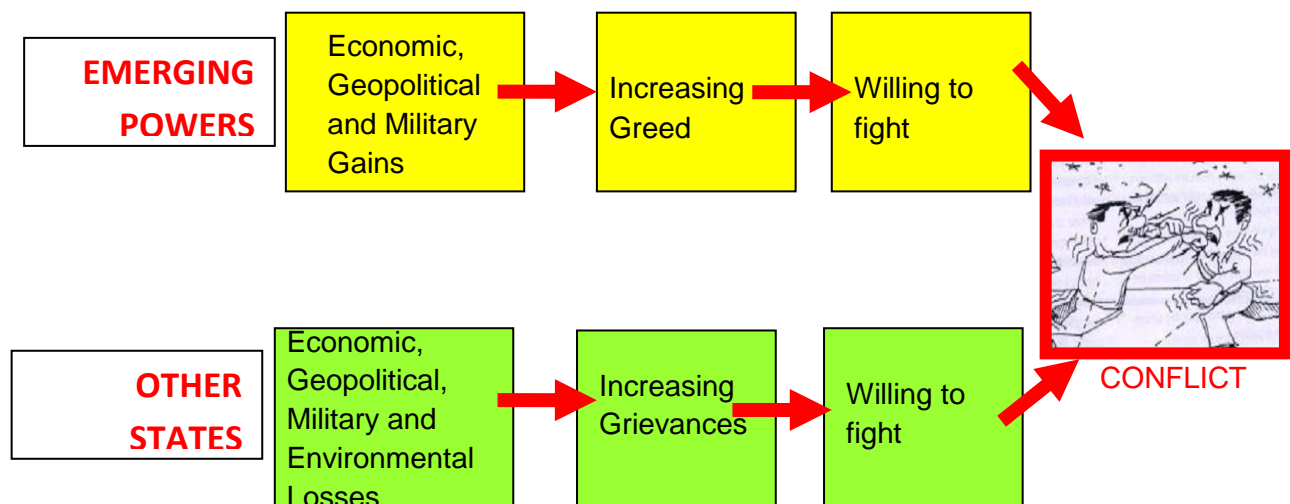
<sup>100</sup> **Billon P L.** The political ecology of war : Natural resources and Armed Conflicts, Paper on political Geography, 2001

<sup>101</sup> **Ghosh P.K.** "The Maritime Dimension", in "Oil and Gas in India's Security" Ed Jasjit Singh (Knowledge World New Delhi July 2001)



Much academic and policy research has produced important findings on the resource based conflicts, broadening and widening into inter and intra state conflicts, most importantly in drawing attention to the rise in combatant “self-financing” through access to regional and global networks of licit and illicit trade and finance and diasporas remittances.<sup>102</sup> Much of the academic debate on the economic causes of contemporary armed conflict has become polarized around greed versus grievance dichotomy.

Juxtaposing ‘Greed Vs Grievances<sup>103</sup>’ is like juxtaposing “loot-seeking” with “justice – seeking<sup>104</sup>” and will invite maritime terrorism, rebellions, and, more generally, the significance of economic versus socio-political drivers of civil war<sup>105</sup> There is growing recognition of resources and it is a factor that matters to conflict dynamics, Greed of others’ resources and Grievances on protecting own resources may finally introduce the use of force in their will to fight.



<sup>102</sup> **Mats Berdal and David Keen**. “Violence and Economic Agendas in Civil Wars; Some policy implications “ *Millennium : Journal of International Studies* 26(3) . 1997: David Keen. *The Economic Functions of Violence in Civil War*”. *Oxford Economic Papers*50(4). 1998. 563-573)

<sup>103</sup> Karan Ballentine, “Beyond Greed and Grievance: Reconsidering the Economic Dynamics of Armed Conflict”, pp.259-283.)

<sup>104</sup> . **Paul Collier and Anke Hoeffler**, *Greed and Grievance in Civil War*. Policy Research Working Paper no.2355. Washington . DC. The World Bank. 2001:

<sup>105</sup> **Mats Berdal and David M.Malone**, *Greed and Grievance: Economic Agendas in Civil Wars* (Boulder: Lynne Rienner Publishers, 2000)

## Economics and Conflict; Exploring the Relationship

Different resources tend to have different beneficiaries<sup>106</sup>, depending on the mode of exploitation and the way proceeds are managed by the state. Today the maritime transportation mainly ships, have become Lutable resources attracting pirates. These sea supplies provide direct rents for pirates and terrorists; they also tend to generate incomes for local communities winning their hearts and minds. By contrast, oil, deep – shaft minerals and other unlutable resources also have become lutable due to the mode of transportation. The way in which natural resources provide tents to terrorists is also relevant to the duration of conflict. Access to lutable resources appears to prolong non separatist conflicts by disproportionately benefiting terrorists, typically the weaker side of the conflict and thereby averting their military defeat. Lutable resources also create internal discipline problems within armed groups.

Regional security threats can arise because of the instability of states with the problem of economic, social, and political viability. In addition, recourses scarcity and resources competition constitute threats, especially when they are linked to food and energy insecurity. Indeed, it has been argued that, in the years ahead, “resources wars” will become “the most distinctive feature of the global security environment<sup>107</sup>”. Furthermore, states that “fail” due to basic problems of poor governance and corruption are incapable of asserting authority within their own territories and are seen to be “troubling to world order” since they become sources of instability, mass migration, and terrorism<sup>108</sup>.

## Causes of Maritime Conflict

Today’s most perceived threat on maritime affairs will be the Pirates and terrorists’ motives of self – enrichment (‘Loot Seeking’<sup>109</sup>) and economic opportunities. Even where pirates’ capture of lucrative resources through hijacking ships is due to the weak states and poor governance and the piracy is the outbreak of conflict and was triggered by the interaction of economic motives and opportunities with long standing grievances over poor economic governance (Particularly the inequitable distribution of

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<sup>106</sup> **Michael L. Ross**, “Oil, Drugs and Diamonds: the Varying roles of Natural Resources in Civil Wars,” pp.47-70.

<sup>107</sup> **Michel T. Klare**. Resource Wars, The New Landscape of Global Conflict, Metropolitan Books; 1st edition (May 17, 2001)

<sup>108</sup> **Rotberg R.I** When states fail : Commans and consequences , Amazone books,Nov 2003

<sup>109</sup> **Paul Colier and Anke Hoeffler**. Justice-Seeking and Loot-Seeking in Civil War, in Oxford Economic Papers, pp 563-73.

resource wealth), exclusionary and repressive political systems, inter – ethnic disputes, and security dilemmas are further exacerbated by unaccountable, weak states. Likewise, access to lucrative economic resources by hijacking ships in trading routes does contribute to the feasibility of armed insurgency.

### **Strategic Alliance Concept for the Security of Indian Ocean**

Although there are disputes over maritime territories with traditional and nontraditional security threats that may have emerged due to the resource greediness or power politics, they may lead to direct, structural and cultural violences resulting in protracted conflicts. Solutions to such conflicts like Preventive diplomacy<sup>110</sup> and Co-operative alliances under the strategic alliance concept would reap the benefits of development and cooperation of this vital maritime region. There were some regional cooperation and alliances but these proceeded slowly with a distinct lack of speed and procrastination in the actual implementation of plans. A lot has been said in the meetings and declarations but many of them are hard to achieve. Most of the decisions are of a declaratory nature, non binding and non cohesive, and are barriers to actual functional cooperation. This is due to the power asymmetries of emerging Nations, barriers to the national sovereignty, mutual suspicion, differing national interests<sup>111</sup> and the diverse nature of the resource and energy needs of the states in the region. Indeed confidence building measures, institutional frame works and structures with defined ground rules are necessary for strategic alliance in the region.<sup>112</sup>

The means to end transnational threats by which states pursue their rights of protecting sea lanes will be the righteous way of doing as of the escalation of violence at sea. The reason is that, as states, they already have individual ways and means of giving security for their shipping that are established within themselves, but some are not concerned at all about the sea security, and finally succumb to the end victim syndrome. Nevertheless it is the immediate duty of all land locks, littoral and Island nations to keep the sea free from violence. But this peace cannot be established or guaranteed without a treaty among nations. A special kind of alliance must be formed which we may call an alliance of peace at sea. This alliance does not seek to deprive the state of any of its power, but merely strives to

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<sup>110</sup> Preventive diplomacy is the concept of previous UN sec Gen Bhoutos bhotous Garley, prevents conflicts before it happens

<sup>111</sup> **Arkes, Hadley.** Bureaucracy, the Marshall Plan, and the National Interest.

<sup>112</sup> Author acknowledge the readings for Msc in peace and conflict studies literature of Colombo University, Sri Lanka regarding this area of the paper

maintain and secure the freedom of the sea for all other allied states to achieve their maritime interests. The practicability of this idea of a strategic alliance will gradually be extended to all states in every region and so lead to perpetual peace which can be demonstrated. If fortune directs powerful and enlightened states should form a regional co-operation, which is by nature inclined to perpetual peace and the leading state would serve as a center for the security<sup>113</sup> at sea. Other states would join it and thus the freedom at sea would be secured in accordance with the maritime interests of the nations. And the alliance would gradually extend further and further.

This would be an alliance of nations, but not necessarily a state of nations. A “state of nations” would be self-contradictory, because a state entails a relationship of a sovereign lawgiver to the subject people and many nations in one state would constitute only one nation. This contradicts and has effects on maritime security which is our premise, since we are considering the rights of nations in their relations insofar as they remain separate states and will not merge into one.

A strategic alliance on issues over the Indian Ocean has to be fundamentally a Maritime alliance and should not be widened and broadened with other impending issues related to the region. Thus individual nations should accept responsibility proportionate to their national power and national interests. In particular India and China should take a greater role and should form a maritime coalition through the strategic alliance concept to ensure the safety of shipping in Indian Ocean. This Indian Ocean maritime coalition should focus on a nation to nation coalition aiming to maintain and secure the safe and free use of the Indian Ocean. Importantly such a coalition does not require strict rules and agreements or convention. Rather it has to be a consensus decision making<sup>114</sup> thought process based on mutual trust.

### **The Way Ahead for Strategic Alliance – Mutual Security Pledges**

Maritime conflicts emerging through Islands and chokepoints are mainly attributed to grand strategic decisions of the states. Countries that have the security and resource advantage may wish to have their

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<sup>113</sup> **House. J. W.** “War Peace and Conflict Resolution: Towards as Indian Ocean Model Transaction Institute of British Geographers, New Series, 1984

<sup>114</sup> **Ranasinghe J.J.** Bridging the ends – paper on Peace Building through Post Conflict Operations by Military Forces in Sri Lanka, 2010

nearby islands and choke points to be under their will, and greed prevents the same being used by another for their advantage. This can be overcome through the new concept of preventing conflict environment and is called Mutual security pledges. This involves commitments by countries not to act in ways that would jeopardize the other. Having the existence of mutual security pledges diminishes the prospects of conflict in the ocean. This concept of mutual security pledges will open up the avenues for any state to enter into the coalition as long as they share the same common objectives as well as mutual security pledges. However any state's involvement in the coalition should be based on its assessment of its National interests, albeit any involvement should be proportionate to its military capabilities. This allows controlling the level of involvement of the stronger by other states. Effective coalition needs to be concerned about certain imperatives related to maritime security like advanced situational awareness, responsive and consciousness decision making architecture, expeditionary military capabilities, ability of providing security in contested littoral regions and capability of applying all elements of multinational power <sup>115</sup>.

The strategic coalition of the Indian Ocean should introduce its preconditions for membership well before the formation of same and should insist on the possibility of coalition by conformation of Mutual security pledges of such coalition. There are three basic security pledges ; firstly to cooperate in maintaining the security of the Indian Ocean in peace time as well as in emergency or crisis, Secondly economic cooperation in commerce, trade, and marine resource development and lastly a commitment to maintain and develop the benefits of the ocean. These concepts could be re-arrayed simply as co-existence, prosperity and values. The requirement of confidence building measures on this context is to strengthen the mutual security pledges so that peace can exist without any fear.

## **Transparency**

Transparency invites other conflict states to rethink the process of peace which measures and help to dampen the prospects of conventional conflict in the ocean. Some actions can be used to enhance deterrence and warning at times of hostile intentions. They can also reassure potential enemies that the other side is not preparing for war or coercive military action. These episodes escalated tensions and aroused concerns in other interested countries and stakeholders of the Indian Ocean, about the possibility of a maritime war. No maritime nation wanted a war and all sides wanted to avoid full-scale war in the Indian Ocean or nearby. For keeping chokepoints and islands of the Indian Ocean a

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<sup>115</sup> Thomas B., Fargo. Article on Securing Sea Lanes in Papers in Australian Maritime Affairs No 21

conflict free area, it is important to consider the confidence building measures by the states to avoid conflict. There can be a series of Confidence Building Measures ( CBMs)<sup>116</sup> that would be agreed upon and implemented by the interested parties and states but prominent among these should be the transparency measures, such as the prior notification of interests over the islands and chokepoints, large-scale military exercise to avoid future escalatory spirals etc. It is highly likely that other transparency measures, such as the limitation of troops to particular areas and the creation of demilitarized zones in choke points and islands can further limit the likelihood of conflict in the making, in the Indian Ocean.

Achieving transparency is a systematic process<sup>117</sup>, in which a number of preconditions must be present for the successful identification and implementation of military confidence building and conflict avoidance measures. First, successful CBMs require sustained negotiations with the goal of institutionalizing the most appropriate mechanisms to de-escalate tensions and prevent the outbreak of accidental or inadvertent war. Second, once CBMs are identified and agreed upon, their success depends on sustained implementation. Third, military CBMs require transparency since their objective is to minimize misperceptions about the intentions of the adversary. Transparency requires verifiable information to monitor agreed-upon CBMs such as force deployments or military movements. Fourth, military CBMs cannot succeed in a vacuum and require parallel political, social and economic policies to build the necessary environment for cooperation between state parties. Finally, the effectiveness of military CBMs depends on the political will of state parties to avoid conflict and to incrementally build mutual trust<sup>118</sup>.

### **Managing Dangerous and Potentially Dangerous Military Activities**

The management of dangerous and potentially dangerous military operations at sea, near the chokepoints and islands also has considerable significance in the Indian Ocean, especially in the context of the incipient and growing nuclear arsenals in emerging powers. These measures involve the provision of guarantees not to deliberately intrude into the air spaces of other states and not to test missiles near the choke points or in the Islands of the Indian Ocean. Communication and hotlines

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<sup>116</sup> Dipankar Banerjee. CBMs in South Asia: Potential and possibilities, Ceylon press, CBO.2000

<sup>117</sup> **Edward Azar and John Burton.** International Conflict Resolution: Theory and Practice,,Boulder, Colorado: Lynne Rienner Publishers, 159 pp, 1986.

<sup>118</sup> Extracts from précis issued by Colombo University on “Avoiding violent Conflicts”

between strategic Commanders and political leaders also will work with greater efficacy and bring parties into a common interest in avoiding inadvertent war at Indian Ocean.

Contemporary maritime conflicts need to be analyzed and addressed within their strategic alliance policies and political economy, considering relevant stakeholders with aims of resolving conflict. Strategic alliance approaches to conflict management, including UN Security Council sanctions enforcement, need to be developed to complement and thus strengthen national and global strategies to control regional flows of arms and resources.

Countries near choke points and Islands should receive greater technical and financial support to improve cooperation on customs controls and maritime patrols for coastal surveillance and border policing necessary to curtail cross-border trafficking of arms, drugs and commodities. Such regulatory efforts need to be complemented with strategic alliances and (its) cooperation on key economic and trade policies

Taken together, these studies suggest that a strategic alliance of Nations is the requirement for interdicting maritime threats posed on chokepoints and Islands thus managing resource flows from and to conflict maritime zones and are important mechanisms for improved conflict prevention and resolution for (the) maritime conflicts at sea. However, they require substantial strengthening and adaptation to be more effective and more responsive to potential unintended consequences. As long as the structural, “demand-side” factors of underdevelopment and state weakness remain unaddressed, international efforts will continue to treat the symptoms rather than the complex range of causes for contemporary maritime conflicts.

### **Conclusion Lessons and Implications for policy**

From the outset, the Indian Ocean region has its inherited conflicts and issues and thereby its security is very volatile. In this context interaction of states within the region was relatively weak and this ensured a weak regionalism; much of the responsibility for constructing security in the Indian Ocean region lies in the hands of emerging powers of the region. Most of the littoral states of the Indian Ocean are maritime dependents and sea-based economies, thereby growing maritime security challenges have a direct influence on the security and economic considerations of their state matters.

There is considerable scope to construct security through strategic alliances around areas of common interest, especially on choke points and Islands to protect the environment and sea lanes of communication (SLOCs) from traditional and non tradition threats.

Minimizing insecurity requires greater mutual knowledge, education, and understanding among Indian Ocean regional states and peoples. Indeed, there is an opportunity for the regional alliance to rally around the Indian Ocean for “second track” actors to make an important contribution to regional security. Other areas of concern, such as environmental security and many other nontraditional security threats, such as those noted above, might well form the basis of an increasingly strong civil relationship among people living around the Indian Ocean Region in the future.

Considering the value and strategic importance of the Indian Ocean for stability, security, as well as its economic usage for the region and world affairs, there must be a common perception on threats related to the safety and security of this important sea lane. It is a paramount requirement of littoral and other states to contribute to the safeguarding of security and interests of the Indian Ocean, being out of the end victim syndrome<sup>119</sup>. This strategic alliance concept will serve best if it is not in the form of power presence in the Indian Ocean, but through capacity building, exchange of information, in support of Navigation, Hydrographic survey, getting information through VMS ( vessel monitoring System ) and surveillance, and most importantly adhering to mutual security pledges promoting confidence-building measures.

The findings of this paper indicate that security, power, resource and economic factors be the grassroots to the conflicts emerging in relation to the chokepoints and Islands. Finally it is worth mentioning and concluding with what “Thomas B Fargo” has said on securing Sea lanes that,

*“it is the collective efforts that will give the results, no nation can unilaterally control all the variables involved in any transnational threat, every nation has to contribute and every nation has a unique capacity and responsibility to help.*

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<sup>119</sup> Until it happens to the particular, will not feel the gravity or the effect



# **Emerging Geopolitics: Placing Sri Lanka in the Indian Ocean, Geopolitical Rivalry**

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## **Introduction**

In this study, an attempt was made to identify and critically evaluate the factors defining the place of Sri Lanka in the emerging Indian Ocean regional cold war. Generally ‘geopolitics’ implies the relationship between politics and geography with respect to the foreign policy of nations. The study of geopolitics basically concentrates on understanding the power bases of competing states and their interactions with one another. “State” is the fundamental unit of the study of geopolitics. Every state in the world tries to maximize its national interest and maintain sovereignty internally and externally. Generally in geopolitics the super powers and regional powers compete for power in global and regional theaters and search for geopolitically, geo-economically and geo militarily significant friendly states. Mostly those friendly states are “small states” and in general they happen to be centers of attraction or hubs geopolitically. Sri Lanka is one such small state located centrally within the Indian Ocean. .

The current Indian Ocean geopolitics, characterized by growing Sino-Indian rivalry has given a new boost to geopolitical significance of Sri Lanka. Thirty year old ethno-nationalist crisis marked its end in 2009 and Sri Lanka now stands as a war free nation in the world political system .The entry of China into the Sri Lankan geopolitical space and their immense interest over the Sri Lankan state has signaled a new phase of geopolitics. The growing U.S-Sino-Indian geopolitical rivalry in the Indian Ocean has intensified the significance of Sri Lanka and thus the present geopolitical space has drawn Sri Lanka into the regional cold war in the Indian Ocean.

## **Methodology**

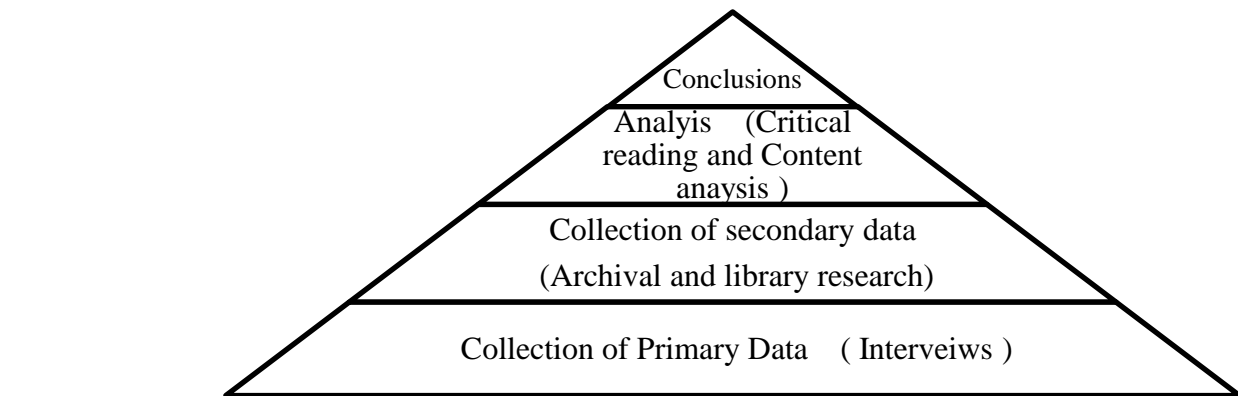
The overall goal in selecting a methodology for research is to get the most useful and accurate data and information for the study in the most cost-effective and realistic fashion. The methodology that I adopted is historical/analytical approach and the key techniques that I made use of are,

- Content analysis
- Interviews

- Critical interpretation.

The following diagram shows the sequential presentation of my research.

**Figure:2.** Temporal/Sequential Presentation of the research



Source – Author

## **The Approach**

I followed the historical / analytical approach to research which is basically the process of learning and understanding the background and growth of a chosen field of study. The historical/analytical method of research applies to all fields of study because it encompasses their origins, growth, theories, personalities, crisis, etc. Both quantitative and qualitative variables were used in the collection of historical information, but for my dissertation research I used primarily the qualitative variables in the collection of data and depended on both primary and secondary data sources. There are steps that I followed to achieve a reliable result. I adopted Charles Bushas' and Stephen Harters' six detailed steps for conducting historical research for my research.

## **Data Collection**

Since my research topic is new and there are only a few published materials on it, the methodologies of data collection I chose were more exploratory methods i.e. Interviews, archival analysis, and library research. To collect data, I used both primary and secondary sources. The major source of data and information was secondary sources and they were collected through the internet, primary library research and by using published texts including books, political manifestoes, journals and news papers. I chose archival analysis method which is a form of observational method, whereby the

researcher examines the accumulated documents such as diaries, novels, magazines, books, journals and news papers and the internet sources.

I conducted interviews and discussions with academics, especially university lecturers to collect data and information related to my study.

## **Data analysis**

Content analysis is a research tool focused on the actual content and internal features of media. It is used to determine the presence of certain words, concepts, themes, phrases, characters, or sentences within texts or sets of texts and to quantify this presence in an objective manner. Texts can be defined broadly as books, book chapters, essays, interviews, discussions, newspaper headlines and articles, historical documents, speeches, conversations, advertising, theater, informal conversation, political manifestos or really any occurrence of communicative language. To conduct a content analysis on a text, the text is coded or broken down, into manageable categories on a variety of levels--word, word sense, phrase, sentence, or theme--and then examined using one of content analysis' basic methods: conceptual analysis or relational analysis. Conceptual content analysis method is used in my dissertation study. The following list (adapted from Berelson, 1952) offers more possibilities for the users of content analysis: <sup>120</sup> I adopted Berelsons' content analysis method for my study.

In analyzing the information, I adopted the method of critical reading and critical thinking. Here, critical reading refers to a careful, active, reflective, analytic reading. Critical thinking involves reflecting on the validity of what I read in light of my prior knowledge and understanding of the world.

## **Introduction**

### **What is a small state?**

It is rather difficult to provide an objective definition but from a **geopolitical point of view** we identify a small state as a state which is neither a Super power nor a Regional power in the global and regional geopolitical arenas.

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<sup>120</sup> <http://www.colostate.edu/Depts/WritingCenter/>

Smallness is not defined purely by geographical extent but its relatively smaller influence in political, economic, cultural and strategic spheres in the global community of states.

#### Sri Lanka as a small state

- Historically, Sri Lanka has enjoyed an independent political identity despite being a small island state and in close proximity to India.
- As a victim of Colonialism in the late 16<sup>th</sup> century, Sri Lanka lost its independent identity and was less consistent in security, unstable in economy and far behind in diplomacy and cultural integrity.
- As a result of the process of colonial withdrawal and the entry of the super powers into the power balance, Sri Lanka as a small state is located in the inter and intra regional power alignments and alliances and is now in a struggle to balance the asymmetry of political identity through those power alignments.

### **The Importance of the Indian Ocean**

*“Whoever attains maritime supremacy in the Indian Ocean would be a prominent player on the international scene. This ocean is the key to the seven seas in the twenty-first century; the destiny of the world will be decided in these waters”*

- US Navy strategist Rear Admiral Alfred Thayer Mahan (1840-1914)

Historically Indian Ocean was the most prominent ocean in the world where it was the destiny of the world civilizations. It was the homeland of Indo valley and Harrapa civilizations. In the Colonial era Indian Ocean was brought into the center of attention of the world community by the colonial powers. In the Cold War period Indian Ocean was the theater for the Superpower rivalry. In the Post-Cold War period Indian Ocean Geopolitics was defined purely by economics. In the Regional Cold War between India and China, Indian Ocean had now become the most significant Ocean in terms of geopolitics in the global and regional arenas. There are other issues like Terrorism, Drug trafficking, Piracy and Oil spills bringing significance to the Indian Ocean.

### **Geopolitical Significance of Sri Lanka in the Post-war scenario**

Post war geopolitics mark a silver line in the Sri Lankan geopolitics. The defeat and elimination of LTTE after its thirty-year-long armed conflict against the state is considered as the most significant geopolitical event that took place in the Sri Lankan political history. LTTE, one of the world's powerful terrorist organizations had been declared a terrorist organization and had built a strong international network. It had created a bad impression about Sri Lanka in the world community and stressed that the ethno-nationalist problem in Sri Lanka is a Gordian knot that is hard to untie.

After 9/11 incident in the United States, the bad time of LTTE started. LTTE was internationally banned in 2006 by the European community and that made the Sri Lankan government carry military operations against the LTTE in 2006. The war against terror has made Sri Lanka geopolitically prominent in the global geopolitics.

With the election of President Mahinda Rajapakse in November 2005, the government took several steps to end the ruthless civil war that had principally blocked the development of the nation for nearly 30 years. First the government moved for a peace talk in 2006 and tried to solve the problem through mutual understanding, but the continuous violations of the ceasefire by the LTTE forced the Sri Lankan state to defeat and put an end to this thirty-year old armed conflict. In 2007 the government launched military operations against the LTTE and by 2009 the government fully defeated the LTTE and re-established peace in the country. This enabled the government to take suitable steps economically, politically and socially to raise the living standards of the people of the country as well as to re-establish the lost political glory.

The end of civil war made Sri Lanka a safer place indeed in 2009 and brought international popularity and recognition to our motherland as a peaceful and non-violent country. The end of civil war is bound to bring back the lost glory of Sri Lankan geopolitics in the present time.

To reveal the rising geopolitical importance of Sri Lanka in the post civil war period, I adopted content analysis to show how it achieved an important place in local, regional and global geopolitics. The results obtained through Google search illuminates how Sri Lanka is now becoming the most influential geopolitical hub in the regional geopolitics.

**Table 1: Geopolitical significance of Sri Lanka.**

Countries	Importance of the name of the country with the notion “Geopolitics”	Importance of the name of the country with the notion “Indian Ocean Geopolitics”	Importance of the name of the country with the notion “global geopolitics”
USA	1530000	1080000	2810000
China	5170000	951000	1610000
India	1630000	1750000	1350000
Sri Lanka	416000	611000	372000

Source- Author (2011)

(Number of Google results)

According to the results obtained we can clearly see that Sri Lanka is now becoming widely known as the new hub of development and is going to be a large growth center in the Indian Ocean region. With all the modern development programs, most of the experts as well as laymen forecast the potential of Sri Lanka to become a mountain of prosperity and to mark a silver line in the South Asian geopolitics and geo-economics.

The efforts of the government in developing Sri Lanka as a dynamic global hub has resulted in Sri Lanka rising up as an independent and powerful nation in the post war era. According to President Rajapakse’s political manifesto, his objective is to transform Sri Lanka into a strategically important economic centre of the world. His determination therefore, is to transform Sri Lanka into being the focal point of the Asian Silk Route once again. Using Sri Lanka’s strategic geographical location effectively, the government tries to develop our country as a Naval, Aviation, Commercial, Energy and knowledge hub, serving as a key link between the East and the West.

The rising geo-economic and geopolitical significance of the new hub (Sri Lanka) has accelerated the importance of geopolitics in the Indian Ocean region. The rise of Sri Lanka coupled with China as a vital center of geopolitics, has intensified the interest of world Super powers and regional powers to establish power in the Indian Ocean. They now search for friendly states in the Indian Ocean region to safeguard their sovereignty and power bases.

This emerging interest of world powers has now lead to a competition and signals a geopolitical rivalry in the Indian Ocean. The super powers and the regional powers now search geopolitically, geo

economically and geo militarily significant spaces in the Indian Ocean. The spaces which are geopolitically more significant become centers of attraction/hubs geopolitically; Hambantota is one such space which received enormous attention as the most geopolitically significant hub in the local and regional geopolitics in the post –war era.

Therefore the growing US-Sino-Indian geopolitical rivalry in the Indian Ocean has enhanced the significance of Sri Lanka as a geopolitically significant space and in that, Hambantota plays the main role as the crucial hub of Sri Lanka.

### **Emergence of a new cold war**

In the recent years, Sri Lankan geopolitics have entered into a new phase as another Asian regional power -China has got involved in Sri Lankan geopolitics. Entry of China into the Sri Lankan geopolitical space and their immense interest over development activities especially in Hambantota made the regional and world community confused in recent years.

The most significant transit of Sri Lankan geopolitics in the post-civil war era is the change in interest shown by the international community the ideally situated natural harbor of Trincomalee to “Hambantota”; the emerging growth center of Sri Lanka.

In that context the entry of the Chinese into the Indian Ocean region is now becoming an arena of geopolitical rivalry among world powers. This will constitute an exploration of the strategic importance of the Indian Ocean region in contemporary world politics and raise the question “Why Chinese interest in Sri Lanka and why particularly Chinese interest in Hambantota?”

Entry of China into Sri Lankan geopolitical space thus signals a new era of South Asian geopolitics and marks geopolitical significance of Sri Lanka as a new hub. It signals Sri Lanka becoming a crucial node in the shatter belt of the emerging regional cold war. The growing US-Sino-Indian geopolitical rivalry in the Indian Ocean has enhanced the geopolitical significance of Sri Lanka and has received major attention from the global community.

**Map I: Great power competition in the Indian Ocean region.**



Source-

*Sangam.org (2009)*

The peaceful situation created after a 30 year old civil war marked a silver line in Sri Lankan geopolitics. It now signals a new phase of Sri Lankan geopolitics.

- In a realist perspective, the Super power (U.S.A) and regional powers (China & India) compete for power in the global and regional theaters.
- They search for friendly states in this competition.
- This leads to global and regional geopolitical rivalry and draws other states into it.
- They also search geopolitically, geo economically and geo militarily significant spaces outside their sovereign boundaries.
- Some of these spaces become centers of attraction/hubs geopolitically.
- Sri Lanka is one such state and Hambantota is one such hub located in the Indian Ocean region.

### **The Place of Sri Lanka in the IO geopolitical rivalry**

- Post war geopolitics brought Sri Lanka back into the center of Indian Ocean geopolitics
- Both India and China are expanding their influence and power bases in the Indian Ocean.
- They are in a bid to attain supremacy in the Indian Ocean region.
- India decisively influences Sri Lankan geopolitics as it is located within the Indian sphere of influence.



- Chinese involvement specifically in Hambantota, signals a threat to India to function as the leader of the region.
- China has become India's number one security problem in the Indian Ocean.
- It signals a regional cold war and Sri Lanka could find itself as a state in a “shatter belt”.
- Sri Lanka may be heading into a dangerous geopolitical terra-incognita.

## Conclusion

In this transition phase, the Indian Ocean's security will be a crucial issue. Massive military build-ups have already started, and the risks of miscalculations by the traditional and new great powers are getting higher. We can expect the South Asian region to be one of the system's key areas to be watched in the next decade. The Indian Ocean is a maritime arena where global and regional powers are busy making new alliances and strategically repositioning their naval assets, along with building new capabilities. There is the real possibility that national and regional events could draw Sri Lanka into the center of this tripartite (US, China, India) geopolitical rivalry. Understanding all sides of this struggle is important for Sri Lanka to be placed safely within the Geopolitical rivalry in the Indian Ocean.

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## **How Sri Lanka Navy Can Assist In Eradicating Maritime Piracy In Post Conflict Scenario**

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### **Introduction**

World opened eyes to “Sea Piracy” following the seizure of the oil-tanker “Sirius Star” in year 2008 mid-November. Not stopping there, the Somali pirates continued piracy, taking hostages and demanding ransom. This became a disturbing factor among the International Community (IC), shipping industry and the navies around the world.

Many believed that piracy was in control after considering the achievements individual states and navies have achieved in areas off Malacca Strait and other regions. Despite these achievements, it’s now high time to realize that the menace has been only controlled but not eradicated. Today we witness the emerging global threat of piracy through Somali pirates. Recent attacks saw the emerging new tactics, advanced weapons, ability to strike in deep seas, well organized teams and the skill to strike at will.

World has never witnessed pirates become this hazardous. If we think this is the highest height they can attain, it’s wrong. The possible combination of pirates and terrorism can pose a threat to the maritime environment and world security. In this backdrop no sea area/vital Sea Lines Of Communications (SLOCS) can be termed safe due to the nature of piracy.

Even though piracy is regarded as a symptom of a main issue, there is a huge obligation on the part of the IC and navies to react timely and effectively to eradicate this menace. If we wait till the root causes of piracy are addressed, it’ll be too late for ships that take passage in dangerous waters even at this moment.

In this outset, Sri Lanka Navy (SLN) has much more to offer with the huge amount of experience and expertise they acquired after having fought with the LTTE sea tigers for nearly three decades, successfully defeated and at the end had total sea control over the seas around the country. To achieve these results, SLN had the best men, tactics and importantly new strategies which they used against a deadly force. They proved that they are battle tested in the most dangerous maritime environment that a Navy could ever face. This wealth of experience can be effectively used in

eradicating sea piracy, a phenomenon which is fast becoming dangerous and completely uncontrollable if we do not react fast.

### **What Are the Available Solutions against Sea Piracy?**

Solutions can be found by individual states, the international community, the shipping community and by the World Navies. Individual states have a major role to play in countering sea piracy as the breeding grounds for piracy and the root cause of this issue lies in the shores of certain states. Until these states find permanent solutions for the root cause, eradicating piracy will be complicated.

When the individual states fail, responsibility to act becomes a part of the IC. They can impose various strategic as well as tactical measures to counter piracy but the major concern of IC will be to make sure that important organizations such as the UN, IMO, IMB, ASEAN, etc come to a common understanding of the seriousness of the issue. Mutual agreements can then lead to combined naval activities followed by assistance to individual states to handle situations.

Even though merchant vessels have not reacted effectively, they can adopt many protecting measures to avoid pirates boarding. Their preparation onboard will come in handy as navies cannot present themselves at all locations at all times. Shipping community needs to map out plans in collaboration with navies so that they can face the threat rather than aim for a “shipping route deviation”.

In this backdrop, even though other navies have no or little option other than stationing their bigger warships in likely areas where sea piracy can strike, the SLN has a new dimension of an approach which has the ability to strike effectively in order to find a lasting solution.

### **What the Navies should understand if they are to react?**

There are a few important factors that the navies should understand. Firstly it is a moral obligation as well as a responsibility of navies to make sure that sea routes are kept safe from unwanted usage. In this backdrop, navies are bound to protect maritime routes adhering to international regulations and conventions that have been laid down.

Secondly, they should understand that they are dealing with a symptom of a major issue and the root cause(s) lies in the shore of a destabilized/corrupted state(s). Despite this very fact, the navies still

have to respond, as reactions of navies are the only hope that can be seen in safeguarding endangered seas.

Thirdly, navies should understand that they are facing a much-advanced enemy at present. Modern sea piracy is rich in tactics, well organized, equipped with sophisticated weapons, have the ability to avoid been detected by modern navies and is fast acquiring updated information of important cargo carriers as well as movement of naval units through a globally knit system which brings the situation to a very serious level.

Fourthly, navies should understand that they have not been fully geared to face a threat of this nature, which has the capability to seize a huge oil tanker almost the size of a US Aircraft Carrier in the deep seas. Further we are looking at a potential enemy, that can cause serious damage if not handled effectively. Navies around the world need to understand that special preparation is an immediate requirement by making adjustments to the advanced operational missions they have been engaged in ever since.

Finally, navies should understand that they are facing a new maritime warfare environment which requires special tactics. “Modus operandi” of sea piracy has evolved to a greater level and it will be hard to predict the level of improvement pirates will achieve in the future. The requirement of developing state of the art counter measures by navies around the world remains crucial at this juncture if we are to navigate safely. At this particular juncture, the expertise and mammoth experience coupled with state of the art maritime tactics that are in the possession of the SLN can be of enormous value.

### **How Can the World Navies React?**

Reaction of navies can be categorized into two main areas. First, to react in collaboration with other navies, maritime organizations, IC, individual states etc. to find a coordinated solution. Secondly, to react to sea piracy when it takes place in own coastal area or in a sea area, when deployed to counter piracy. First let's look at “reaction by collaboration with navies, maritime organizations etc”:

a. Regional Co-operation with navies- Powerful navies need to take a leading role in this regard, as a single Navy cannot be present at all the vital locations throughout. Once threatened areas are identified, navies need to conduct surveillance/patrol in these regions by dividing areas of responsibility to each Navy. In this method, a naval component will be conducting patrol in vital sea

routes keeping contacts with other naval units which are at standby to assist them whenever required. Despite the fact that the presence of 69 odd warships of the United States, Russia, Canada, China, Britain, France etc. are in the West African seas, pirates continue to attack ships sailing through the area. This fact alone reveals the importance of effective coordination among navies in order to utilize assets effectively by forming Anti Piracy Task Forces (APTF). Combined exercises aimed at detection, identification, classification, striking, handling hostage situations, boarding ill fated ships etc will be of immense value when situation demands.

b. Assist Formation of Regional Piracy Response Centers- Navies should cooperate in forming one of the key elements in counter piracy operations i.e. Regional Piracy Response Centers (RPRC) in crucial coastal areas in collaboration with international organizations. RPRCs will activate through a special signal emitted by the ship in danger using satellite technology. The navies need to work together to demarcate zones according to threat assessment as well as considering operational feasibility. Fleet units too can place response receivers onboard and share information if they are not in the area concerned.

c. Utilization of Naval Aviation- Navies should react to sea piracy with concealment in order to eliminate the threat. Coordinated use of naval aviation by world navies can be effectively used to add depth to surveillance. Certain navies utilized in anti piracy missions may not have the naval aviation, but in coordinated missions such units can receive assistance from others. The practice of sea pirates has always been to evade whenever a warship is sighted or to pretend to be fishermen.

d. Intelligence Sharing- Modern pirates are well geared in sharing vital information by coordinating with terrorist groups, corrupted officials etc. regarding important shipments as well as movements of naval units. If navies are to react effectively, they should be equipped with precise and real time intelligence when ever possible. So what ever the intelligence that is available should be shared with other navies and whenever such credible intelligence is been received, navies should react effectively till the objective is accomplished.

e. Close Protection for Vital Cargo- Naval units can provide close protection to vital cargo shipments by forming convoys combined with other navies in threatened waters. This will require the assistance of shipping agents as well as of individual states in order to form the convoy at a predetermined location and to concentrate on the maximum number of vessels carrying vital cargo.

f. Position Special Units onboard- If the above (e) application is hindered by an insufficient number of naval units, navies can have teams specialized in counter piracy operations onboard naval vessels and then these teams can be inducted into ships carrying important consignments at predetermined locations. These special teams are tasked with ensuring that no pirates board the ship. This will serve as an effective solution rather than deploying a large number of warships for convoy protection.

g. Provide Training to Ship's Crew- One way in which the Navy can react effectively is by training the crew of Merchant Vessels. This training should cover aspects such as implementation of an effective radar watch, positioning of onboard lookouts and sentries, ship maneuvers that help evade pirate craft etc. Even though navies patrol the seas, they will not be able to be present whenever piracy is committed. So the ship's crew needs to be trained effectively by the respective state navies.

h. Utilization of Technology- As the aim of deploying naval units is primarily to detect and eliminate sea pirates, concealment plays a vital role. To achieve stealth, detection and to carry out strikes with surprise, new technology can be effectively adopted. Unmanned Surface Vessels (USV) can be of great value in this regard as this can be remotely operated. As there is a high degree of danger in closing in on pirate craft, the USV can be essential in intercepting at high speeds, classification and attacking.

i. Reacting with Deception- Pirates avoid warships and pretend to be innocent by appearing as fishermen. When the warships are out of sight they continue their hunt. Deploying fleets of warships to eradicate piracy will compromise concealment, detection probability and surprise of attack. Navies need to develop tactics which suit the threat. Deception can be best used in hunting pirates. If we go back to the concept of "Q Boat" which was used in the WW II against German U boats, we will be able to understand the concept. Any ship can be used to explore this tactic and the requirement of the ship will be to pretend as a normal vessel but concealed with special trained teams and enough fire power inside to strike on time. Deceptions can have various combinations but this seems to be a sound method to ensnare pirates for an easy kill.

The second method discusses how a Navy can react when in own sea areas or when deployed as a part of APTF in other areas. With the recent successes a few navies had against piracy, pirates are well aware that they have to face significant threat from powerful navies around the world in the future. In this backdrop, pirates are left with two options; to continue piracy with improved tactics or to abandon piracy (which is very much unlikely). This implies that pirates will not give up but will



only emerge with advanced tactics aimed at even striking warships. With such a development, the possibility of pirates turning into a group of well organized maritime terrorists cannot be ruled out. No Navy would prefer to endanger their valuable warships by exposing them to an environment where a sudden surrounding of a warship is been carried out by pirate speed boats including suicide craft which have the potential of repeating the USS Cole experience. If pirates launch an attack of this nature (which is very likely) against a warship, navies will have to consider twice before deploying. But the best option is to prepare for the worst scenario.

It is a fact that the pirates go ahead with their mission despite the presence of warships in the region. Notwithstanding the attendance of 69 odd warships from various countries in the West African seas, pirates continue their attacks. The message is quite clear; we need to apply new tactics against a new threat, which is emerging dangerous. I would like to suggest the employment of a battle proven concept of our own i.e. the “Rapid Action Boat Squadrons (RABS) against an enemy that carries out its mission using low profile high speed boats armed with sophisticated weapons.

### **React With New Tactics: Key to Eliminating Piracy**

For the navies to react with new tactics, understanding present day sea piracy operations is a must. Importantly, pirates have taken the attention of all navies and have created a new maritime warfare where navies need to react fast and effectively. The modern day piracy consists of four major phases, which navies need to understand carefully if we are to be proactive:

- a. Phase 01-Launching phase of pirate boats from shores and navigating in territorial waters. If precise detection can be carried out, the task of eliminating pirates are much easier. As pirates use to act like innocent fishermen their motives are too early to identify and even if positively identified, there will be restrictions on dealing with them when inside another country's territorial waters.
- b. Phase 02-In this phase, pirates are in the close proximity of Merchant Vessels. In this decisive phase pirates will decide either to board or to leave the targeted ship. This stage comprises another aspect when considering modern pirate tactics. Pirates are effectively utilizing the mother ship or phantom ship concept. After conducting an innocent passage pirates can get hold of slightly a bigger vessel (fishing trawler) to go into deep seas and carry out attacks.

c. Phase 03-In this phase, pirates have already boarded the vessel and are in full control, along with a hostage situation. This stage can be considered a very crucial stage as the navies have to react with precaution considering both the safety of the crew and the nature of cargo onboard (explosives, military hardware, gas/oil etc).

d. Phase 04- In this stage, pirates will commence guiding the seized ship towards their port. This stage too requires navies to react with precaution. The actions that modern warships can do on stage 3 and 4 will be limited.

### **React with Small Boat Operations**

Analyzing the above stages will illustrate that freedom of action/reaction by navies narrow down from stage 01 to 04. Navies should principally focus on acquiring initiative in the first two critical stages. The height of professionalism should be possessed by navies along with the introduction of a new tactic like the Rapid Action Boat Squadron (RABS) concept which the Sri Lanka Navy introduced and used quite effectively against the LTTE sea tigers. Effective use of this will facilitate navies to contain pirates only to stage 01 and 02.

This concept is based on utilizing specially trained mariners in small fast attack craft. RABS can be organized into 05-06 craft per single ship. But this number can be increased using suitable transpiration platforms. A combination of two such RABS groups will comprise a minimum of 12 craft which is an effective number to launch a surprise attack on the enemy. The Command ship is responsible for the transportation of these craft and deployment in designated areas. These craft can also be launched from shore bases, closer to the endangered sea area. Composition of a craft will be 5-6 men along with detection systems, weapons ranging from 23mm, 14.5mm, 0.50 inch, RPGs and small arms.

These units will primarily conduct operations closer to shore and in deep seas. Detection at deep seas will be done by the bigger warships and RABS will be directed for action. The fundamental behind this concept is to “get into the enemy’s operational level” to be assured of elimination. Following are the advantages of using the above concept as an effective reaction by navies:

- a. Ability to achieve high concealment as these units can be deployed inside territorial waters (on agreement) to mingle with fishing clusters. The small size makes them less noticeable compared to that of bigger warships.
- b. Ability to detect low platform pirate craft. RABS units are equipped with radars, night vision etc. Accurate detection, classification and close observation of low profile targets can be obtained as RABS too operate from a low profile.
- c. High rate of maneuverability and fire power can be effectively used during operations. If bigger warships are deployed these advantages will be hard to achieve.
- d. Ability to out number pirate craft. With RABS, pirates can be easily out numbered rather than to be present with a single ship. The days that pirates are going to launch in large numbers are not far. In this backdrop, navies too should concentrate on effective numbers rather than concentrating on bigger platforms.
- e. This will be a better platform against pirates. In the case of pirates counter attacking warships with RPGs, they will present a big target to the enemy. In the case of RABS, the target is small and provides the best platform to attack a similar platform with flexible maneuvering.
- f. Ability to counter suicide craft. If pirates acquire suicide tactics which is a high possibility considering the nature of operations, the RABS concept will be the best option as it can both evade the suicide craft due to speed and maneuverability and can also destroy suicide threats with a high rate of fire. If a warship is exposed she will find it extremely difficult to outmaneuver the suicide threat apart from detecting the small pirate boats.
- g. With the UN passing a new resolution enabling naval forces to counter Somali piracy even on the shore, the above concept will be of great use as it has the ability to attack the enemy till they reach the shore and assist the ground forces by providing the exact location of their beaching points. RABS can also be effectively used to launch surprise attacks on pirate shore bases.

- h. This concept will prevent piracy especially on small boats which have no advanced technology to indicate pirate attacks. But when these small units are deployed, their aim will be mainly to contain the pirates to stage 01 and 02 thereby protecting both small and bigger vessels.
- i. Ability to react at the time of pirates attempting to board. If warships are utilized, reaction will be limited to observations. RABS will have the ability to confront the enemy even at the critical time of pirates attempting to board the ship. This situation is vital to pirates as they are vulnerable due to lack of maneuverability and reduced fire power. This condition can be exploited by RABS concept as the men are trained to handle situations of this nature.

Considering the above advantages, RABS can be seen as the most effective method to react against piracy. The main aim of this is to contain pirates to stage 01 and 02 and to react if they launch from phantom a ship(s).

### **Barriers to Reacting**

There are a number of barriers that navies have to deal with, when reacting to piracy. The following are some of them:

- a. Piracy is a symptom of a crisis on land. Even though navies destroy pirates out at sea and keep shore bases untouched, a lasting solution is unlikely to be found. Despite recent UN resolution authorizing navies to act on shores, there will be consequences.
- b. The exercises of jurisdiction principles enforcement on the sea, imposed by maritime law, can create several limits which sometimes affect the conduct and outcome of naval operations. Attention on evolution of the International law in order to fine tune and set up a suitable legal foundation for future operations is a must.
- c. Most piracy incidents are not reported due to the various restrictions they encounter following reporting. With this trend, navies find it difficult to analyze the nature of piracy attacks, tactics and endangered zones.

- d. The practical inability to be at all the locations all the time due to restraints in naval resources and various other operational commitments.

## **Conclusion**

Discussions on reacting to piracy have reached a crucial level. Navies have to deal with a symptom rather than with the root cause of an issue. Today sea piracy has emerged as a serious threat to world trade, international maritime security, and global peace and as a challenge to world navies. Despite these facts, navies have to address the issue effectively as other measures do not seem to be effective. Modern sea pirates are well equipped, armed and innovative in tactics even to threaten the deep seas.

Piracy is only a tip of an iceberg that can become a serious maritime threat which requires special strategies, tactics and coordination to eradicate. No one can predict the next possible sea piracy attack, its magnitude or whether devastating tactics like suicide will be introduced or not. What is left to the navies at this stage is to react effectively in countering sea piracy till the root cause is addressed.

**HUMANITIES, LAW, INTERNATIONAL RELATIONS AND LAW**

**PLENARY SESSION**

CHAired BY HON. DR. SARATH AMUNUGAMA

MINISTER OF INTERNATIONAL MONETARY COOPERATION

## Summary

### **Introduction:**

*The objective of this plenary session is to stimulate the researchers for further studies by creating a thought provoking atmosphere where participants in the plenary and technical sessions can propose constructive mechanisms to deal with the issues of humanities and social sciences with respect to challenges of economic development of Sri Lanka after the conclusion of a three decade war.*

*Mr Gomin Dayasiri, a prominent constitutional lawyer and a negotiator at the various peace talk efforts between the government of Sri Lanka and LTTE, presented a paper on prospective analysis of constitutional changes by examining possible solutions for prevailing issues from within our legal system, beginning from the Soulbury Constitution to the constitutions of 1972 and 1978, including the Thirteenth amendment. According to him, the current context, with the defeat of terrorism and the ruling party gaining a two thirds majority in the parliament, has created the best opportunity for Sri Lanka to find a mature constitutional solution for the socio economic and political challenges of Sri Lanka in the new millennium. Thereafter, Attorney General Mr. Mohan Peiris, who has faced many challenges with respect to legal contradictions, presented a paper on the Problems and Issues of the Constitutional Proposals in Post Conflict Sri Lanka.*

*It was the view of the panel that devolution of police power and land rights itself will not enable a solution to the problem but perhaps aggravate the issue as it could fuel the grievances of affected parties. With reference to the 13<sup>th</sup> amendment, the panel opined that it was not properly tailored for the specific problem, but was a hash proposal that was completely based on the Indian constitution. Finally, the panel presented that there is a need for a home-grown constitutional arrangement that would reflect the hearts and minds of the people and which would be compatible with the multiethnic society of Sri Lanka. It was also put forward that the constitutional proposal, merely, does not offer solutions to the situation, as the problems are closely intertwined with socio economic difficulties that have accumulated in Sri Lankan society, and thus needs to be linked with other complementary solutions.*

## **Constitutional Reforms in Post Conflict Sri Lanka: A Prospective Analysis**

*Mr. Gomin Dayasiri (Attorney at Law)*

We are now constitutionally at a very crucial point; I would say that it is a ‘magic moment’ because this is an opportunity and occasion that will not arise in future if the present Parliamentary Election System prevails. Under the present Parliamentary Election System, it is impossible for a party to obtain a two thirds majority. You may remember, the first instance was in 1956 when SWRD Bandaranaike swept into power. It was also the case when Mrs. Sirimavo Bandaranaike got a two thirds majority in 1970. In 1977 J. R. Jayawardene virtually wiped out the opposition.

But, remember that was when there was a single constituency electoral system. Under Proportional Representation System it is not possible unless you cheat; and we were cheated once when general elections were not held, but instead there was a referendum. It was also called the *Lampu – Kalagedi Sellama*. It was a device used by the then government to continue to keep the two thirds majority in Parliament knowing that an election will not provide such a majority. If elections were held Prabakaran would have been the MP from the North and Wijeweera would have been an MP from the South. If so, it is possible that there would have been no insurrections. Those gentlemen would have gone to Parliament and would have learnt about Parliamentary debates, and also would have traveled extensively while enjoying perks and privileges such visits give, and life would have gone on. But it did not happen.

I pay tribute to the Armed Forces who have restored peace in the country under the leadership of the President Mahinda Rajapaksa, the Defence Secretary Gotabaya Rajapaksa and military Commanders. I do not think the military at any stage was different, but there was a clear difference in management. In this particular situation the leadership gave the much needed motivation and the ultimate political will to finish the war. Finally, the people respected that leadership and respected the Armed Forces equally, and gave the government a two thirds majority. I do not think it will ever happen again. So, we are now at a crucial juncture.

For years we were blaming a dead man for bringing in a Constitution that has been the reason for many of Sri Lanka’s problems. Now we have the medicine to cure it. People remember how the government very smartly and craftily made the two thirds, which was well within the constitutional framework to do what is good for the country. So now we are at, I would say, take it all or leave



moment for better or worse. In this situation, what is to be done? Many things! If I go to dwell on them I will need another hour or two.

So, I will restrict myself to two areas which are controversial and deal with them very carefully. Firstly, what is the prime requirement? We have gone through terrorism for 30 years. We cannot leave it for future generations. We were always proud of our past. We talk about 2,500 years of glory, but remember, we are vulnerable in many of the present day issues. The contemporary generations are undergoing various difficulties in their socio-economic and political relationships. The most important thing that we need to ensure today is the sovereignty of the state and the ability to exist without any interference; and that there shall be never a possibility of terrorism.

In the Constitution, which we have had from 1977, there are two aspects that are troubling: one is the Police power and the other is land. These powers have not been actually delegated to the Provincial Councils in practice. These areas in the Constitution are very gray areas. We have to remember that gray areas are very dangerous elements. The judicial decisions with respect to issues of a gray area can turn it black or white. We have had a Chief Justice in this country who had given excellent decisions. In one particular case on demerging the North and East, I appeared as a Counsel.

It may be right or wrong, but judicial decisions are such that, someday, it is possible to declare them legally invalid; certainly not under this government, but in a court of law. This kind of application is called judicial interpretation. It can always put it into the bundle of the provisions that the Provincial Councils are entitled to now. That is a very dangerous situation. We have had an experience that in the North and East there was a Provincial Council and there was a Chief Minister by the name of Vardaraja Perumal. He declared a State of Eelam which was a unilateral declaration of independence and cessation from the country. It is always possible for such a situation to arise as a constitutional interpretation in a judgment that such powers is to be given to the Provincial Councils.

When it says Police powers and land powers, as a main trait is dangerous, especially because a terrorist organization or a conspiracy does not occur overnight; it starts in a very small way by means of robberies, discussions at homes, night time meetings, a few attempts to smuggle arms etc. These are not the matters that come within the purview of the military. Those are matters that come within Police powers. So the early traces of any kind of terrorist movement can be discovered only by the exercise of Police powers. If the Police powers are in the hands of the Chief Minister, it can affect the strategic approach against such violence. In Sri Lanka under the present political and legal

circumstances the Chief of a Provincial Police will no doubt be carrying out the dictates of the Chief Minister. If he is like Vardaraja Perumal, or like one from the TNA, the situation can be really dangerous. In an election time power can be exploited to assist in creating a situation to favor the interest of the Chief Minister.

The memories of India after the attack on Taj Mahal hotel in Mumbai are important for us to get an idea of the consequences of Police power. How long did the central Police take to come to the hotel? It is important to take into account. In that particular incident they had to go through so much of red tape. The entire situation was under the control of the Mumbai police. After the first attack a second attack went on. The security forces were on the scene after getting all the clearance. So, remember Police is a part of security. Those are not subjects that can be alienated by a Constitution. However, JR Jayawardene picked up the Provincial Council system from India for which India still paying penance. With respect to Police powers I have handled only a very minor aspect because I have no time to spend much on it.

The second aspect, i.e. the land powers, is again very important. For example, we won the war because we were able to create some crucial conditions due to land powers that were enjoyed by the central government. If those land powers were not with the government, the High Security Zones that became a vital factor of the defence strategy of the government could not have been established. Even in other areas if the military needs to move and take over and establish themselves for security reasons they must have land to occupy. You cannot set up High Security Zones if the central government does not have the land and it is in the hands of the Provincial Council administration. Then the terrorists could get the advantage of legality of the land power.

We are now not living with Prabakaran but only with the Grease Yakas or something else. But the fact of the matter is that such a situation can always develop. Therefore, the two thirds majority should be used for the betterment of our next generation, that is to not to suffer from the issues that we have undergone. It is a problem even for India. We can imagine the situation in Sri Lanka if those powers are given to the Chief Ministers. If the Police powers and the land powers are handed over to the TNA which is now in power what could happen? What was the TNA previously? One must consider the security aspects now relative to the organizations holding the Police power and land power.

It may be argued that you are taking away powers of the minority, and undoubtedly, I would say there are certain genuine problems that need to be considered. There are legitimate Tamil grievances, legitimate Muslim grievances just as much as there are legitimate Sinhala grievances; matters like language, security concerns, land alienation, high security zones, water, development, employment, cultural affiliations, multi-ethnic forces and so on. I feel that the government must address all these issues.

There was a commission appointed, in which I was a member, made up of very distinguished people. Many of them were Tamils experts who disagreed on most of the things, but we did agree on one thing: the existence of legitimate Tamil grievances. It was chaired by none other than the daughter of the former leader of the Federal Party, a very learned Professor Nirmala Naganadan. The Commission found that there is no need for constitutional changes, but that they can be resolved by executive action and through legislative action with the Presidential fiat.

In my view, we cannot have Sinhalese exclusion. It is as bad as Tamil terrorism. Therefore, there must be a balance, and must be a give and take policy. In this country people must live in harmony; it is a prime requirement. In this country, we have a good base; we have an excellent cultural base. Buddhists and Hindus worship at the same temple and the same Kovil. They have the same hours of auspicious times; they have their same *Nekath* times; they celebrate New Year together; Christians, Catholics, Tamils, and Sinhalese do black magic in the same way. They go to church, sit on the same pew and worship and pray. So we have cultural affiliations and bonds that must be developed.

The next area is devolution. Devolution as prescribed in the present Constitution is not necessary. What should be done is to devolve power to the people? How do you give power to the people? That can be done if we have the smallest possible units of operation. Therefore, we must get back to the *Grameeya Sabhas*; it may be something bigger than *Gam Sabhas* of old times. There we need to move away from *Pradeshiya Sabhas*, which is another electorate under a different name. The *Grameeya Sabhas* are the units preferable in devolving power to the people. It is the genuine devolution.

There is a need of different kind of devolution than giving power to politicians. If you give the power to the people you can be sure that corruption and mismanagement will be reduced. If you give the money to the village, the village men will look after the resources. That is the best way of checking the use of resources. The Provincial Councils are far too big for all such activities.

There are two essential things you have got to do: one is giving the Police powers, and the other is giving land powers. Here you must give relief to the people of the North and East. Devolution here is an effort to eliminate corruption, mismanagement and inefficiency, and to promote the democracy.

I wonder how many people realize the strength of our position against those who are accusing us of war crimes. Do you know that on the 07<sup>th</sup> of August, 2011 (two weeks ago) for the first time Britain appointed a commission to inquire into rendition; you know what is rendition? It is one of the most disgraceful things; you don't do that kind of dirty tricks in your house. You go to Egypt, you go to Jordan, you go to Uzbekistan, and you go to Morocco, and use all methods of torture outside Britain and America. That was first discovered in 2011, after ten years. In 2005 they denied such a thing. Britain denied in 2007.

Our good friend, that gentleman who wanted to hover around in Nandikadal, Mr. David Miliband, had to admit in Parliament that they had made a mistake. In 2011 they appointed Sir Philip Gibson to inquire into crimes or wrongs committed by the British with regard to rendition and torture of prisoners. Who is this Sir Philip Gibson? He was the head of the military intelligence. Now, imagine the situation if our head of military intelligence Kapila Hendavitharana, is appointed to head the Human Rights Commission. Sir Philip Gibson has given a report one year ago saying that those in the LTTE were very respectable and honourable.

President Barak Obama, who talks of command responsibility, was in a room at the White House watching live Bin Laden being taken from the room, in which he was with his two little children and his wife, while in the custody of the US Navy. Obama and Hillary Clinton were watching from a room in the basement of the White House. It was not a film. They were watching it live. I mean a prisoner being captured with no kind of retaliation. What human rights could they talk about?

Third incident is again in August. A report has been issued in the name of Peace by the North Eastern Humanitarian Organization: The massacre of 12 civilians by the IPKF, the Indian Air Force. All details were clear. Why are they not asking for war crimes charges against India? Same war and same civilians, but nothing happens.

Last incident, there is a gentleman called Marzuki Darusman. He never stepped into Sri Lanka but he has written a report for the Commission. Could it be for discrediting the Attorney General, discrediting our law enforcement officers, discrediting our ballistic specialists and discrediting our state agencies? This damning report on human rights was made for Ban Kyi Moon. My question is,

why a person who has a definite bias against Sri Lanka was appointed to inquire into the issue? Why did Ban Kyi Moon, when he has the whole world to choose from, choose this one man as the judge to decide on human rights violations in Sri Lanka?

The constitutional changes in Sri Lanka for devolution of power need to consider such background in the world scenario and need to take the issue of genuine devolution of power and not devolution of power to politicians that can be played into the hands of the regional and global players in the contemporary Sri Lanka.

Thank you.

**Constitutional Reforms in the Post Conflict Sri Lanka: *Problems and Issues of Sri Lanka's Constitutional Changes***

*Mr. Mohan Peiris, Attorney General*

Dr. Sarath Amunugama, Senior Minister of International Trade Development, Hon. Champika Ranawake, Minister of Power and Energy, Mr. Lalith Weeratunga, Secretary to the President, Brigadier Lal Gunasekera, Deputy Commandant, Gen. Sir John Kotelawala Defence University, Dr. Rohan Gunaratne, Other Distinguished Guests, Officers, and Ladies and Gentlemen.

I am not sure whether I could continue to excite you as Mr. Gomin Dayasiri did. Certainly, I will endeavor to make it interesting for a discussion this afternoon. History informs us that the debate on constitutional changes in a post-conflict scenario needs more attention. I would perhaps join issue with the idea that constitutional changes were the panacea for all ills of the day.

We have had eighteen amendments to our Constitution which would become nearly a periodical if we do not stop. But practically nothing seems to have changed. You cannot indulge in most serious jurisprudential gymnastics or perhaps Constitutional Jurisprudence without winning the hearts and minds of people. Constitutions are not meant for politicians or lawyers or judges to play on as a hobby. Constitution grows with time. There is no magic in that word. It grows from within us; from our own soil.

How do we give life to that Constitution? It will be a dead Constitution if it does not grow. Eighteen amendments plus of a Constitution have no results much if it is not alive. What has actually gone wrong is that we do not ourselves give life to the Constitution. We read the Constitution. But, practically, we do not get involved in that process. It is my submission that a debate on constitutional changes is actually a prerequisite. So there has been a constant clamor for constitutional change.

What I propose today is to sensitize you on some issues which are engaging both local and international community and opinion makers with regard to Constitutions. Let me give you a little background on the issues. I would like to talk to you very briefly about the Thirteenth Amendment to the Constitution because there are so many misgivings about it. People talk about the Thirteenth Amendment and read many things about the Thirteenth Amendment without perhaps understanding the substance of it.

Ladies and gentleman, you will remember as a matter of history that Legal Counsels argued on behalf of a large number of petitioners before the Supreme Court that the amendment required the peoples' approval at a Referendum. The Attorney General and lawyers on behalf of the President strenuously argued that it did not require a Referendum. Out of nine judges, five, including the Chief Justice, held the view that no Referendum was required for the Thirteenth Amendment to the Constitution and the Provincial Councils Bill. The remaining judge held the view that the two Bills would require a Referendum unless two clauses were amended.

As such, that judgment became a hallmark. It was virtually on a question of Constitutional Law: the question of devolution. The main argument in that case was that the Bill was inconsistent with Article 2 of the Constitution that proclaims Sri Lanka to be a unitary state. Now why I think it is important is that the terms unitary state and sovereign state are very passionate and sentimental to read and listen. Sri Lanka is to be a unitary state. Simply, any change in the unitary status would require the consent of the people at a Referendum. The unitariness is fundamental in the constitutional process.

The opinion of the majority of the Court, as set out by the then Chief Justice Sharvananda, the term unitary is used in contradiction to the term federal. Federal means an association of semi-autonomous units or a conglomerate of semi-autonomous units with a distribution of sovereign powers between the units and the centre; not decentralization, but a distribution of sovereignty between the centre and the provinces. In a unitary state, the Chief Justice said that the national government or the centre is legally supreme over all other levels of government. In a unitary state the sovereignty is undivided. Let us try to understand what sovereignty is. It means undivided, or in other words Ladies and Gentleman, that the powers of the central government are unrestricted. It means not being hampered or there is no impediment to that power. There are two essential qualities: the supremacy of the central Parliament and the absence of subsidiary sovereign bodies.

Now let us look at the words subsidiary legislative and sovereign bodies and law making. Subsidiary law making bodies are not sovereign bodies. Sovereign bodies are equal. A subsidiary law making body can exist and can be abolished at the discretion of the central authority. In other words the central government can at any time dissolve these subsidiary law making bodies, if it so desires.

In India the powers of government are divided between the centre and the states. This is important. Those two units are not subordinate to one another: They are equal. It is not like the center and the provinces. They are co-ordinate and independent within the respective spheres and within the

parameters of powers devolved. So you can see how the Supreme Court looked at the vesting of the legislative, executive and judicial powers at the provincial level in Sri Lanka.

I hope that I am not boring you with this jurisprudential stuff but it is something that we need to understand, and perhaps it is not difficult to understand. The Supreme Court simply said that there was no alienation of legislative, executive and judicial power when devolution took place through the Thirteenth Amendment. Accordingly, Sri Lanka continued to be a unitary state and all that the Thirteenth Amendment did was to devolve power to subordinate bodies such as Provincial Councils. That was how the Supreme Court actually got around the problem. The 1978 Constitution retained, therefore, its unitary character, but with devolved power or decentralized power.

There are so many features in the Thirteenth Amendment that demonstrate the subordinate nature or the inferior nature of the Provincial Councils. For example, Ladies and Gentlemen, let us very quickly take the Office of the Governor. The Governor is appointed, as you know, by the Presidential warrant, and he holds office during the pleasure of the President. The President can remove the Governor from office at any time. Under Article 154 the President is empowered to take back, by proclamation, the executive power and to assume all the functions of the Governor and also to assume all the functions of the administration of a Province. It indicates that the Governor functions as a delegate of the President and exercises executive powers delegated by the central executive authority.

Within the time limit let me tell you what the Supreme Court again said about the legislative power of Provincial Councils. It said, with regard to legislative power, there is a sphere of competence defined by the two bills both with respect to the matters set out in the Provincial Council List and the matters set out in the Concurrent List within which the Provincial Councils can function. Their legislative competence is not exclusive in character but is subordinate to that of the Central Parliament. Provincial Council List contains certain subjects which the Provincial Councils can deal within the parameters laid down. There are lots of contentions with regard to certain powers, such as land and Police powers, but that is another matter at which jurists can look.

Article 154G of the Constitution conserves the sovereignty of the Parliament in the legislative field. Parliament can amend or repeal the provisions relating to the legislative authority of Provincial Councils. In other words Parliament has the ultimate power. A Provincial Council is simply a dependent for its continuity of existence and the legislative competence on Parliament. Therefore, the



court went on to say that Article 154 did not limit the sovereign power of Parliament. What the court emphasized was the fact that Parliament never lost its sovereignty or any of the power it had.

The majority judgment also interestingly cited the Article 27 (4) of the Directive Principles of State Policy. Although, they are not justifiable, it is a very important aspect of Constitutional Law. The Supreme Court said that it is a directive principle that the state shall strengthen and broaden the democratic structures of the government and the democratic rights of the people by decentralizing the administration and by affording all possible opportunities to the people to participate at every level of national life. The central government established the Provincial Councils to bring those structures closer to home by bringing up the things to your door step. The wisdom of that is something that the history will perhaps tell, as that may be what the Provincial Councils simply intended to do. The Directive Principles of State Policy, as I told you, are not enforceable. Unlike Fundamental Rights they are not enforceable in a court of law, but the court was of the view that that short comings did not detract from their value as projecting the aims and aspirations of a democratic government.

Now I will touch upon devolution very quickly. Devolution continues to be of relevance and the concept of devolution is used to mean delegation of central government powers without the relinquishment of the supremacy of Parliament. Finally it would appear when one reads through the whole constitutional mechanism of the Thirteenth Amendment that we ended up with perhaps a hybrid between devolution (in terms of Provincial Councils) and a unitary state, or a little bit of federalism. That was the construct the court entertained by pronouncing that while preserving the unitary status, the government permitted certain subjects to be devolved to the Provinces.

The Supreme Court went on to say that healthy democracy must develop and adapt itself to changing circumstances or the activities of central government, including substantial powers and functions should be exercised at a level closer to the people. As I said earlier it brought the government to the door steps of the people.

Ladies and Gentlemen, I think my time is up, but having said that, can I just very quickly place before you some future amendments that I think might be relevant perhaps to think about as we go on.

Let me tell you very briefly about something called the National Action Plan on Human Rights. A draft National Action Plan for the Protection and Promotion of Human Rights is before the Cabinet of Ministers, and it is the product of many months of consultation and cooperation involving both government and civil society. The government should be proud to have followed a participatory root;

there was a lot of consultation and a lot of participation by civil society in developing the National Action Plan on Human Rights that focuses on the protection and promotion of Human Rights. It firmly believes that the process of developing a plan is as important as its outcome. Under a Presidential Directive, a Cabinet subcommittee, assisted by the Attorney General's Department, has been appointed to fine tune this and probably we will see it in Parliament soon.

One little question that I would like to pose to you. Should there be constitutional review of legislation? I say that for this reason, the only challenge that a citizen can mount against a piece of law is at the Bill stage *i.e.* within 7 days of a Bill being presented to Parliament. You have this small window of opportunity of review for going before the Supreme Court. Once a Bill receives the assent of Parliament and the Speaker's seal it becomes law. You cannot question that law. I leave this question open: should a law be brought into operation be able to be tested at a later stage for inconsistencies with Fundamental Rights? I leave that for future thought.

If you take England, a law can be challenged as offensive to the Human Rights Act or to the European Convention on Human Rights. Any person in Europe today can challenge a law at any point of time on an inconsistency. As our Constitution currently stands, an offensive law may be reprehensive and harsh, but no action can be taken in any court of law to declare it null and void because Article 16 declares all existing law written or unwritten will be valid and operative despite any inconsistency. Article 80 (3) places a bar on any court to scrutinize a law; that is why our archaic Army Act, our archaic Navy Act and perhaps our archaic Air Force Act cannot be challenged. That is what the British left with us, and we have not done anything about it, and so it still remains to be as law unchallenged and un-amended.

You can recall Mr. Felix Dias Bandaranayake, who actually tried to say that Parliament is supreme and whatever Parliament does is also supreme. This citation could reject the Theory of Separation of Powers. Nobody is higher than the elected representative of the people. Any person not elected by the people has no right to throw out the decision of the people. He used the hypothesis of the people. The hypothetical argument was that the people are supreme. Whatever people said through their representatives was the gospel truth and that was right. Therefore, he said that Parliament can never be wrong.

Then, there is the issue of right to life. It has not specifically been provided for in the Constitution. Our Supreme Court has declared that it is inherently protected. It is inherently protected by the other

rights that have been enshrined as Fundamental Rights. But, both at domestic and international forums, there had been a demand that the Constitution must expressly provide for the right to life. If that is the case should we also declare that there will be no death penalty in the country given the fact that no person has been executed? There has been a moratorium on death penalty since 1978, and in 2008/2007 Sri Lanka voted at the United Nations in favor of a resolution calling for a moratorium on executions as a step towards the ultimate abolishing of the death penalty. So, should we then visit this issue of incorporating in our Constitution a definite specific provision with a right to life?

Finally, you would be happy to know that we are drafting an amendment to the Criminal Procedure Code. I am careful here because this is a legislation that might get shot down. Perhaps we are trying to depart from the age old principle, which you would probably know that a statement made to a Police Officer under the present law is inadmissible as evidence. You can tell a Police Officer that you murdered someone, and there is nothing he can do about it. That is our law and that what the British left with us. The British changed that 30 years ago but they did not tell us; so we go along happily struggling on with this piece of legislation and many a criminals have actually got the better of it.

Quite apart from that there is another very serious repercussion as a result of a statement made to a Police Officer. Not only in this country, but even in Britain, the Police have a tendency to use all kinds of methods to elicit information and those are not methods that could be acceptable by the law. That can be avoided if a statement made to a Police Officer is admitted. And that is what we are considering at the moment. Whether we should admit statements made to a Police Officer as material. By and large that is something that we are looking at. But let me tell you this. If a statement made to a Police Officer is good to be made admissible it should be permitted to be made in the presence of an Attorney at Law so that no torture or no coercive method can be adopted by the Police in the eliciting that material. That something we are changing and that constitutional provision is something that actually has to be adopted. That something I say is really worthy of thought.

Ladies and Gentleman, may I say this as the final analysis. Constitutions, you can change them, amend them, or do whatever you like. But until such time the people give life to something that they really want to, changing the constitutional model is really playing around with the Constitutions. I ask will it end there tomorrow. Is it going to be a better Sri Lanka? Are we accommodating our Tamil brethren? Are we ready for that? Are we willing to make them feel that they belong to us? Are we

going to do it in the redevelopment phase or in the reconciliation phase? Are we genuinely committed to it?

You can write Constitutions as long as you like, with the best of constitutional lawyers. But many Constitutions failed, because those Constitutions never came from within the hearts of the people. So, in my final analysis may I also say that, the Armed Forces have done a great job for this country and I think that each one of us should be thankful you. Having said that remember that you have another role to play, and that is to ensure that all our people irrespective of the ethnicity, irrespective of religious divisions, irrespective of whom they are and what they are entitled to live this country in dignity as equals and that my simple request to you is to think about it. Do you really need a constitutional change or a change in each one of our hearts?

Thank you very much!

**HUMANITIES, INTERNATIONAL RELATIONS AND LAW**

**TECHNICAL SESSION I**

CHAired BY R ADM SHaweendra FERNANDO

DEPUTY SOLICITOR GENERAL

### **Summary**

*Looking at the legal aspects, a presentation on “Efficient Paperless Property Transaction Model for Sri Lanka” by Kumudumalee Munasinghe held that the proposed system would help to minimize or completely avoid the common technical, procedural and documentation errors that occur in current domestic property registration practices. Therefore, she concludes that it is essential to establish a standardized legal framework to ensure efficiency and security of the system. Such a framework would provide for methodologies of electronic transactions, transparency of electronic property deals, protection of parties, measures to capture forgeries and punishments for breaches of law. The United Kingdom, Canada and New Zealand are some foreign jurisdictions with highly developed electronic land information management systems from which Sri Lanka could gain inspiration. However, the author agreed that there is a need for further studies to filter the idea before concluding the final suggestions.*

*The paper on “An Analysis of Successful Defence Concepts Adopted in the Kandyan Kingdom” by Maj. S Molligoda and Col. R W Seneviratne gave reference to the Kandyan Kingdoms and presented the view that Sri Lanka encounters similar obstacles that require military intervention. The paper put forward the idea that the same ground and social systems during that period need to be adopted in facing the challenges in the contemporary Sri Lanka. According to the study, there are three arenas for war: deterrence, conventional war and urban/rural guerrilla warfare. The researchers suggest developing strategic alliances, developing morally sound, mentally strong and physically skilled citizenry and creating a large and economical reserve force. A strong military capability in unconventional warfare, thorough research and modern military technology and methodology of potential enemies would make the ground untenable to enemy.*

*An Anthropological Study on “Caste Based Marginalization in Selected Parayar Communities in Baticaloa” by G. Vickneswaran found that structural violence is inimical to the attainment of peace and is also the basis for recurrence of social conflict. Caste based marginalization is a form of structural violence and manifests itself as a form of community and cultural insecurity. According to the study traditional caste based obligations of drum beating and dancing are considered as a cultural feature of the Parayar community, a Tamil ethnic group, by other castes. There has been a trend among the Parayar communities to abandon caste based obligatory cultural practices as a strategic action to escape from their lower status. This trend is explicit in the radical actions by the youth, and it has caused conflict within the particular caste since conservative members wish to preserve traditional values.*

*In this technical session there was a presentation on the “Local Government Administration and the Principle of Democracy” by SM Aliff and MAM Fowsar. According to the study the local governments were marginalized because of the lack of attention by the central government and lack of vigilance of the public eye. The study tried to convince the audience how local governments could run its institutions with the protection of local democracy.*

*A Study on Primary School Students’ Errors on Word Problems by T Mukunthan defined word problems through a mathematical formula that is stated in words rather than in symbols. It was based on Newman’s (1977) analysis where the errors made by students in solving word problems and developed a model to classify such errors, called Newman Error Analysis (NEA) Model and it postulates a sequence of steps i.e. Reading – Comprehension – Transformation – Process – Encoding. This study sought to identify the reasons for students’ weaknesses in word problems using a sample of primary school students as a sample. The findings indicated that more than three quarters of students made errors in the first three stages, i.e. before performing calculations, the reason being the lack of skills in the first language.*

## AN EFFICIENT AND PAPERLESS PROPERTY TRANSACTIONS MODEL FOR SRI LANKA

*Kumudumalee Munasinghe*\*<sup>121</sup>

### Introduction

It is observed that Sri Lanka has had great traditional practices and customs on property/land registration which have been developed uninterruptedly by Buddhist monks, Kings and prestigious civil society members blessed by the Governors.<sup>122</sup> The English rulers introduced many rules and regulations relating to property/land registration and development of the country.

In the period of Sir Fredrick North the Proclamation of 1<sup>st</sup> of March 1809 required establishing a system of land registering for the respective districts. As Professor G. L. Peries quoted, this register was initialized to “draw up, make out and enroll title deeds dealing with landsheld under any tenure from the Crown, as also all the manners of transfer, mortgage bonds, assignments and all other deeds affecting land and movable property.”<sup>123</sup> Moreover, it was ordered to follow the formalities required by the Dutch on registration process. Subsequently, many proclamations were made in 1817, 1863, 1877 etc. All the regulations emphasized that land/property transactions should be made in writing on stamped ollas, paper or parchment.

Currently Sri Lanka practices two legally established paper based systems on property/land registration, namely registration of documents and registration of titles. Most of the developed countries like United Kingdom, Canada and Australia etc. practice the system in digital/electronic mode.

### Objective

This study is to understand the current E Dealings on property/land in other jurisdictions and develop a suitable Sri Lankan electronic transactions and management system or framework for properties.

### Methodology

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<sup>122</sup> V. Jayawardene, *The Law relating to Registration of Deeds*, i-xix pp

<sup>123</sup> Prof. G. L. Peiris, *The Law of Property in Sri Lanka*, Volume 1



The research is highly based on secondary sources such as books, internet, journals, international legal instruments and customs/practices.

## **Discussion and Data Analysis**

### **Current property/land registration practice in Sri Lanka**

The Deed system is implemented under the provisions of the Registration of Documents Ordinance No. 08 of 1863. As mentioned earlier currently there are two systems on property/land registration practice in Sri Lanka. Registration of documents is governed by the Registration of Documents Ordinance No 23 of 1927.

Preamble of the Ordinance states that, it is an Ordinance to amend and consolidate the law relating to the registration of documents. This registration system is the most available practice in the country. The registration procedure is as follows.

Registration of an instrument shall be effected by entering the prescribed particulars in the proper folio<sup>124</sup>. Every registrar shall prepare and keep the prescribed books for the registration of instruments allotting to each book or many volumes, a defined division of his province or district.<sup>125</sup>

Every instrument presented for the registration shall contain, an accurate and clear description of the land affected, its boundaries, extent, the district, the village, pattu, korale or other division of the district in which the land is situated.<sup>126</sup>

There shall be type written or written in ink at the head of every document presented for registration a reference to the volume and folio in which some earlier instruments relating to the same land is restarted if such reference is known to the notary who prepared the instrument.<sup>127</sup>

Advantages of registration of documents are that registration establishes proof of ownership and produces an easy-to-read document reflecting the contents of all the paper title deeds. This simplifies conveyance, making transactions easier and potentially less costly for all involved.<sup>128</sup>

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<sup>124</sup> Sec 14,15

<sup>125</sup> Sec 12

<sup>126</sup> Sec13

<sup>127</sup> Sec 7,Registration of Titles Act No. 21 of 1998

<sup>128</sup> [http://en.wikipedia.org/wiki/HM\\_Land\\_Registry](http://en.wikipedia.org/wiki/HM_Land_Registry)

Disadvantages of registration of documents are that the possibilities of registration in wrong folios and possibility to misplaced entry volumes, and if so no previous records on the land/property can be obtained to prove the title of the owner.

The other registration method is registration of title, governed by the Registration of Title Act No 21 of 1998. This is an Act to make provisions for the investigation and registration of titles to a land parcel, for the regulation of transactions relating to a land parcel so registered and for the matters connected therewith or incidental thereto.

The reports of the Land Commissions held in 1927, 1955, and 1985, also recommended a modernized procedure to be applied which paved the way to implement the Title Registration.<sup>129</sup>

What does it mean by a land parcel? It is an area of land separately delineated on the cadastral map.<sup>130</sup>

The Commissioner of Title Settlement may refer any dispute pertaining to any land parcel for settlement by the conciliation board appointed for the area in which such land is situated. A conciliation board shall assist any person having an interest in land situated in the area for which such board is appointed to resolve any dispute.

The registration of title to every land parcel under the Act shall be in accordance with the cadastral map prepared for the purpose. The Commissioner of Title Settlement shall cause an investigation to be conducted in order to determine the genuineness or otherwise of claims made in response to a notice. Finally, if the title seems clear, the state offers the Certificate of the Title to the owner of the parcel.<sup>131</sup>

### **Sri Lankan technological approach for land/property registration**

*Bim Saviya* Project was implemented to expedite the operation of the Act as a national programme in 2007 under the *Mahinda Chinthana*<sup>132</sup> and it is monitored by the Ministry of Land and Land Development. The vision of the project is to strengthen the ownership of the land and to make land strengthen to the nation.

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<sup>129</sup> Id Sec 8,9

<sup>130</sup> Sec 75

<sup>131</sup> Sec 37

<sup>132</sup> [www.president.gov.lk/pdfs/MahindaChinthanaEnglish.pdf](http://www.president.gov.lk/pdfs/MahindaChinthanaEnglish.pdf)

Objectives of the *Bim Saviya* Project are to;

- \*Introduce title registration in place of deed registration practiced at present.
- \*Settle or make arrangements to settle the ownership of the lands which are presently unsettled.
- \*Establish a Digital Land Information System.<sup>133</sup>

It seems that Sri Lanka has taken necessary steps to initiate a technological approach for a future land registration management system. The following paragraph on the future Sri Lankan e-dealing and land/property management system is quoted from official web site of Ministry of Land and Land Development.

“The advantage given to the land owner as well as the country as a whole through the clear title, which also paves the way for the country's development, is unreserved. One of the prominent advantages is that every inch of the island is surveyed and mapped while the country possesses a database which would lead to forge ahead with country's development plans in seeking suitable venues to implement them.

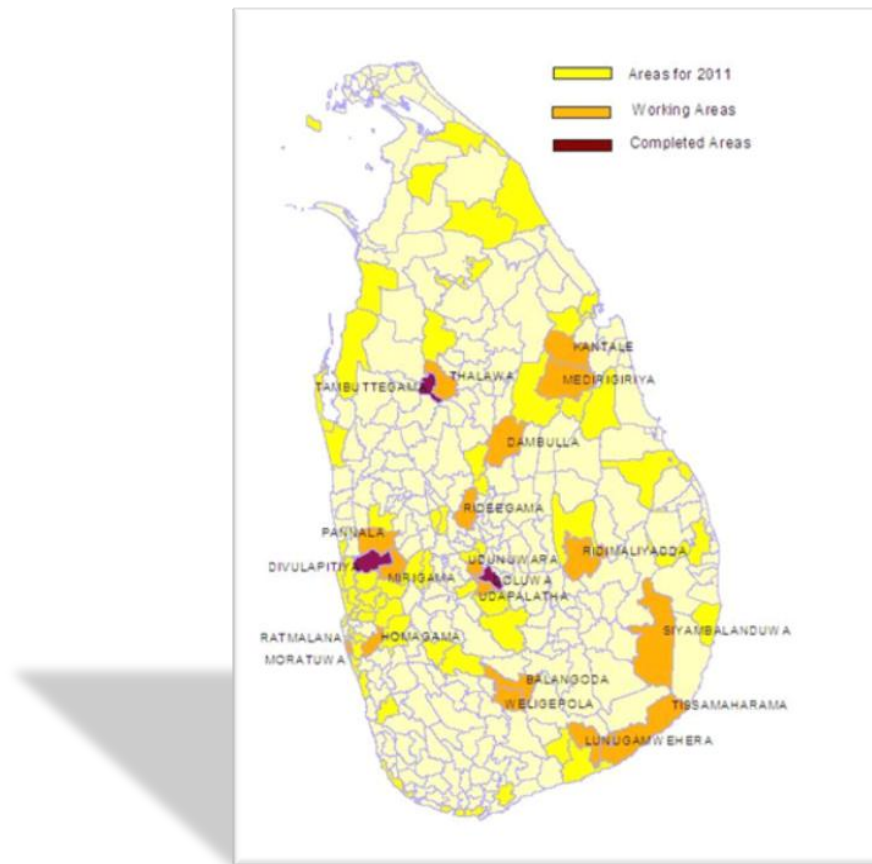
We have experienced some development projects which collapsed due to the lack of such a collection of detailed database. Accordingly, this system would prevent such mistakes and every inch of the land would become productive, while the land market would become active with the reliability grown in transactions.

The land owners would get the opportunity to invest their lands as the transactions with the banks and other financial institutions become simple and reliable. State institutions could launch their development plans accurately. Thus this Land Title Registration Programme implemented with frequently updated database, shoulders country's development through ensuring the Title of every inch of land.<sup>134</sup>”

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<sup>133</sup> [www.landmin.gov.lk](http://www.landmin.gov.lk)

<sup>134</sup> [www.bimsaviya.gov.lk](http://www.bimsaviya.gov.lk)



### Current Progress of BimSaviya Project

#### Key elements of an electronic transaction and registration management system for lands/property: Developed countries prospective

Some of the states in Canada (since 2004), Australia -Victoria (since 2002), United Kingdom (since 2002) and New Zealand (since 2002) are the countries where electronic transaction and registration management systems are practicing subject to minor framework revisions.

Canada-Ontario system includes an automated land registration database and a web based gateway for registration. British Columbia system enables authorized users to electronically submit Land Title documents for registration. Creating and lodging an electronic dealing in New Zealand system, called an e-Dealing, includes the following steps: create dealing, prepare, certify and sign, settle and release, submit and register. Moreover Land Transfer Act 1952 (NZ) was amended to support the introduction of electronic lodgment for title transactions in 2002. Land Registration Act 2002 (UK) introduced providing electronic contracts of sale and electronic transfer and mortgage deeds, eliminated the registration gap, and handled chain sales transparently.

Generally, an electronic transaction and registration management system for lands/property is initialized, financially sponsored and regularly monitored by the respective state. The key soft wares for the system are developed by reputed professional software developing bodies. Mostly the websites are hosted either by the government or a third party provider.

Canada-Ontario system initialized in 1980 s by the Ministry of Consumer and Commercial Relations (MCCR) developed POLARIS (the Province of Ontario Land Registration Information System) through a software called “Teranet” an electronic land registration systems.<sup>135</sup> Teraview Inc<sup>136</sup> developed Teranet to fulfill the requirements of MCCR. Section 19 of the Land Registration Reform Act RSO 1990 provides: "the Minister responsible for the administration of this Act may by regulation designate all or any part of land that has been designated under Part II as: (a) an area in which documents may be registered in either an electronic format or a written form; (b) an area in which documents must be registered in both an electronic format and a written form; or (c) an area in which documents must be registered in an electronic format alone".

Section 21 Land Registration Reform Act RSO 1990: "Despite section 2 of the Statute of Frauds Act, section 9 of the Conveyancing and Law of Property Act or a provision in any other statute or any rule of law, an electronic document that creates, transfers or otherwise disposes of an estate or interest in land is not required to be in writing or to be signed by the parties and has the same effect for all purposes as a document that is in writing and is signed by the parties" and Section 22: "If a document is registered in an electronic format and the document exists in a written form that is not a printed copy of the electronic document, the electronic document or a printed copy of the electronic document prevails over the written form of the document in the event of a conflict".

In British Colombia Electronic Filing System (EFS)<sup>137</sup> was introduced on 1 April, 2004 runs through BC Online accounts. When it comes to New Zealand, the system is called Landonline,<sup>138</sup> administered by Land Information New Zealand (LINZ). The system contains electronic title records, instruments and plans. “Land online” administrated by Land Information NZ Institute After hosting the site, Individuals or/and firms/establishments are welcome to create access accounts to the web site by

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<sup>135</sup> Teranet's website is <http://www.teranet.ca>

<sup>136</sup> Teraview's website is <http://www.teraview.ca>

<sup>137</sup> [http://srmwww.gov.bc.ca/landtitle/EFS\\_web\\_site/index.htm](http://srmwww.gov.bc.ca/landtitle/EFS_web_site/index.htm)

<sup>138</sup> J Greenwood & T Jones, 'Automation of the Register: Issues impacting on the integrity of title', Taking Torrens into the 21st Century: A conference to mark the 50th anniversary of the Land Transfer Act 1952, Faculty of Law, University of Auckland, 19-21 March 2003.

registration. In Canada-Ontario registration is open to Lawyers, Bankers, Notaries, and general public.

The user must identify the type of the transaction/documentation that they want to create or register. Information such as the location, current owner of the property, earlier transactions, the nature of the transactions, legal descriptions on the subject matter etc. are automatically updated to the database.

After preparing the relevant documents on the deal, the lawyer makes it available electronically to the Lawyer of the representing party. Once the authority of the client is obtained the information is certified as complete by the Lawyer for each party by attaching their electronic signatures.

All title office fees and stamp duty are paid electronically from the nominated accounts. The Lawyer, who has prepared the document, must sign the document for release. Then the digital system allows updating the deal.<sup>139</sup>

### **Advantages of using an electronic transaction and registration management system for Title Registration**

It is clear that, using an electronic transaction and registration management system is more advanced, comparing to current methods of registration of documents, registration of title and property transactions systems. In future after all lands of the country been surveyed and registered under the Registration of Title Act, this technical approach will be more effective way for all citizens as it may a method of certainty and integrity of title.

In such a system, the land title registration is based on state guaranteed certificate and it may be functioned as a central land/title register under the observation of the authorized Ministry. Then title registration and property/land transactions may be efficient. It may also be important because the data base or the e model will carry latest updates, and once it is started to use, it will also seems simple rather than manual entry dealings.

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<sup>139</sup>Clicking on the LOCK button on the form will lock key fields on the form and a unique number will be inserted at the top of the form. Locking the document provides an assurance to the lawyers that the content of these key fields cannot be changed without their knowledge. The purpose of the unique identifier is to help lawyers and notaries keep track of changes to a form by providing a new number each the form is locked and unlocked. Thus changes to critical data can be tracked and different versions of a form are not confused. Clicking on the UNLOCK button on a locked form unlocks the frozen data and deletes the unique identifier.

*Issues identified in foreign electronic transaction and registration management systems; Lessons for future Sri Lankan unique electronic transaction and registration management system for properties/lands*

a) Enhancing electronic registry access

Purpose of establishing an electronic transaction and registration management system for properties is to correct the current system of registration, enhance general public acknowledgement of the property transactions of the country and discourage documentary forgery practices etc. In that sense, majority should have to have opportunity to access the system. It is important to consider whether it can be done in present conditions according to the requirements of the system.

Following examples will lead to analyze the situations of electronic registry access limitations in the foreign jurisdictions.

In New Zealand an individual user need have a digital certificate to log into the site, Land online offered by the government whereas a legal firm should obtain a permit license for the same purpose.<sup>140</sup> And also such a firm should consist with the people who have digital certificate to enter into the site.<sup>141</sup>

In Canada- Ontario user and Teranet Company enter into an agreement which provides user a personal security package (PSP),<sup>142</sup> a personal security disk (floppy diskette with encrypted information) and a pass phrase is also required to access the system.<sup>143</sup>

In British Colombia BC online has its own restrictions in accession but e-documents can be registered if a Lawyer signed on the document using Juricert signature, the sign which required by the system. It seems that here the importance of the signature comes at the point of the signing and it does not required to log into the system.

<sup>140</sup> <http://www.landonline.govt.nz/content/general/licenses.asp>

<sup>141</sup> [http://www.teraview.ca/ereg/ereg\\_PSP.html](http://www.teraview.ca/ereg/ereg_PSP.html).

<sup>142</sup> Boyle, K "An Introduction to Gatekeeper: the Government's Public Key Infrastructure" (2001) 11 (1) Journal of Law and Information Science 38, 40

<sup>143</sup> A prospective Teraview user has to complete 4 forms: (1) Licence to use Teraview software; (2) form to obtain PSP; (3) Deposit Account Payment Plan and (4) Electronic Registration Bank Account: <http://www.teraview.ca/purchase/purchase.html>

In Australia the initial stage, is restricted only for authorized users such as Lawyers, financial institutions, registered conveyancers and land agents. Also the state has introduced its unique digital signature system for the purpose of minimizing fraudulent practices related to the property.<sup>144</sup>

b) Use of the digital signature -

Use of the digital signature is important in the context of e lodgment, which does a great job in discouraging e forgeries relating to property deals and registering process. These signatures are protected by the system.

Types of signatures used in Australia are, using a manuscript signature which is scanned as an image in to a word processing file and typing a name at the bottom of an e mail or a document. These have dual functions as public and private keys. Public keys are held in digital certificates.

A digital certificate is a file on a computer system. Private keys may be held in files on computers, on discs or smart cards. The keys will be two large prime numbers<sup>145</sup> which are related to each other mathematically but it will not be possible to determine the private key by simply knowing the public key.

The purpose of requiring instruments to be signed using a PKI digital certificate is twofold:

- o Protection of the integrity of the document (it will be obvious to the receiver of the document whether it has been tampered with after signing), and
- o Identification of the party submitting the document for registration. It is anticipated that under this type of system witnessing of instruments would not be required.<sup>146</sup>

In New Zealand, a person's identity must be provided in one of the 3 forms before the digital certificate is issued. Those are Passport, Driver's License and Firearm License certification. Further, these should be certified by a solicitor, court registrar, justice of the peace or a notary public or any person authorized to take declarations pursuant to the Oaths and Declarations Act 1957.

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<sup>144</sup> S Christensen & A Stickley, 'Electronic title in the new millennium' (2000) Flinders Journal of Law Reform 209 which discusses the process of registration under the Land Title Act 1994

<sup>145</sup> A. McCullagh, "Legal Aspects of Electronic Contracts and Digital Signatures" in Going Digital 2000. Fitzgerald A, Fitzgerald B, Cifuentes C, Cook P (ed), Prospect Media, St Leonards N.S.W, 2000 at 195.



As mentioned above, in Ontario, each one must obtain unique security package named PSP, by filling a form of Teranet and being verified the identity of the applicant. The PSP is able to be used to sign and encrypt documents on the Teraview site. The personal security disk contains information unique to each user that is used to prepare documents, sign statements of law and electronically register documents.<sup>147</sup>

The situation differs when it comes to British Colombia. Here Lawyers must obtain Juricert authenticated certificate for signing electronic instruments.<sup>148</sup> To do this, lawyers must first register with Juricert.<sup>149</sup> When an e version of a transaction sends for the registration, then the information system automatically compare the signature with the Juricert software. If there is no mismatch then only system supposes to up load the information on the prescribed transaction.

In Canada following sources are accepted to prove identity of the user. Accepted primary ID: valid Canadian's drivers licence, or valid Canadian passport (photo ID required); accepted secondary ID: valid major credit card & expiry date, bank card, social insurance card, birth certificate, either of the photo ID items noted previously, not used as primary ID, which cannot be accepted: Retail credit cards; Health card Accepted designated representatives: lawyer; notary public; designated land registry office (LRO) representative; designated Teranet representative; financial institution signing officer.

c) enhancing computer literacy of the Legal Professionals -

If this will be the expecting situation, it is essential to enhance the computer literacy of the Legal Professionals. It must be initialized by the government authorities then it may utilize to professional bodies or institutes. The e education should be accordance with the basic requirements or functions of the future e transaction and management system.

If this community does not have any technical background for handle or operate the fore coming, even it will cause many social problems which may lead to violate the fundamental rights of the citizens.

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<sup>147</sup>Teraview, 'Understanding how the personal information your provide in the Personal Security Licence Application is used and protected', <http://www.teraview.ca/ereg/downloads/pslbrochurepdf.pdf>

<sup>148</sup>Juricert site to register for digital credentials' (2004) No 2 March-April Benchers' Bulletin

<sup>149</sup>Juricert was founded by the Law Society of British Columbia. Information obtained from Law Society of British Columbia

As following examples, Lawyers have previously been held liable in negligence to mortgagee for failing to assure the identity of mortgagors:

In *Eadev Vogiazopoulos*,<sup>150</sup> husband forged wife's signature on the mortgage. In *Frazer v Walker*, wife forged husband's signature on the mortgage and in *Young v Hoger*<sup>151</sup> where recently found, a daughter with mother's assistance, forged father's signature on the mortgage.

The legal community must have to be very concern on their legal duties, when such e system on properties/land is introduced. Also they must acquire essentials of information communication technology.

Then is it prime duty of the Sri Lankan Government to take necessary steps to enhance and standardize IT essential skills of legal professional before state move into such an advanced system.

#### d) Special concern one - forgeries -

R. Massey stated the importance of identification of electronic medium threats as follows. "The increase and proliferation of identity theft is directly linked to the growth of internet use and corporate reliance on the use of electronic data storage systems": and "The growing concern of e-identity theft"<sup>152</sup> Individuals who use electronic services either actively, by inputting their details on the internet, or passively, by using electronic services that contain their details such as bank cards, supermarket loyalty cards or library membership cards, are exposing themselves to the threat of a criminal anywhere in the world stealing their identity by means of a computer network".

As above mentioned it should be the prime concern of the government to identify and monitor general forgeries of such information management and land/property transaction models, and develop an appropriate legal framework to discourage or minimize electronics forgeries in the entire transaction and management stages.

## Conclusion

<sup>150</sup> [1993] 3 VR 889, Husband had responsibility of the business. He forged his wife's signature on the mortgage. Solicitor acting for husband and wife did not consult the wife to ensure that the mortgage documents were duly executed by her

<sup>151</sup> [2001] QSC 455, Daughter forged her parents' signature, the mother assisted with the forgery. Solicitor did not have any direct dealing with the father, dispensed with the standard verification procedures to ensure that the signatures on the mortgage instrument were genuine. *Grgic v Australian and New Zealand Banking Group Ltd* (1994) 33 NSWLR 202, Son had the certificate of title and other documents relating to the property. Mother and son used another person to impersonate the father. The impersonator was able to produce the certificate of title and other documents. Bank prepared the mortgage document and the impersonator signed the document.

<sup>152</sup> (2003) 5 (9) Electronic Business Law 10

Establishing a future Sri Lankan unique electronic transaction and registration management system for properties/lands is not an impossible task. But as we have discussed above, it should be carefully designed and regular monitored by the relevant authorities. Then, it will lead Sri Lanka to have a developed an e transaction and registration management system for properties/lands such as in developed countries.

## A Study on Students' Errors on Word Problems

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### Introduction

Word problem is defined as 'A Mathematical problem that is stated in words rather than in symbols or as an equation' (Mathematics Thesaurus). Sri Lankan Primary Mathematics syllabi consist of six main topics – Numbers, Mathematical Operations, Measurement, Money, Space and Shapes, and Data Handling. All the above topics contain word problems. These word problems are introduced to the students from the primary level. Most of the students find word problems challenging. There are several points at which students fail to solve the problem correctly.

Newman (1977) analysed the errors made by the students when solving word problems. She developed a model to classify errors. She identified a sequence of steps in the error analysis model. This model is called as 'Newman's Error Analysis Model' (NEA model). The sequence of steps the model postulate is;

Reading → Comprehension → Transformation → Process → Encoding

The steps are elaborated as:

- (i) **Reading abilities;** can the student actually decode the question? Does the child recognize the words or symbols within the question?
- (ii) **Comprehension:** once the student has decoded the words or symbols, can he or she understand the question
  - (a) In terms of general understanding related to mathematical topic and
  - (b) In terms of specific mathematical expressions and symbols?
- (iii) **Transformation:** Can the student choose an appropriate process or algorithm to solve the problem?
- (iv) **Process Skills:** Can the student accurately do the operation(s) he or she has selected at the transformation stage?
- (v) **Encoding:** Can the student relate his or her answer back to original question to record the answer in appropriate form?

(Adapted from Dickson, Brown and Gibson, 1984)

Clements (1980) conducted a research using the Newman's Error Analysis Model (NEA) to analysis the data. He found that 66.67% of the errors made when solving the word problems occur at the Reading, Comprehension and Transformation stages (first three stages). That means before students perform any calculations. Nanayakkara (1993) conducted a study in Sri Lanka with Sinhala medium Grade 3 and 5 students. He also used NEA model to analyse the data and noted that 60.4% of the errors made when solving the problems are also related to the first three stages of NEA model. The results of these two studies indicated that more than 60% of the students made errors in performing any calculations.

Many researchers have studied the different levels of difficulty presented by the word problem (Carpenter and Moser 1982). Anghileri (2001) conducted a study in Holland and suggested that students should be introduced to real life problems.

There were many studies conducted related to primary grade students' errors on word problems worldwide. Nanayakkara's (1994) study is the only study conducted in Sri Lanka related to children. But that study considered only the Sinhala medium students in Sri Lanka. There are no studies in this field related to Tamil medium primary students. Therefore an urgent need exists for research on Students' errors on word problem in Primary school students who are in the Tamil medium schools.

### **Research Problem**

There are many studies highlighted that students are weak in solving the word problems compare to other topics in Primary mathematics.

National Institute of Education (NIE) carried a study in 394 schools in eight districts thought the country to examine the performance of Grade 5 students in Literacy and Numeracy- after five years of implementing educational reforms in 1998. This finding of this study indicated that, ' the most important sub skill Problem Solving in numeracy have not shown the expected improvement (Suranimala, Fernando 2004). The Sri Lankan context word Problems called as problem solving.

Although National Education Research and Evaluation Center (NEREC) of the Faculty of Education, University of Colombo carried out a study throughout the Island and noted that, students are very weak in solving Word problems.

Basic Education Sector Unit of the Provincial Education Departments of the Northern and Eastern Provinces carried out a study to identify the errors made by the Primary school children in all the districts in Northern and Eastern Provinces in Sri Lanka. The findings of this study noted that, students performance in mathematical Word Problem is very poor (Sibli, 2009)

In this back ground, this study attempts to find the reasons for this problem.

## Objectives

The objectives of this study are

- (i) to identifies the reasons for students' weakness in Word Problems
- (ii) to find the types of errors made when solving Word Problems by boys and girls
- (iii) to find the types of errors made when solving Word Problems by students of different grade levels

## Research Design

This is a descriptive study. Data collection in this study was mainly based on several students in two grade levels and at least a single measurement of performance for each individual within each grade level. Therefore this is a cross-sectional study design.

## Sample

Sample of this study is Grades 4 and 5 students (All students in these two classes) from a 1AB type Tamil medium school in Colombo Education Zone. The sample is given in Table 1

**Table 1: The Sample**

<b>Grades Gender</b>	<b>Grade 4</b>	<b>Grade 5</b>	<b>Total</b>
Boys	16	06	22
Girls	08	07	15
<b>Total</b>	<b>24</b>	<b>13</b>	<b>37</b>

## Research Instruments

A question paper containing 5 word problems covering all four mathematical operations was used for collection of data. This question paper was designed by the researcher.

## Data collection

After marking the answer scripts, the students who have made errors were interviewed to identify the reasons for making such errors. The data collected from the interview were further analysed to categorise the errors.

## Finding and Discussions

**Table 1**

<b>Questions Error Type</b>	<b>Q.1</b>		<b>Q.2</b>		<b>Q.3</b>		<b>Q.4</b>		<b>Q.5</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Reading	10	50	6	23.1	9	29.1	10	33.3	9	40.9
Comprehension	6	30	14	53.8	15	48.4	13	43.3	7	31.8
Transformation	0	0	2	7.7	0	0	4	13.3	3	13.6
Process	4	20	4	15.4	7	22.6	3	10	2	9.1
Encoding	0	0	0	0	0	0	0	0	1	4.5
<b>Total</b>	<b>20</b>	<b>100</b>	<b>26</b>	<b>100</b>	<b>31</b>	<b>100</b>	<b>30</b>	<b>100</b>	<b>22</b>	<b>100</b>

The English translation of the first Question is: 48 boys and 62 girls went to the playground to watch a sports meet. Find the total number of children who went to the playground.

The Tamil medium Question one contained two sentences. There were eight words in the first sentence and six words in the second sentence. The relevant mathematical operation was addition ( $62+48=$ ). That is adding two 2-digit numbers with carrying over. The table shows that 50% of the students surveyed could not read the question and 30% of the students did not comprehend the question. The long sentences may be the reason for these results. But Primary level mathematics text books contain similar word problems.

The English translation of the second question is: A bag contains 60 marbles of black and white colours. 37 marbles are black. Find the number of white marbles in that bag?

Question 2 also contained two sentences. There were 6 words in the first sentence and 9 words in the second sentence. Mathematical operation was subtraction ( $60 - 37 =$ ). Table above indicates that 53.8% of the students surveyed did not comprehend and 23.1% of the students could not read the question. This indicates that, students' language skills are very poor and it affects their mathematics learning.

The English translation of the third question is: Price of a coconut is Rs. 45.00 and a papaya is Rs. 35.00. If I gave Rs. 100.00 to the shop keeper find the balance?

Question 3 contains only one sentence with 16 words. But this question related to day to day life situation. There were two mathematical operations involved in this question. First operation was adding two 2-digits numbers ( $45.00 + 35.00 =$ ) and the second operation is subtracting the answer of the first operation from 100.00. The table indicated that 29.1%, 48.4% and 22.6% of the students surveyed achieved the Reading, Comprehension and Process levels respectively. It was noted that the error in processing level of the third question was higher than the other four question. This may be due to the multiple operations.

The English translation of the fourth question is: There were 4 students seated on a bench. How many children can sit on 8 similar benches?

Question 4 contained two sentences. There were four words in the first sentence and five words in the second sentence. The mathematical operation involved was multiplication ( $4 \times 8 =$ ). More than three quarter of the students surveyed faced problems in Reading and Comprehension. A significant number of students selected the mathematical operation addition instead of multiplication ( $4 + 8 = 12$ ). The students could not understand the question and just added the numbers.

The English translation of the fifth question is : 27 colour pencils were equally shared among 3 siblings. How many pencil did one sibling get?

Question 5 contained two sentences. First sentence contained 6 words and second sentence contained 5 words. The mathematical operation involved in the question was division ( $27/3 = 9$ ). The table indicated that more than 80% of the students faced difficulties in the first three stages.

### **To identify the reasons for students' weakness in Word Problems**

All type of errors identified during the interview were recorded. Total number of errors diagnosed during the interview was 129. Details by grade and gender are shown in Table 2.



**Table2: Error diagnosed**

<b>Grade</b> <b>Gender</b>	<b>Grade 4</b>	<b>Grade 5</b>	<b>Total</b>
Boys	57	18	75
Girls	35	19	54
<b>Total</b>	<b>92</b>	<b>37</b>	<b>129</b>

Errors were classified according to error types postulated in Newman's Error Analysis model

**Table 3: Categorising of Errors according to NEA Model**

<b>No of Students</b> <b>Error Type</b>	<b>No.</b>	<b>%</b>
Reading	35	27.13
Comprehension	55	42.64
Transformation	10	7.75
Process	18	13.95
Encoding	01	0.78
<b>Total</b>	<b>129</b>	<b>100</b>

The table above indicates that, a high percentage of the students in Grades 4 and 5 were unable to comprehend the question. A considerable number of students made errors on reading. 77.52% of the students made errors in the first three stages. It means that more than three quarter of the students made errors before performing any calculations. This finding indicates that, students' lack of skills in their first language (Tamil Language) affected their mathematics learning.

The sentences in the primary level Tamil language book contain no more than six words. But mathematics word problems contain more than 14 words sentences. Therefore, the primary level curriculum developers have to take this matter into consideration. At the primary level the same teacher teaches Tamil language and Mathematics. Therefore primary teacher need to prepare the students to read and understand word problem in mathematics through the language subject.

**To find the types of errors made when solving Word Problems by boys and girls**

Gender wise number Error Type	Boys		Girls	
	No	%	No	%
Reading	23	30.67	22	40.74
Comprehension	35	46.67	20	37.04
Transformation	05	6.67	05	9.26
Process	12	16.00	06	11.11
Encoding	0	0	01	1.85
<b>Total</b>	<b>75</b>	<b>100</b>	<b>54</b>	<b>100</b>

Statistical tests have revealed that there is no significant error type between the boys and girls.

**To find the types of errors made when solving Word Problems by students of different grade levels**

Grade Error Type	Grade 4		Grade 5	
	No	%	No	%
Reading	27	29.35	18	48.65
Comprehension	41	44.57	14	37.84
Transformation	09	9.78	01	2.70
Process	14	15.22	04	10.81
Encoding	01	1.09	00	0
<b>Total</b>	<b>92</b>	<b>100</b>	<b>37</b>	<b>100</b>

Statistical tests have revealed that there is no significant of the error type between the boys and girls.

**Conclusion and recommendations**

Mathematics and First language are the compulsory subjects in GCE (OL) in Sri Lanka. Most of the sums in GCE (OL) paper are in the word problem format. Therefore students have to get good competencies to solve the word problems. The primary mathematics is the foundation for the secondary level mathematics. But the studies highlighted that, students performance in Word problems are very weak.

This study identified the reasons for students' weakness in Word problems. Most of the students made errors on the Stages of Reading, Comprehension, and transformation. Reading and Comprehensions are related to language. Same teacher is teaching the Language and Mathematics at the Primary Schools. Therefore the teacher has to prepare the students to learn mathematics through during the language lessons.

A significant number of students made mistake in process stage also. These are related to the mathematical operations. Many studies identified the error patterns on mathematical operations. These errors on operations were classified as Systematic errors, Random errors, Careless errors (Nanayakkara, 1994). Therefore teachers have to identify these error patterns and take remedial measures.

As noted earlier, the sentences in the primary level Tamil language textbook contain no more than six words. But mathematics word problems contain more than 14 words sentences. Therefore, the primary level curriculum developers have to take this matter into consideration.

**Key Words:** Word Problem, Newman Error analysis, Error

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## Annexure

Error Type	Grade 4				Grade 5				Total	
	Boys		Girls		Boys		Girls			
	No	%	No	%	No	%	No	%	No	%
Reading	15	26.32	12	34.29	08	44.44	10	52.63	35	27.13
Comprehension	26	45.61	15	42.86	09	50.00	05	26.32	55	42.64
Transformation	05	8.77	04	11.43	00	0	01	5.26	10	7.75
Process	11	19.30	03	8.571	01	5.56	03	15.79	18	13.95
Encoding	0	0	01	2.86	00	0	00	0	01	0.78
Total	57	100	35	100	18	100	19	100	129	100

## **HUMANITIES, INTERNATIONAL RELATIONS AND LAW**

### **TECHNICAL SESSION II**

Chaired by Mr. Bernard Goonetilake

Former Ambassador to the United States of America

### **Summary**

*After the introduction of the session by the chair Mr. Bernad Gunatilake, the presentations were started with a paper on “Human Rights Perspective in Preventive Detention and Rehabilitation” by Ms Jeewa Niriella. It concluded that government, nongovernmental organizations and other stake holders have a greater responsibility in the rehabilitation of detainees. In the same session a study inquired into the relationship between cast based marginalization and violence in society. It focused on the issue of violence between both intra and inter social groups because of the perceptual differences in the particular casts of the Hindu society in the selected area.*

*“Regionalism and Security Building in South Asia: Dominance or Co-operation?” by Sandya N. Gunasekara and Buddhika N. Gamage posited that regionalism is a policy whereby the interests of a nation are defined in terms of particular countries or regions. Conflicts have been a major feature of the state system and an integral factor in the interstate relations of the South Asian region. Most South Asian states have had a great difficulty in coping with conflict situations and threats emerging from within the state or beyond state borders. Regionalism is used by states to counter such threats. Nevertheless, the different use of regionalism by South Asian states for their own benefit under different circumstances has contributed to the emergence of a new polarization in the region. But, the researchers conclude, the best security concept is a common, collective, comprehensive and co-operative approach.*

*A study on social integration by Dayani Panagoda presented an interactive experience of social issues that demand social integration. The presentation incorporated micro level information on the Ratnapura district which revealed the complexity of the issues that demand careful consideration in formulating a policy framework for social integration.*

*According to the paper by Harsha D. Wijesekara on “Education as a Tool of Ethnic Integration: Are We Successful?”, the education system has the potential either to aggravate the conditions that lead to violent conflicts or to heal them. The Sri Lankan education system introduced curriculum changes to facilitate ethnic reconciliation. The paper presents an evaluation that, unfortunately, the changes introduced to inculcate in young people the need to respect ethnic pluralism by fostering values of inclusion and equality has not been so successful. The responsibility of such task lies not only at policy making level, but also in the hands of the schools to a great extent. Schools are required to create the environment to practice what is taught through good classroom practice and extracurricular activities. However, the ability of the schools to take such steps is limited by the*

*education system itself. Ethnic segregation of institutions and ethnically exclusivity of policy making and management in multiethnic schools are the major constraints. But it appears that such disparity has not affected the academic performance of minority students.*

*Mobisher Rabani, a scholar hailing from Middle East, put forward the possibility of a close alliance among the countries of Pakistan, Sri Lanka and China. The presenter suggestes that such an alliance will be mutually beneficial for state security that would help Sri Lanka in creating necessary conditions for economic growth and development.*

## **Human Rights Perspective in Preventive Detention and Rehabilitation in the Post War Situation: Sri Lanka's Standpoint and Achievements**

*M.A.D.S.J.S. Niriella<sup>153</sup>*

### **Introduction**

Rehabilitation and reintegration of former members of resistance groups<sup>154</sup> who were involved in terrorist or otherwise subversive activities, into society is an important component of the peace building process in post conflict context. This contributes towards preventing future outbreaks of armed conflicts<sup>155</sup> or serious violent situations in a country. It also helps to redevelop the country that has suffered from civil war. Furthermore, it is essential for sustainable peace for such a country. Rehabilitation and reintegration of the above alleged offenders is certainly a complex process, (especially) when they are in preventive detention. The concept of rehabilitation is one of the objectives of formal penal punishment imposed by the courts. Theoretically, the question arises whether the alleged offenders in preventive detention without any criminal charges could be rehabilitated. Therefore, it is necessary to evaluate the legal validity and usefulness of such a regime, the targeted group and how the rehabilitation programmes support to transform this special category of offenders into active participants in economic and social development in the country aiming at sustainable peace.

In order to achieve the above objective the paper focuses on the theoretical framework of concepts of preventive detention and rehabilitation as well as the international jurisprudence and its development in relation to the preventive detention regime and rehabilitation of the offenders with having a special focus on human rights perspective, the evaluation of national laws relating to the subject and the role of the criminal justice agencies, the challenges encountered in initiating and in implementing rehabilitation programmes for this special category of offenders, the role of the criminal justice

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<sup>154</sup> Here in after, the paper referred as alleged offenders.

<sup>155</sup> International Humanitarian Law which is known as law of armed conflicts recognizes two different categories of armed conflicts. They are international armed conflicts that occur between two or more States and non-international (internal) armed conflicts that cause war-like clashes to occur on the territory of a single State. Non-international armed conflicts are usually known as civil wars. See Dietrich Schindler, (1979), 'The different Types of Armed Conflicts According to the Geneva conventions and Protocols' RCDAL, Vol. 163 II, Oxford University Press, pp.117-163.



agencies and general public which may help to initiate and operate an effective mechanism of rehabilitation for such offenders for long lasting peace in a country affected by civil war.

### **Preventive Detention**

The beneficiaries of the rehabilitation programmes addressed by this paper are (former) members of resistance groups who involved in civil war previously but (currently) under preventive detention. Therefore, it is pertinent to discuss, the concept of preventive detention, its nature and legal validity in first. Generally, preventive detention means (a) suspect/s arrested and kept in custody without any (criminal) charges. In other words, a confinement of an accused person pending trial under terms of a statute authorizing denial of bail to defendants charged with having committed certain offenses and/or are being considered a danger to themselves or to the public at large. These detainees were not convicted by the court of law or in other words they were not charged with a criminal offence.

The term 'preventive detention' was first recorded in *R v Halliday*<sup>156</sup> by Lord Wrenbury. Today, the term 'preventive detention' is normally used to describe a situation where a terrorist<sup>157</sup> suspect or combatant is detained for political reasons or reasons connected with national security or/and the public safety of a country. The Guantanamo detainees are the most well-known captives in 'preventive detention' in the world today. The International Committee of the Red Cross favors the term 'internment,' which is defined as 'deprivation of liberty ordered by the executive authorities even when there is no specific criminal charge made against the individual concerned which is similar to the term 'preventive detention'. However, it is significant to note that there is no proper internationally standard definition agreed-upon for this term though the International Commission of Jurists (ICJ) has been particularly active in this regard.<sup>158</sup>

Preventive detention is a defensive tool which any State/administrative authority can use to hold terrorist suspects (captives or surrendees) in order to prevent a potential threat or danger of any

<sup>156</sup> 1917 AC 260. See further, *The Five Knights Case* of 1627 2 St. Tr. 371; *Liversidge v Anderson*, 1942 AC 206 HL.

<sup>157</sup> Although there is no accurate definition for terrorism, generally terrorism means calculation of violence or the threat of violence against civilians in order to attain goals that are political or religious or ideological in nature which is done through intimidation, coercion or instilling fear. Therefore, 'terrorists' are those who are engaged in such activities. See, [dnetweb.princeton.edu/perl/webwn](http://dnetweb.princeton.edu/perl/webwn);

See, Comprehensive Convention on International Terrorism;

Bruce Hoffman, (1985), the Prevention of Terrorism and Rehabilitation of terrorists: Some Special Thoughts, paper presented at International Symposium on Rehabilitation of Terrorist in Turkey, Istanbul, Turkey, 21<sup>st</sup> – 23<sup>rd</sup> in 1985. See further, Regulations No 6 and 20 and also 7 8 and 9 of Emergency Regulations 2006 – Sri Lanka.

<sup>158</sup> See further, Standard Minimum Rules for the Treatment of Prisoners, ECOSOC Res. 2076 (LXII), 95, U.N. Doc. E/RES/2076 (May 13, 1977).

terrorist activity taking place. This also may be a legitimate mean of social protection and control. Such deprivation of the liberty of terrorist suspects is termed as 'administrative detention' in civil law countries while the common law countries use the term 'preventive' or 'preventative' detention.<sup>159</sup> As the United Nations Crime Prevention and Criminal Justice Unit justified, this may be applied to a broad range of circumstances outside the normal process of arresting suspects of crimes by police and bringing them into the ordinary criminal justice system.

The decisions relating to preventive detention is taken by the State/executive authorities under special circumstances such as armed conflict situations or grave/sudden necessity of ensuring national security. Therefore, preventive detention does not encompass other forms of deprivation of liberty such as simple, rigorous or life imprisonment imposed on an offender subsequent to the formal judicial proceedings or of deprivation of liberty under the normal criminal justice process such as remand custody including police custody of the suspect/accused person.<sup>160</sup>

Therefore, it is extremely important to evaluate the recognition of the preventive detention regime under international law. According to the international law, there are four situations that the suspected terrorists/members of resistance movements engaged in violent activities to be kept in custody. They are: during peace time, public emergency where the State has the power to derogate from right to liberty of the people, international armed conflicts and non- international armed conflicts. In the above said settings, suspected terrorists may be detained for the purpose of criminal prosecution or national security purposes. There are basic substantive and procedural international law norms to govern such detentions of these suspects/alleged offenders.<sup>161</sup> When the terrorist suspects are arrested (or they might be surrendered) and detained in peacetime or in public emergency, the International Human Rights Law (IHRL) norms are applied with regard to the validity and the procedure of such regimes and rights of such detainees. When they are arrested and detained in armed conflicts in both characters, International Humanitarian Law (IHL) principles along with IHRL norms are applied for the same situation.

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<sup>159</sup>Stella J. Burch, (2009), Re-thinking 'Preventive Detention' from a comparative Perspective: Three Frameworks for Detaining Terrorist Suspects, Yale Law School Student Scholarship Paper, Yale law School, USA, pp. 108-110. <http://digitalcommons.law.yale.edu/student.papers/87>.

<sup>160</sup>Some of the countries who have the preventive detention regimes are The United States of America, Denmark, Greece, India, Pakistan, Sri Lanka, Turkey, Australia, Singapore and South Africa. According to Stella J. Burch there are 32 countries have preventive regimes as it 2009. *Ibid*, p.110.

<sup>161</sup>It is important to note that both International Human Rights Law and International Humanitarian Law introduced international norms relating to preventive detention as a whole.

The Universal Declaration on Human Rights in 1948, International Covenant on Civil and Political Rights in 1966, Convention against Torture and Other Cruel, Inhumane or Degrading or Treatment or Punishment 1984 and United Nations Body Principles for the Protection of All Persons under Any Form of Detention or Imprisonment in 1988 represent the IHRL. In international armed conflicts, the IHRL agreements are complemented by two IHL treaties namely; Fourth Geneva Convention of 1949 and Protocol Additional I to the Geneva Convention of 1977. During non-international armed conflicts, Common Article 3 of the Geneva Convention and Protocol Additional II to the Geneva Convention of 1977 are applied in addition to the above mentioned IHRL treaties.

The question arises, which norms can claim superiority; either the IHRL or the IHL? There are two suggestions for finding a better solution in this regard. Firstly, from the detainees' point of view. Whenever IHRL grants greater protection than IHL for them, they should be benefited with more favourable provisions in IHRL. Secondly, from point of view of *lex specialis* principle, which if the IHRL norms are more general than IHL, the more specific IHL norms should prevail. In relation to the preventive detention for public security purposes in non-international armed conflicts, if the existing IHL norms are weaker than IHRL norms, or there are no more specific IHL norms, then IHRL are applied for substantive limits and procedures for preventive detention. However, both IHRL and IHL<sup>162</sup> norms recognize that the liberty of persons may be deprived for reasons related to the non-international armed conflicts and that they should be treated humanely. It is also important to state, if terrorist suspects are arrested and detained for public security purposes in non-international armed conflict situations, those actions should not be done in an arbitrary, unreasonable or disproportionate manner and must be based on the grounds of previously established national law.<sup>163</sup> They must be informed of the reasons for detention too.<sup>164</sup>

### **National laws and Preventive Detention**

Prevention of Crimes Ordinance No 2 of 1926 is the first legislative enactment in Sri Lanka that sets out the provisions for preventive detention. Under section 7 of this Ordinance, the High Court Judge can order such detention against an offender charged before the High Court for a term of not less than one year of rigorous imprisonment. If the person is habitually addicted to crime and if the court's

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<sup>162</sup> The Optional Protocol II to the Geneva Convention.

<sup>163</sup> IHRL norms.

<sup>164</sup> See further, Cassel Douglass, (2008), Pretrial and Preventive Detention of Suspected Terrorists: Options and Constraints under International Law, The Journal of Criminal Law and Criminology, Northwestern, University of School of Law, USA, Vol. 98, No. 03.

opinion that by reason of his criminal habits and mode of life is danger for the protection of the public, the court may pronounce such order. According to this Ordinance, preventive detention is a mode of punishment that a Judge<sup>165</sup> can impose on the offender in order to prevent future crimes and to protect the public in the country from crime and criminals. However, the provision in this Ordinance is not applicable when the government declares that the country is in a state of a war situation.

The Public Security Ordinance No 25 of 1947 and Prevention of Terrorism Act No. 48 of 1977 set out the legal provisions for preventive detention especially due to the emergency situation in the country.

According to the preamble of the Public Security Ordinance, it is an Ordinance to provide for the enactment of emergency regulations or the option of other measures in the interest of public security and preservation of public order. Therefore, the State has the legal power to enact emergency regulations and take other measures to ensure the security of the people in the country when in need (if there is any urgent and grave necessity). When the State has declared an emergency situation under section 2 of the Ordinance, section 5 empowers the President to make regulations are essential to ensure the public security. Section 5(2)(a) provides that the regulations made under section 5(2) may authorize the preventive detention of persons.<sup>166</sup> Therefore, in such situations any person can be detained for the preventive purpose. According the Emergency Regulations 2005,<sup>167</sup> preventive detention without trial on security grounds for up to one year is authorized. The regulation excludes judicial review<sup>168</sup> and declares all such detentions lawful.<sup>169</sup> Further, preventive detention without criminal charge/trial is also permitted for the purpose of the rehabilitation of ‘surrendeeds’ under Regulation 22 of the Emergency Regulations 2005.<sup>170</sup> According to these new amended regulations, a surrendee (who actively involved in terrorist activities or support directly or indirectly to carry out such activities) can be detained up to two years for the purpose of rehabilitation. Therefore, one may argue that rehabilitation of the surrendeeds, who are under preventive detention, is lawful.

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<sup>165</sup> *De Jure* Preventive Detention. There are two categories of preventive detention, namely *de jure* and *de facto* preventive detention.

<sup>166</sup> Other than Sri Lanka, Kenya, India, Mozambique, Malaysia, Nigeria, Pakistan, the Russian Federation, Singapore, Swaziland, Trinidad & Tobago and Zambia are the other countries whose detention of terrorists is fit into the national security detention regime.

<sup>167</sup> Regulation 19. See further, Regulation 1.

<sup>168</sup> *Ibid* 19 (10). See further, section 8 of Public security Ordinance- No emergency regulation and no order, rule or direction made or given thereunder shall be called in question in any court. *Visualingam v Liyange* (1984) 2SLR 123; *Adirisuriya v Navaratnam* (1985) 1 SLR 100.

<sup>169</sup> *Ibid* 19 (3).

<sup>170</sup> Emergency Regulations 2005 as amended by Emergency Regulations 1462/8 in 2006.

Next, it is pertinent to discuss preventive detention under the main counter terrorism law, i.e Prevention of Terrorism Act No. 48 of 1979. Section 2 of the Prevention of Terrorism Act No 48 of 1979, stipulates some of the recognized offences under this Act. If a person who commits any of the offences under this Act or if the minister of Defence in the country has reasons to believe or suspect that any person is connected with or concerned in any unlawful activity under this Act, the minister may order such person to be detained. This is the provision where preventive detention is to be seen under this Act.<sup>171</sup>

According to this Act, the duration for such detention should not exceed three months but such order may be extended from time to time for a period not exceeding three months at a time and the maximum period of such detention is 18 months.<sup>172</sup>

The order issued under section 9 of this Act also excludes judicial review power which is similar to the emergency regulation 19 (10). However, this Act does not explicitly provide provisions for the rehabilitation of the surrendees. This may be noted as a legal vacuum in domestic counter terrorism law. Nevertheless, emergency regulations could be considered as 'laws',<sup>173</sup> and preventive detention for rehabilitation is a lawful regime in the country.

With regard to the constitutional validity of preventive detention, it is significant to note that Sri Lanka has no explicit constitutional provisions with reference to preventive detention. However, in *Saman Wikramabandu v Cyril Herath and others*<sup>174</sup> the court held preventive detention is not a violation of a basic constitutional liberty of the people and further endorsed the validity of regulations which provide legal provisions for preventive detention in Sri Lanka.

The detainees who were not charged with a criminal offence are placed in a different category from convicted prisoners. Sometimes they may have to undergo indefinite detention under national security purposes which may lead to have some concerns of rights of such persons. Next it is important to discuss the rights of detainees under preventive detention.

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<sup>171</sup> Section 9 (1).

<sup>172</sup> *Ibid.*

<sup>173</sup> Section 7 of the Public Security Ordinance says that an emergency regulation or any order or rule made in pursuance of such a regulation shall have effect notwithstanding anything inconsistent therewith contained in any law: and any provision of a law which may be inconsistent with any such regulation or any such order, or rule shall, whether that provision shall or shall not have been amended, modified or suspended in its operation under section 5 of this Ordinance, to the extent of such inconsistency have no effect so long as such regulation, order or rule shall in force.

<sup>174</sup> Supreme Court Application No 27/88 SC Minutes of 6 April 1990. Further see *Charitha Lankapura v. PDA Perera*-Fundamental Rights Decisions vol ii. p. 347; *Yapa v Bandaranayake* 1988 1 SLR 63.

## **Rights of Detainees**

The fundamental principle is that detainees should enjoy a normal lifestyle that is parallel with security<sup>175</sup> and protection of their human rights should be an integral part of detention irrespective to the category (nature) of detention. However, countries such as Malaysia, Malawi, a detainee is also treated as a prisoner who seems to have enjoyed the special attention, protection and corrections. Therefore, it is pertinent to discuss the protected human rights of prisoners and detainees under international jurisprudence.

The standards relating to this subject have been recognized both at international and regional levels. Most of the member States to the United Nations Organization have signed and ratified or acceded international conventions which specifically focus on the rights of prisoners/detainees and abide by those standards declared in these treaties.

## **International Jurisprudence**

The Universal Declaration of Human Rights in 1948 (UDHR) was built on the fundamental principle that human rights are based on the 'inherent dignity of all members of the human family' and is the 'foundation of freedom, justice and peace in the world.' It recognizes that in order to guarantee human dignity, economic, social as well as civil and political, rights need to be observed. This means that disregarding all other geographical and biological factors, there are some basic human rights that anybody should enjoy being a human being. Therefore, it is not wrong to state, as the very first International agreement, UDHR demonstrates the concerns of detainees, through some of its provisions. Since this international agreement attempts to ensure the basic human rights any human being can enjoy, a person whose liberty is deprived also may enjoy the same rights whilst they are holding in such places. Article 5 of the Universal Declaration on Human Rights, stands against torture, inhumane and cruel punishment and Article 6 incorporates the vital principle that everyone has the right to recognition everywhere as a person before the law. Therefore, this signifies that a prisoner or detainee does not cease to be a person inside the prison or inside detention camp, and as such is entitled to receive a reasonable decent and civilized treatment in those places.<sup>176</sup>

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<sup>175</sup> See *Whittaker v Roos Batemar* 1912 AD 92; *Goldberg v Minister of Prison* 1979 1SA 14.

<sup>176</sup> See further Article 3.

The International Covenant on Civil and Political Rights (ICCPR) in 1966,<sup>177</sup> Declaration on the Protection of All Persons from Being Subjected to Torture and Other Cruel, Inhumane or Degrading Treatment or Punishment in 1975,<sup>178</sup> Convention against Torture and Other Cruel, Inhumane or Degrading or Treatment or Punishment (CAT) in 1984<sup>179</sup> and the Basic Principles for the Treatment of Prisoners in 1990, are some of the main universal conventions which consider the rights and the treatment of the prisoner/detainee.

The Prisoners and detainees basic rights are now stated in the United Nations for the Treatment of Prisoners adopted in Geneva, 1955 which sought to eliminate undue torture and suffering to prisoners and detainees, narrowing down the gap between prison life and normal free-life. This international instrument is known as Standard Minimum Rules for the Treatment of Prisoners. These rules emphasize rehabilitation of the prisoner and training him/her for his/her return to normal life in society whilst they are to be humanely treated during the period of imprisonment, while protecting all their basic human rights.

According to these rules, they should be treated with respect due to their inherent dignity and value as human beings and there should be no discrimination on the grounds of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.<sup>180</sup> These rules stipulate that the prisoners should be categorized, and kept separated according to age, sex and criminal records.<sup>181</sup> It is important to state that un-convicted prisoners (detainees who are under preventive detention could be considered under this category) should be kept separate from convicted prisoners. Prisoners entitled to have accommodation should meet all requirements of health, including minimum floor space to sleep, lighting, heating, ventilation, sanitary installations, shower installations, and a clean place, for personal hygiene.<sup>182</sup> Some rules are set out to ensure the

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<sup>177</sup> See Article 6, 7, 9 and 10. Among the others Article 10 specifically deals with the treatment to the persons who are being subjected to the deprivation of liberty. Article 10 (1) All persons deprived of their liberty shall be treated with humanity and with respect for the inherent dignity of the human person, 10 (2) (a) Accused persons shall save in exceptional circumstances be segregated from convicted persons and shall be subject to separate treatment to their status as un-convicted persons. 10 (2) (b) Accused juvenile persons shall be separated from adults and brought as speedily as possible for adjudication. 10 (3) The penitentiary system shall comprise treatment of prisoners the essential aim of which shall be their reformation and social rehabilitation. Juvenile offenders shall be segregated from adults and be accorded treatment appropriate to their age and legal status.

<sup>178</sup> See especially, Articles 2, 3 and 5.

<sup>179</sup> Article 2 (2) and 4, Further see Chapter 2 : 'The Crime of Torture and Related Crimes Under International Law', 2001, End Impunity: Justice for the Victims of Torture, United Kingdom, Amnesty International Publications, pp. 25-50.

<sup>180</sup> See further, the Body of Principles for the Protection of All Prisoners under Any Form of Detention or Imprisonment in 1988, the Basis Principles for the Treatment of Prisoners in 1990, the Standard Minim Rules for the Administration of Juvenile Justice in 1985.

<sup>181</sup> Rule 8.

<sup>182</sup> Rules 10 -16.

entitlement of clean clothes, nutrient food in proper quantity, and medical services for sick prisoners.<sup>183</sup> According to these, rules any prisoner should not subject to corporal, cruel, inhumane or degrading punishments during their imprisonment period.<sup>184</sup> All convicted and un-convicted prisoners have the right to know what is happening outside the prison and to sustain contact with the outside world subject to some reasonable conditions.<sup>185</sup> Maintaining the relationship between the prisoner and his/her family for the best interest of both parties and providing after care service are other important rights protected by these rules.<sup>186</sup>

The Body of Principles for the Protection of All Prisoners under Any Form of Detention or Imprisonment in 1988 is another important international instrument that deals with the rights of the detainee. According to the agreement, all detainees should be treated humanely,<sup>187</sup> arrest and detention should be carried out strictly according to the law<sup>188</sup> and they should not be subjected to any form of torture, cruel inhuman or degrading punishment.<sup>189</sup>

According to the Convention of the Rights of the Child in 1989, no child should be subjected to torture or other cruel, inhuman or degrading treatment or punishment whether they have committed offence, no child should be deprived of his or her liberty unlawfully or arbitrarily and such arrest, detention or imprisonment of a child should be in conformity with the law, every child deprived of liberty should be treated with humanity and respect for the inherent dignity of the human person, and in a manner which takes into account the needs of persons of his or her age. In particular, every child deprived of liberty should be separated from adults unless it is considered in the child's best interest not to do so and should have the right to maintain contact with his or her family through correspondence and visits, save for some exceptional circumstances.<sup>190</sup>

Part III of the Standard Minimum Rules for the Administration of Juvenile Justice in 1985 stipulates the rights that should be preserved under this particular international agreement. According to that when preventive detention is nevertheless used, juvenile courts and investigative bodies should give the highest priority to the most expedition processing of such cases to ensure the shortest possible

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<sup>183</sup> Rules 17- 26.

<sup>184</sup> Rules 27-34. Further see 35 and 36.

<sup>185</sup> Rules 37-40

<sup>186</sup> Rules 79-81.

<sup>187</sup> Principle 1.

<sup>188</sup> Principle 2.

<sup>189</sup> Principle 6.

<sup>190</sup> See Article 37.



duration of detention.<sup>191</sup> Further, it also recognized that the juvenile detainees should be provided, where possible, with opportunities to pursue work, with remuneration, and continue education or training. However, this work, education or training should not cause the continuation of detention.<sup>192</sup>

Furthermore, the above mentioned international standards are supplemented by a number of regional human rights instruments<sup>193</sup> and international monitoring bodies<sup>194</sup> established to monitor the effective function of the above regional conventions.

### Concept of Rehabilitation

Rehabilitation of offenders is a new phenomenon in the subject of criminology. During the latter part of the 19<sup>th</sup> and the beginning of the 20<sup>th</sup> century,<sup>195</sup> development in the field of criminal science brought about significant changes in criminology. In clinical and sociological schools of thought, 'treatment of the offender' was the principal aim of punishment.<sup>196</sup> This view found expression in the reformatory theory of punishment. During this era, it was believed in many parts of the world, such as India, Europe and America, that rehabilitation of the offender should be the main aim of punishment.<sup>197</sup>

The main objective of this concept is to make the offender a 'better person', capable of being re-integrated into society by improving the offender's character. According to the experts and intellectuals who believe in reformatory theory, a criminal should be studied like a patient in his entire

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<sup>191</sup> See Rule No 17.

<sup>192</sup> Rule no 18 (b).

<sup>193</sup> European Convention for the Protection of Human Rights and Fundamental Freedoms (1953)- Article 5; the European Convention for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment (1989) – Article 1; European Prison Rules (1987), the American Convention on Human Rights (1978) – Article 7, and African Charter on Human and Peoples' Rights (1986) – Article 5.

<sup>194</sup> Committee for the prevention of Torture and Inhuman or Degrading Treatment or Punishment (with in the states of European council), The African Commission on Human and Peoples' Rights appointed a special rapporteur on Prison conditions. Optional Protocol to the Convention against Torture established a system of regular visits to places of detention by an international body of experts, to be complemented by sustained regular visits conducted by national independent inspection groups are some of the monitoring bodies .

<sup>195</sup> Clarkson C.M.V., and Keating H.M., says in *Criminal Law; Text and Materials*, that at the end of the 19<sup>th</sup> century reform of the criminal became the main aim of penal policy in England. Clarkson C.M.V., and Keating H.M., (1998), *Criminal Law; Text and Materials*, 4th Edition, Sweet and Maxwell Ltd., London, pp. 53, 54.

<sup>196</sup> According Gorgias the main objective of punishment is to reform the criminal. Gomperz T., *Greek Thinker, Vol. III*, 1905, John Murray, London, p. 251 in Sethna M.J., (1971), *Society and the Criminal*, M.J. The Law Book Company, Melbourne, Australia, p.240.

<sup>197</sup> See the following judicial decisions where took the view point of rehabilitation of the offender. *Inder Singh v State* AIR 1978 SC 1091; *Rajendra Prasad v State of Uttar Pradesh* AIR 1979 SC 916; *Hiralal Mallick v State of Bihar* (1977) SCC (Cr.) 538; *Darambir v State of Uttar Pradesh* (1979) 3SCC 645; *Jackson v State of Indiana* (1972) 406 U.S. 715 ; *McCray v State* 10 Cr. L.R. 2131 ; *New York v Williams* 337 US 247 (1949)

socio-economic surroundings and attempts should be made to reform or treat and rehabilitate the offender. The crime was seen as a symptom of an illness that could, with the appropriate remedy, be cured. Under this theory, an opportunity is provided for the State to take steps to reform offenders and so to control crime. The ultimate aim of the punishment is to make the offender re-adjust as a law abiding person and to reintegrate him/her into the society.

According to the sociological point of view<sup>198</sup>, people are not criminals by birth and even if a person commits an offence it does not mean that he or she is a criminal forever. Moreover, there is a reason for a person to commit a crime and therefore, the society has a responsibility to rehabilitate him or her and make him aware of his wrongdoing. Therefore, none of us can deviate from the idea of rehabilitation of even a detainee who is involved in terrorist activities. The relevant authorities should take necessary steps to initiate the most appropriate rehabilitative mechanisms for this special category of wrongdoers.

The captives or surrendees subjected to rehabilitation should not be viewed as mere detainees. The convicted offenders who are incarcerated are addressed as inmates and not as prisoners in order to respect their self-esteem. As Rohan Gunaratna<sup>199</sup> suggested, they should be viewed in different way; as 'beneficiaries' of the rehabilitation process.<sup>200</sup> Some would like to view them as 'rehabiltees.' Since this is mostly a psychological transformation of their mind set from radical or extreme ideologies to a normal pathway, the difference between this special category of offenders and the other offenders would make the rest of the process easier and a successful.

As mentioned before, the main aim of rehabilitation of these beneficiaries involved in subversive activities is to resocialize them and facilitate them to attend to their individual needs during the detention period. Developing their mental, vocational and educational skills, stimulating an interest and a desire in them to be recognized as law abiding citizens when they return to society are other important objectives of this process. This will also help them to stand on their own feet with pride and self esteem when they return to society. Rehabilitation of beneficiaries is the starting point of the reintegration process. This requires making him/her engage in the above said aspects. A successful programme must identify all modes of rehabilitation. Within each mode of rehabilitation, there are

<sup>198</sup>Sociological theories of crime - The theory Chicago school, Anomie or Strain theory, Learning theories and Social control theories. See Bohm, Robert A. and Haley, Keith N. (2002), 8Mc Graw Hill, New York, pp. 88-96,

<sup>199</sup>Head, The International Centre for Political Violence and Terrorism Research, S. Rajaratnam School of International Studies, Singapore.

<sup>200</sup>Rohan Gunaratna, (2009), The Battlefield of the Mind: Rehabilitating Muslim Terrorists, UNSCI Discussion Paper No.21 in October.

various styles. Therefore, it is significant to discuss the world recognized rehabilitative modes which could be utilized to rehabilitate any beneficiary during the period of preventive detention. These methods can be divided into five major rehabilitation standards/principles such as Social, Educational/Psychological, Religious, Health and Economic/Vocational Rehabilitation.

### **Social Rehabilitation**

Social Rehabilitation addresses both the concerns of family and the beneficiary. Under social rehabilitation, programmes are organized and conducted to maintain or increase a healthy social relationship with the family, friends, other beneficiaries, officials and community at large. Counseling for family members, receiving visits from family/friends/colleagues, permitting the beneficiaries to maintain communication with the outside world to a certain extent, allowing the development of family and social bonds before release from the detaining centres are some methods could be used to achieve social rehabilitation.<sup>201</sup>

### **Educational Rehabilitation**

It is very important to make the beneficiaries understand the gravity of the violent activities they were involved in and make them regret. From a psychological perspective, it is much easier to change one's behavior with rewards than with punishment. Education is one way of changing one's thinking pattern. Providing opportunities by conducting educational programmes to improve their skills in literacy, modern technology, and languages other than their mother tongue are the main programmes relating to educational rehabilitation. Increasing and expanding existing library facilities are other ways of assisting them towards self-improvement during the detention period.<sup>202</sup>

### **Religious Rehabilitation**

Although the religious ideology has been used to provide justification for violence in some countries, every religion brings peace, harmony and values such as tolerance, assistance, charity and morality. Although Educational, vocational, and social rehabilitation can change one's mind, the most powerful is religious rehabilitation. Religious rehabilitation has the power to unlock the mind of any person

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<sup>201</sup> See some examples for social rehabilitation: Angola, Congo, -MDRP-National Programmes for ex-combatants, Yemen-DDR Programme

<sup>202</sup> Examples for educational rehabilitation: Africa-FAWE, Burundi-Female Former Child Soldier Integration, Philippines-the children's rehabilitation Centre, Rwanda AOLATE, Sierra Leone- Scouts in Sierra Leone,

including these beneficiaries. It has the power to make a beneficiary of rehabilitation, repent and re-enter to the mainstream. Therefore, conducting various religious programmes aiming at psychological improvement and granting permission to participate in these activities is a better way to transform their wrong thinking to right thinking, and make them realize the errors in their conduct. Since religion represents a rich resource in the moral and spiritual regeneration of mankind, conducting programmes consisting of religious instruction and counseling, together with facilities for group worship of the beneficiaries according to their own choice would help them to come out of the previous ferocious ideas.<sup>203</sup>

### **Heath Rehabilitation**

Like other members of the society, beneficiaries should be in good health, both physically and mentally. Providing proper medical treatment to those in need, food in right quality and quantity, sanitation facilities are some initiatives taken to maintain their physical health. Conducting proper counseling programmes may help to maintain a good mental health condition.<sup>204</sup>

### **Economic Rehabilitation**

To reintegrate these beneficiaries into the society, they need to be guided and prepared through development of skills and educational attainment. Programmes are designed to develop necessary skills for jobs, vocational rehabilitation and impart useful skills for beneficiaries upon their release. This ranges from teaching them metal and wood work, carpentry and masonry, dairy farming and agriculture and self-study. Unlike other programmes, vocational training programmes contribute to the development of the beneficiaries' skills. This helps them to find a vocation to sustain him/her after his/her release. Further, the community may participate in helping them to find job opportunities.<sup>205</sup>

### **After-Care Service**

From a sociological point of view, no correctional or rehabilitative scheme can be effective unless opportunities exist for the after-care of beneficiaries. An after-care programme should commence

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<sup>203</sup>See American Correctional Association's 'Declaration of Principles in Siddique Ahmad, (1997), *Criminology Problems and Perspectives*, Lucknow, Eastern book Co., p. 157.

<sup>204</sup>Uganda –Freidis Rehabilitation and Disable Centre, Community Based Association for Child Welfare.

<sup>205</sup> *Supra* note 58.

from the time of their release from the detention camps.<sup>206</sup> After-care service implies all efforts to enable beneficiaries to overcome various social, economic and psychological problems he/she faces after his/her release under a treatment policy. This does not simply mean that at the time of leaving these beneficiaries are given some money by the State or a set of clothes to equip him or her for the new life. 'After-care service' is a practical programme of proper assistance and supervision over this special category of offenders, which assists he/she to reintegrate into society.

### **Categorization of Beneficiaries**

As there are various levels of beneficiaries, the responded programmes should also be varied accordingly. Therefore, classification of beneficiaries is of utmost importance for a successful programme. There is no such recognized universal key to classify these beneficiaries other than sex (male and female), age (children and adult), the type of the offence committed (here the nature of the participation to the main problem; terrorism, whether leaders, operatives or direct and indirect supporters). Therefore, they should be separated by their sex, age and nature of the involvement to the major activity (terrorism), respectively. Classifying them according to their participation to the main subject may be helpful in recommending them for the ideal/best programme. Operational leaders (hardcore), those who had the extreme ideologies and planned all the violent activities may be classified under one group. Very few beneficiaries belong to this category. The next category is operative members, those who carry out the operations. They are fully obliged to their leaders and are ready carry out any violent activity at any time. Many of the membership of the resistant group are classified into this category. The third category is direct supporters, for instance, spies. The fourth category is indirect supporters those who are relatives or friends had helped them in various ways to conduct the terrorist activities.<sup>207</sup>

### **Challenges in Post Conflict Rehabilitation**

Other than the practical difficulties<sup>208</sup> of developing a universal model to rehabilitate these alleged offenders, there are some sociological problems to be overcome. There are two main sociological problems identified in this research. They are, Isolation and stigmatization and difficulty in assuring

<sup>206</sup>Mc Clean and Wood, 'Criminal Justice and Treatment of Offenders', at p. 142 in Sirohi, J.P.S., (1995), *Criminology and Criminal Administration*, Allahabad 2- Law Agency, p. 138.

<sup>207</sup>Rohan Gunaratna, (2009), *The Battlefield of the Mind: Rehabilitating Muslim Terrorists*, UNSCI Discussion Paper No.21 in October. (However he has categorized all types of supporters in one group)

<sup>208</sup>Lack of proper environment to conduct programmes like this nature, and lack of efficient, dedicated and trained staff are some of the practical difficulties.

their transformation with real repentance. After the beneficiaries are released back to society, he/she should no longer be isolated but should have opportunities to engage in the society. Sometimes, they may be marginalized from the other communities in the society and may have a fear of non acceptance by society after their release. It is also difficult to guarantee whether their mindset/attitudes have been changed through rehabilitation. The beneficiaries may be placed in half way house and given the opportunity to live with others in the society peacefully as prior assessment of transformation of attitudes.

### **Role of the Criminal Justice Agencies**

The non violation of human rights of the people in the country, avoidance from abuse or exceeding the power to carry out the investigations, arrest the suspects and search the places are important matters that the law enforcement agencies should adhere to. The (prison, arm forces) officers taking care of the beneficiaries and conduct the programmes should treat the beneficiaries humanely. The prime duty of those caretakers is to ensure that the beneficiaries have the most suitable environment to undergo such rehabilitation programmes. Therefore, it is equally important to educate the law enforcement agencies of prevailing laws in the country in relation to this subject and the human rights guaranteed by the international norms.

### **Community Participation**

Rehabilitation is a collective effort taken not only by investigative officers and operations officers but also by academics, professionals and religious leaders such as Buddhist clergies, priests, nuns etc. The priests and monks can involve in conducting religious programmes. The university academics may engage in researches to design rehabilitation programmes and evaluate the efficiency of such programmes. They may also engage in studies to learn terrorists' apparent and real grievances, aspirations and ideologies including the political solution to the main problem. Public and especially the private sector may conduct vocational training programmes and provide the beneficiaries with opportunities to participate in the economic development process of the country.

### **Conclusion**

Due to difficulties in relying entirely on criminal prosecution in confronting the threat of terrorism and combating crime, most countries including Sri Lanka<sup>209</sup> seize the gradually developing system of preventive detention of suspected terrorists (persons who are members of resistant group and involve in violent activities) for security purposes. Due to its features, this regime doesn't have a good recognition in the concept of the rule of law. Nevertheless, the necessity of combating this particular crime pushes countries towards such a regime. If indefinite detention is to be permitted in countries for national security, far greater attention must be paid to the substantive and procedural safeguards of IHRL and IHL. This means these two streams should be strengthened with clear, specific and strong international norms in relation to the human rights of the people including this special category of offenders in such situations. This principle should be equally applied when enacting the domestic penal laws as well.

Rehabilitation of terrorists under preventive detention regime is a new phenomenon which needs certain improvements in order to achieve satisfactory results. As mentioned earlier, community participation and working together with the State are of utmost importance for successful rehabilitation programmes. Acceptance of the rehabilitated beneficiaries by society without any stigmatization and the provision of opportunities to participate in the economic development of the country are essential for the peace building process.

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<sup>209</sup> Some examples are the United States of America, the United Kingdom, India, Pakistan, Bangladesh etc.

## **A Study on Relationships Between Sri Lanka – China and Pakistan**

*Mobisher Rabbani*

Charles De Gaulle once said 'Nations do not have friends, they have only interests'. Two nations that prove this theory wrong are Pakistan and Sri Lanka. Although they are not neighbors and are separated by geographically larger India which has a coastline of 7,517 kilometres yet they are the closest of friends and true allies.

### **Sri Lanka Pakistan Relations**

The foundation of their relationship goes back to 1948 when the Father of the Nation of Pakistan – Muhammad Ali Jinnah and Sri Lanka's first Prime Minister DS Senanayake met and laid forth the vision for the deepest and closest friendship between both their nation states based on mutual respect.

### **Pakistan Support**

When Sri Lanka faced stiff resistance in crushing the foreign backed and funded Liberation Tigers of Tamil Eelam (LTTE), the world was unwilling to supply it with the kind of weapons it was looking for, Pakistan extended immense valuable support to Sri Lanka in its very difficult phase of national history. Pakistan also assisted Sri Lanka by supplying High-Tech military equipment, training and defense advisors.

Shortly after the defeat of the Tamil Tiger rebels in Sri Lanka, Pakistan congratulated Sri Lanka, and the Foreign Affairs Deputy Minister Hussein A Bhaila of Sri Lanka said, "The government and the people of Sri Lanka have considered Pakistan as a true friend of Sri Lanka, which has always stood by it in times of need."

### **Trade**

Pakistan is the second largest trading partner of Sri Lanka in South Asia. Sri Lanka was the first country to sign a Free Trade Agreement with Pakistan, which became operational from June 12, 2005. 4,000 items can be imported to Pakistan from Sri Lanka. Bilateral trade between the two countries was US\$400 million in early 2010, and is expected to increase to US\$2 billion by 2012. In November 2010, President Asif Ali Zardari mulled a 250 million dollar export credit line that



Pakistan would extend to Sri Lanka. Trade between the two countries reached \$500 million by the end of 2010.

### **Co-operation**

Pakistan and Sri Lanka enjoy convergence of views on almost all matters of regional and international significance. The two countries had been closely cooperating in multilateral forums, including South Asian Association for Regional Cooperation (SAARC). It is nevertheless discouraging that SAARC had not been able to move beyond a certain point although Pakistan and Sri Lanka have been playing a very active role in making SAARC an effective and result-oriented organization.

MOUs have been signed between Sri Lanka and Pakistan to co-operate on tourism and archeology which is expected to open a new window of opportunity for both countries. 70 percent of the Sri Lankan population is Buddhist and Pakistan has loaned Buddhist relics to Sri Lanka for displaying at the Colombo museum.

### **Sports**

The sports history of Pakistan and Sri Lanka goes back to April 1949 when the Pakistan national cricket team visited Sri Lanka to play two first-class matches with their hosts. Till date large number of Pakistani cricket fans support the Sri Lanka team and vice versa. Also during the 2009 T20 cricket world cup finals when both teams played each other yet both the country's fans watched the game together united by the love of cricket.

### **Difficult Times**

Both countries came forward to help and defended each other when difficult times confronted them. When the convoy carrying the Pakistani High Commissioner to Sri Lanka, Bashir Wali Mohamed, was attacked by the LTTE on August 14, 2006, the High Commissioner escaped unhurt, but seven people (including four Army commandoes) were killed and a further seventeen were injured in the blast. Pakistan, as a token of appreciation and friendship, supported the families of the Sri Lankan army commandoes and civilians who were killed and injured in the terrorist attack. Similarly after a terrorist assault on the Sri Lankan cricket team's bus on March 4, 2009 in Lahore. President Mahinda Rajapaksa, who cut short a visit to Nepal to return home, condemned the "cowardly terrorist attack",

dispatched his Foreign Minister to Pakistan who stated the attack would not affect ties between the island nation. Meher Mohammad Khalil, the bus driver who saved the lives of the Sri Lankan cricket players, was given a heroes welcome when he visited Sri Lanka.

### **Flood aid**

When Pakistan faced its worst floods in its history in 2010, Sri Lanka sent dry rations of rice, sugar, lentils and tea worth over SLR 3 million. Even overseas Sri Lankans living in the Gulf State of UAE sent relief aid. Pakistan also sent a consignment of aid of blankets and tents for the flood victims in Sri Lanka even though it was still suffering of the aftereffects of floods in its own country.

The people of Sri Lanka have great appreciation for Pakistan and its people which I personally experienced during my stay in Sri Lanka. For the love and friendship I received from the Sri Lankan people I was inspired to write my book and have this quote from it "If Hajj pilgrimage to Saudi Arabia is obligatory for every Muslim then visiting Sri Lanka should be obligatory for every Pakistani"

### **Sri Lanka China Relations**

Sri Lanka and the People's Republic of China (PRC) accorded each other diplomatic recognition in January 1950. In April 1952 both countries entered into the historic Rubber-Rice Agreement, whereby Sri Lanka supplied rubber to China under a barter arrangement, receiving rice from China in return. This agreement was entered into at a time when certain countries had imposed a ban on the supply of strategic materials, which included rubber, to China. Two countries established full diplomatic relations on 7th February 1957 and both countries took a number of steps in the political, economic, trade and cultural fields to strengthen their bilateral relations. Relations between Sri Lanka and China were brought to a record height during 2007, completing a mile-stone of 50 years of establishing diplomatic relations between the two countries.

### **Support**

As the west condemned Sri Lanka, and USA withdrew all funding from the country and part of India wanted to impose economic sanctions, China stood by Sri Lanka. Sri Lanka expressed unwavering support for the China's "One China" policy. It has consistently supported China at the UN. Both

countries have been cooperating in multilateral fora on various bilateral and international issues. In 1996, Sri Lanka welcomed the transfer of sovereignty of Hong Kong to China and had representation at the Hong Kong hand over in July 1997.

## **Cooperation**

The most prominent symbol of Chinese cooperation assistance to Sri Lanka remains the Bandaranaike Memorial International Conference Hall (BMICH), which is an enduring monument to Sri Lanka-China relations. China has also funded several other projects including the Supreme Courts Complex, the Central Main telecommunication Exchange, the Ginganga Flood Protection Scheme, the re-development of the Lady Ridgeway Children's Hospital, among others.

Since 2007, China has featured prominently in Sri Lanka's socio - economic development efforts by funding key infrastructural projects. These include the Norocholai (Puttalam) Power Project, the Hambantota Port and airport, the Colombo - Katunayake Express Way. The Performing Arts Theatre is another key project that has commenced in Sri Lanka with Chinese assistance, which upon completion will stand as a symbol of enhancing 50 years of friendship between the two countries.

## **Trade**

Trade relations between the two countries were formalized by the signing of a General Trade Agreement and Trade and Payment Agreement in 1952. In 1982 both countries signed a trade Agreement with a view to setting up a Joint Trade Committee. In 1984 an Agreement on Economic and Trade Cooperation was signed. In 1991 the two Joint Committees formed under the Agreement of 1982 and 1984 were amalgamated to constitute the Sri Lanka-China Joint Commission for Economic and Trade Cooperation.

## **The Future**

Sri Lanka needs to foster a strong mutual relationship with Pakistan and China to maintain strong economic and military development. The need of the hour is that all three countries come together to form a new association so that they all can benefit from each others expertise with this new friendship block in Asia. The friendship block would be a continuation, evolution and institutionalization of old

prevailing realities. Infact, it would be a practical answer to the challenges of security and economic development member states currently face.

**Major Possible Areas of Cooperation:**

- People-to-People Contacts
- Political Affairs
- Military Cooperation
- Security Cooperation
- International Legal and Judicial Cooperation
- Information, Communication and Media
- Economic Cooperation
- Science and Technology
- Cooperation in the field of Human and Environment Affairs
- Economic Relations with the Other Countries and Economic Groupings
- Social Welfare & Development
- Tourism
- Common Market
- Disaster Management

The national interest of a state is the state's survival and security. Also important are the pursuit of wealth, economic growth and the future of its people. As the saying goes '**One loyal friend is worth ten thousand**' in this region Sri Lanka has two: Pakistan and China.

## **Towards a Policy of Social Integration in Sri Lanka**

*Dayani Panagoda, National Technical Advisor, Facilitating Initiatives for Social Cohesion and Transformation (FLICT)*

In May 2009, Sri Lanka and Sri Lankans were geographically united with the end of three decades of war. However, a military victory does not address the structural causes of conflict. Sri Lankans need to unite through a sense of social justice, confidence in the State and creating a feeling of nationalism towards Sri Lanka as opposed to an ethnic group. To this end, it is imperative that a systematic approach is adopted to formulate a robust social policy and national plan of implementation that can provide an effective framework for social integration on the basis of social justice, rights and duties to create conditions of equality in which people can interact.

A social policy refers to policies used by the government to respond to the welfare needs, wellbeing and social protection of its citizens. It is formulated to address social problems, issues of social disadvantage and practices of administrative and social services. The state and its policies have a profound effect on people's life chances. Therefore, the content of policies must address the needs of the people and this will be reflected in a policy formulation process that adopts a consultative approach that would draw out the needs of the people, and eliminate any bias that would alienate individuals and / or communities. Because of this, there is much debate as to the approach, elements, existing laws, rules and policies as well as who should be included in terms of the policy formulation process.

Hartley Dean defines the academic study of Social Policy as: "... the study of social relations necessary for human wellbeing and the systems by which wellbeing may be promoted." (Dean, 2006:1)<sup>210</sup>. The discourse on what constitutes wellbeing has evolved from the Aristotelean definition of using of all one's abilities and capabilities to Sen's use of capabilities, which refers to what people are able to do, and to their freedom to choose to lead the kind of lives they value; and conversely to capability deprivation, which refers to the social and economic conditions under which we do not have the freedom to function as members of human society<sup>211</sup>. In the post war context of Sri Lanka, in the formulating of an effective policy on social integration, this vision of social justice is being aimed for. This paper will examine the relevance of the factors and elements that should be addressed in creating a national policy on social integration for Sri Lanka.

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<sup>210</sup> Dean, Hartley, Social Policy, Short Introductions, Polity Press, 2006

<sup>211</sup> Dean, Hartley, Social Policy, Short Introductions, Polity Press, 2006

Social integration as an idea in development came into prominence at the Copenhagen Conference on Social Development where it was recognized as one of the highest priority goals for the twenty first century. This commitment to social integration set the goal post at achieving social development and human wellbeing for all. At the summit, social integration was broadly defined as: “ The process of “fostering of societies that are stable, safe and just and that are based on the promotion and protection of all human rights, as well as on non-discrimination, tolerance, respect for diversity, equality of opportunity, solidarity, security and participation of all people, including disadvantaged and vulnerable groups and person (Copenhagen Declaration on Social Development, Commitment 4).”<sup>212</sup>

The greatest problem in terms of building a conceptual framework for social integration is in the above definition, which is very broad based. In the context of the Copenhagen Summit on Social Development, the priority of social integration was interpreted by many states as relating to poverty and the type of social exclusion which occurred because of a lack of equal opportunities. Hence Social Inclusion, or the effort to ensure equal opportunities in terms of access to education, employment, and social, economic and political activities, so that individuals will have the capacity to improve their life’s chances, was seen as the way forward. Therefore social integration was teamed with economic development with the objective of achieving social development. This is evident with states such as Sweden<sup>213</sup> and Mauritius<sup>214</sup>, and also in the case of Tanzanian experience of social integration<sup>215</sup>, among many others associating social integration with sustainable development and economic empowerment respectively in the drawing up of their policies for social integration<sup>216</sup>.

While there is little discussion at the Copenhagen Summit in relation to conflicts, subsequently discussions regarding post war and post conflict situations have used social integration and social cohesion as a key objective for rebuilding societies. Social cohesion is defined as: “Social cohesion is based on the willingness of individuals to cooperate and work together at all levels of society to achieve collective goals. (Jeannotte et al., 2002:3)”<sup>217</sup> The importance of social integration which is a process and social cohesion the end result of such a process is in its potential to address the problems

<sup>212</sup> Report of the Expert Group Meeting “Promoting Social Integration” 8 – 10 July 2008

<sup>213</sup> Summary: A Swedish Strategy for Sustainable Development – Economic, Social and Environmental, 2003

<sup>214</sup> Taken from: <http://www.gov.mu/portal/site/socialintegration/menuitem.ca3bcd6106000349c18d5c10a0208a0c/>

<sup>215</sup> Arusha Conference 2005, Samuel Wangwe “Culture, Identity and Social Integration: The Tanzania Experience in Social Integration”

<sup>216</sup> Economic and Social Commission for Asia and the Pacific: “Strengthening Policies and Programmes on Social Safety Nets; Issues, Recommendations and Selected Studies , UN Paper

<sup>217</sup> Jeannotte, Sharon M. for Expert Group Meeting, July 8 -10 Helsinki, Finland, Promoting Social Integration – A brief Examination of Concepts and issues

associated with social exclusion. Social exclusion is a result of a lack of distribution<sup>218</sup> of and thereby the lack of access to resources necessary to improve social mobility and life chances. Exclusion from distribution is a result of poverty, which social policies generally address, but it is also a result of discrimination, where an individual or community is excluded from enjoying certain rights because of particular characteristics. The state has an important role to play addressing these shortcomings through its policies. According to Sojo, the efforts of the government, market, families and communities can improve the distribution of resources. Because of taxation and public expenditure, the government's responsibility is the greatest<sup>219</sup> compared to the community or individual responsibility in achieving social cohesion.

All societies have division and potential division which causes strains and stresses, which makes it difficult for a society to be fully cohesive<sup>220</sup>. It is more a goal to strive for, whereby a cohesive society has developed satisfactory methods of handling strains in an open and democratic manner<sup>221</sup>. To this end rights and duties lay a foundation for the policy. Rights and duties are two sides of a coin – the right is respected by the upholding of duty, bringing in the moral element in the implementation of any policy<sup>222</sup>. This also brings in the challenge of freedoms that can be legislated for or political freedoms; and what cannot be legislated for or moral freedoms<sup>223</sup>.

In development and policy discourse, the right-based approach tries to tackle this challenge by stressing on rights holders and duty bearers. According to Gneiting (2009), all citizens are viewed as equal and with rights, while the state has developed its capacity as a duty bearer to provide services for all citizens to achieve wellbeing<sup>224</sup>. Recognizing that, especially the poorer states are unable to fulfill such obligations, the focus is on developing governance or the capacity of the state to delivery services to the people regardless of difference removing discrimination and the experiences and

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<sup>218</sup> Sojo, Carlos, Presentation: Social Development, Integration and Public Policies in Latin America

<sup>219</sup> Sojo, Carlos, Presentation: Social Development, Integration and Public Policies in Latin America

<sup>220</sup> Jansen, Jane, Defining and Measuring Social Cohesion, Commonwealth Secretariat and UNRISD, 2010

<sup>221</sup> Jansen, Jane, 2010 Defining and Measuring Social Cohesion, Commonwealth Secretariat and UNRISD

<sup>222</sup> Chandraratne, Donald, Making Social Policy in Modern Sri Lanka, Vijitha Yapa Publications, Colombo 2003

<sup>223</sup> Chandraratne, Donald, Making Social Policy in Modern Sri Lanka, Vijitha Yapa Publications, Colombo 2003

<sup>224</sup> Rights based approach to Development

[http://en.wikipedia.org/wiki/Rights-based\\_approach\\_to\\_development](http://en.wikipedia.org/wiki/Rights-based_approach_to_development)

consequences there off. Many middle income states however, have applied the rights based approach in social policies via social guarantees and have had much success<sup>225</sup>.

The rights based approach focuses on the following elements:

1. Defining and communicating rights, entitlements and standards to which citizens hold the state accountable for the delivery of services.
2. A commitment to uphold the same rights, entitlements and standards in an equitable manner for all.
3. A mechanism for addressing issues relating to the inability to access entitlements and social minimums<sup>226</sup>.

The advantage of taking a rights based approach in a national policy on social integration is that the people become vested in the process, and have the right to stand up for what is required for their wellbeing. The people will hold the systems responsible and not individuals thereby strengthen the systems which are proactive in promoting integration.

In order to strive towards the goal of social cohesion through the process of social integration via a rights based social policy, the factors relating to the process is as important as how the process run. The consequences that policies have on the individuals, communities and the state makes it imperative that marginalizing individuals and communities need to be identified and addressed.

A consociation model<sup>227</sup>, looks at who is to be included in the process, and refers to a consultative process of policy formulation which emphasizes achieving political stability without assimilation through a cooperative approach. This cooperation at the starting point creates loyalty and a popular movement towards the long term implementation process. When discussions are held on all levels of Sri Lankan society it will be apparent if the initially identified issues are relevant. In order for this to be achieved, the policy formulation process needs to be a transparent, participatory and inclusive,

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<sup>225</sup> Rights based approach to Social Policy

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEV/0,,contentMDK:21504953~pagePK:64168445~piPK:64168309~theSitePK:3177395,00.html> accessed on July 1, 2011

<sup>226</sup> Rights based approach to Social Policy

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEV/0,,contentMDK:21504953~pagePK:64168445~piPK:64168309~theSitePK:3177395,00.html> accessed on July 1, 2011

<sup>227</sup> Chandraratna, Donald, Making Social Policy in Modern Sri Lanka, Vijitha Yapa Publications, 2003



on national, district and community levels. On this basis the issues that are confronting marginalized individuals and communities can be identified in order that the necessary rights can be framed to ensure social protection and human dignity.

In addition to this an integrated approach must be adopted; whereby the existing legislation, policies, frameworks and action plans relating to social integration can be brought together in a single policy. The advantage of this is that social integration is approached in a systematic manner as opposed to an ad hoc manner. An integrated approach towards policy formulation would also allow for a system of monitoring and evaluation which in turn would permit government institutions to evaluate the strengths and weaknesses of activities aimed at achieving the right degree of social integration and the impact assessment time to time to evaluate the progress.

Conflict states are viewed as a 'crisis state'<sup>228</sup>, in that, especially in the case of civic conflicts, it is seen that government lacks legitimacy in some areas and the other related issues of exclusion based on the identity of individuals and communities. Crisis states also refer to states that have their institutions weakened by military operations and fragmentation of citizens. In Sri Lanka while public institutions were not destroyed, and public administration intact even the height of war, there needed to be a strengthening in the delivery of services in particular in the North and East where language was one issue among others marginalizing individuals and communities. In addition, infrastructure that was destroyed during the conflict needed to be rebuilt in order that networks could be created and sustained for trade and other types of interaction. This needed infrastructural development is in progress but as noted in the Time magazine: "The end of Sri Lanka's civil war has seen a resumption of business, both big and small, in the Tamil heartland. But much more must be done to bring the area back to the national fold" (Perera, 2010:30)<sup>229</sup>.

However, economic integration is only a single aspect that needs to be addressed. The contentious issues such as languages rights, common identity for Sri Lanka which respects the identities of the multiple communities living together in Sri Lanka, the changing of attitudes and mindsets that perpetuate ideas of a Sinhala or Tamil nationality to that of a Sri Lankan, and also the handling of the events stemming from the war and conflict must be responded to, in order the dignity of all Sri Lankans are respected.

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<sup>228</sup> Report of the Expert Group Meeting "Promoting Social Integration" 8 – 10 July 2008

<sup>229</sup> Perera, Amantha, Profiting from Peace, Time Magazine September 13, 2010

A national policy on social integration should respond to all these ideas, as well as reflect the needs of all citizens into a national fold through social integration. To this end, the policy should apply the social integration concept in a manner in which it includes and transcends both economic and national integration. Social integration is viewed as an active process of creating a cohesive society. In order to achieve this, following elements were identified for the content, as needing particular attention and synthesis, in the course of academic and policy level discussion:

**Economic:** to create conditions for social justice and to address matters of livelihood security and support networks, within which opportunities can be taken advantage of by all Sri Lankans.

**Education:** to create a system that includes multi-language proficiency, sports and extra-curricular activity, a balanced evaluation of history and civic and value education that socializes children to understand, respect and honour diversity and difference.

**Public / Socio-cultural:** to recognize and include identities of Sri Lankans within and outside of Sri Lanka, and to utilize the media to transform attitudes of individuals and communities.

**Reconciliation:** to remove mistrust, build trust and address trauma and socio-psychological mislocation with a system for identifying and mainstreaming disadvantaged groups and individuals; by promoting human rights and responsibilities.

**Justice:** to create confidence and trust and to ensure justice is served with the respect of individual rights to eliminate the tendency to resort to extra-judicial measures.

**Security / Defense:** the military's role in the ending of the conflict and subsequent contributions to peace building, development activities and other nation building activities through civil military relations will provide invaluable information and experience on the issues and elements to be addressed.

**Environment:** primarily two aspects need to be addressed: handling the human cost of environmental disasters and respecting the environment when implementing development programs.

**Political:** social integration requires a broader vision than national integration. The Government has to reach out to those with a real or imagined feeling of alienation and isolation, to create a sense of

belonging. A visible political leadership should be encouraged in the national, provincial and local level in formulating the policy framework.

In addition to the above elements, the following cross cutting themes are also necessary to ensure that the inclusion of all Sri Lankans regardless of difference, ability and capability: gender, youth, Diaspora, disabilities and media.

One purpose of addressing social integration in the manner is also to address the causes of conflict, and cause of an exclusive society is discrimination, the unjust and prejudicial treatment of a community. The purpose is not to only address social integration in Sri Lanka as a process of conflict transformation but also to recognize the problems faced by special interest groups which have the potential to marginalize and exclude. In addition this would garner the ability of some groups such as women and youth to promote social cohesion. The relevance of these elements is significant only if these same elements are identified as relevant during the course of the broad based consultative sessions.

### **The Study and Findings:**

Three public forums were held in the Ratnapura District, Divisional Secretariat of Godakawela, Imbulpe and Ayagama as afforsaid in identifying the issues and elements. The stakeholders invited to the sessions were the Grama Niladaris, Grama Sanvardhana Niladari, Samurdhi officials and Public Health Inspectors, Women's Affairs Officers, Buddha Sasana Affairs Officer, Social Development Officers, Census and Statistics Officers, Social Services Officers, Plantation Development Officers and other officials working in the Divisional Secretariat.

The objective of the meetings was to understand the need for a policy, identify the issues that marginalize individuals that need to be addressed in the policy and priorities interventions to eliminate marginalization. The purpose of speaking to officials at Divisional Secretariats was that they were identified as the first point of contact for the public in trying to readdress the problems affecting their lives and wellbeing.

One of the first ideas that were noted was that there is little confidence in policies, because of non implementation, and / or unfair implementation. Therefore it is important to build confidence in the people that this policy on social integration or any policy in that matter, will not end in the same

manner, even in the course of the formulation process. And in all three meetings, the participants highlighted the need for a participatory and a consultative approach in the policy formulation process to ensure the inclusion of all Sri Lankans and to feel part of the process. The discussants also felt that the policy should enshrine the idea of equality, and rights based approach whereby all citizens are treated as equal in the implementation without favoritism –whereby what is right is appreciated and what is wrong is punished. The policy must be practical for implementation, re iterated by all. One way to garner support for the implementation of the SI policy is to motivate people to own the process, by including their input and there after addresses their needs.

A major issue identified in all three sessions was the issue of Birth Certificates and in particular stating of ‘Indian Tamil’ as ethnicity. Each session had unique testimonies of the experiences regarding such a problem. In Godakawela, a Grama Niladari’s sister could not get a job because she could not provide the citizen ship certificate within a day as her birth certificate stated as “Indian Tamil”. Another such incident was at Imbulpe where the Grama Niladhari narrated the story of a 22 year old boy who cheered the Indian team during the 2011 World Cup because it was stated on his birth certificate that he was an ‘Indian Tamil’. This problem is particularly acute in Imbulpe where there are a greater number of estate workers. There were also stories of change, where in Ayagama, the officer in charge of collecting census information requested that the category Indian Tamil not be included and hoping that the change would accept by the government. A small triumph no doubt, but an important recognition of Sri Lankan identity and inclusion, and this change will prevent the further marginalization of a community very much as part of the economic fabric of Sri Lanka. The issue of registration and identity was identified as a marginalizing factor that disintegrates.

Another marginalized group and hence a special interest group that must be addressed was that of the girl child, under aged unregistered “marriages” and their off spring. In Ayagama this was especially acute, where children as young as 13 -14 were having children. As a consequence of the lack of education, it was noted that these babies were neglected especially in the case of failures of such marriages, also there were more babies born with congenital defects. Heavy alcoholism and domestic violence was also reported in all three divisions. In relation to the breakdown of the family support system, other issues were highlighted in Imbulpe, where elderly parents were not getting the care that they needed, and in Godakawela, where mothers of young children were increasingly trying to go abroad for employment, so much so that a Grama Niladari repeated advised those who came for documents, who had young children, before commencing the paper work. This amounts to issues

relating to the breakdown of the family or one socializing institution of the child, which has the potential to exclude individuals from taking advantage of opportunities later in life.

It was also noted that the programs run on television to create awareness of rights etc, if at all it happened, were ineffective because of the times at which they were scheduled and also because of the content of other more popular programs were sometimes contradictory, and not enough emphasis was placed on the rights of the children and women or promote social cohesion. Hence it was also suggested that the media be used to create awareness and also to bring people together, ensuring that everyone has the space to live with dignity and assured rights and clarified responsibilities.

In Imbulpe, roads in poor condition further isolated the estate workers, who would have to walk long distances to reach schools, for groceries, which also limited the chances of social interactions. This factor was particularly acute in the case of access to health care, especially in the case of pregnant women and infants.

Besides these broad based issues, other important elements were identified in the process of creating social cohesion and coexistence. Teaching and learning Tamil was seen as essential to increase communication and social networks between peoples and regions, and also provide greater access of services to the Tamil speaking Sri Lankans. Education was seen as the way to change people and as such it was important to mould children who would make the important difference. Education and awareness was also important for attitudinal changes of all ethnic communities – these areas where ethnicity was not deemed to be a divisional factor it was apparent that certain hurtful stereotypes were held. Economic marginalization meant additional issues such as lack of nutrition and poor health; hygiene related issues such as lack of toilets and proper drainage and access to common amenities such as electricity and water, especially acute in the case of clean drinking water, which leads to a further cycles of poverty, disease and marginalization. Human security factors were also highlighted in relation to the estate sector. The political culture was also noted as a divider. In Imbulpe political factors were not a major issue, but it was felt that this was because of the low voter turnout (another consequence of poor roads).

Landslides and floods were frequent in Ayagama, and as such the people had developed systems by which to face such disasters – but again it must be stressed that there are issues that should be addressed in relation to such dislocations.

Religion was identified as an important connector, with all communities observing the respective ceremonies and festivals and had stories to tell as to how the communities have brought together. However, it was also felt that estate workers were also marginalized by religious institutions. In relation to the ethnic conflict, all three places felt that they were not as affected by the conflict because of the close relations between the different ethnic groups, however they did stress the importance to learning all languages in order to facilitate closer relations through interactions. Despite this professing of solidarity, also evident was the experience of marginalization due to attitudes of people. Stories were narrated in this regards as personal experiences and commonly agreed that one way or the other some others too have gone through same stigma in public.

What was most encouraging was the participants commitment to the jobs and the responsibilities there of. Each was doing things which they thought was best resulting in an overall ad hoc manner of addressing social issues affecting the fabric of Sri Lankan society. A national policy for social integration will no doubt give their efforts the much needed backing through mechanism and resources.

The above findings verified the approach embarked was on the right directions and the issues and elements identified through pre consultative process in Colombo was adequate. However further discourse and dialogue in other district will enrich the policy formulation process and the policy based on those findings will lead the nation to a better cohesive society for all. To quantify the above findings, a questionnaire was prepared and will be collecting data from a sample of each DS division<sup>230</sup>.

Sri Lanka has many policies which relate to social integration, in particular the current Constitution and the Act on International Covenant on Civil and Political Rights<sup>231</sup>. In addition to this many Ministries have policies deal with social integration in relation to their own mandate, for example the Ministry of Social Services have a policy relating to the people with disabilities which is aimed at providing the institutional and infrastructural framework which would permit the full participation in the mainstream of people with disabilities. However, all these policies don't deal with the social integration holistically which is what is necessary in the current context of Sri Lanka. It is also important that these policies be included to prevent any overlap or contradictions; a single reference point of rights and duties.

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<sup>230</sup> The survey is still being conducted

<sup>231</sup> Noted at discussions by the Legal Aid Commission.

## Conclusions

In formulating a policy on social integration for Sri Lanka the following are very crucial of its success:

- The identified elements: political, economic, justice, education, environment, security / defense, socio-cultural / public, and reconciliation, and the cross cutting themes were seen in Godakawela, Imbulpe and Ayagama as importance elements that needed to be addressed in a policy on social integration.

The issues that excluded individuals and communities and had the potential to disintegrate societies were:

- The lack of infrastructure such as roads means of transport which isolated communities and prevented interaction.
  - Inability to speak Tamil, and also the lack of resources such as teachers when trying to learn Tamil.
  - Attitudes which marginalize: the adults felt that it was too late for them to change and that the children must have proper education which will address this.
  - The breakup of the family and family support system in the pursuit of economic security.
  - The legal framework relating to registration which marginalizes individuals.
  - Religion providing a normative framework for social integration.
  - The importance of impartiality in the dispensing of justice
  - Political system and interference dividing individuals and communities.
  - Environmental disasters which temporarily disrupt the lives of people.
- The consultative process was also endorsed by the participants verbally. In addition any initial reluctance towards “another policy” was removed in the course of conversation further illustrating that the objective of motivating people towards the implementation of policies is possible by involving them in the process of formulation.
  - The rights based approach, along with the making people aware of said rights, as well as the fair implementation in the fulfilling of duties and responsibilities.
  - Integrating all existing policies pertaining to social integration so that there is an integrated as opposed to an ad hoc approach to creating social cohesion.

- A mechanism for monitoring the success of programs so that activities can be designed to ensure maximum effect.

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## **Education as a tool of ethnic integration: Are we successful?**

*Harsha D. Wijesekera*

*"People would like to see our race problem disappear. And the way they think it's going to disappear is by not talking about it. But the real way you make it disappear is by talking about it, learning about it, and understanding it, and then you'll see a change, not just by ignoring it."*

*– a 12th grade student (Henze 2000)*

### **Introduction**

Sri Lanka is a multi-ethnic country. Its population was estimated at 18.7 million in 2001. According to the Census of 2001, the Sinhala population constitutes 74.5%, Tamils, including Indian Tamils, constitute 16.5% of the population and Muslims 8.3%. For about three decades Sri Lanka had to fight against terrorism that originated from ethnic chauvinism. Though terrorism was defeated by the Sri Lankan forces in 2009, the government of Sri Lanka accepts that the issues pertaining to conflict should be resolved through democratic means.

The history of the conflict goes back to an era even before the independence. However, the emergence of ethnic chauvinism in the post-colonial era is the period during which the real conflict began to show its ugly appearance. This was due to 'Sinhala' bigotry among the segments of majority community where they tried to define Sri Lankan society as 'Sinhala-Buddhist' which was later used by Sinhalese politicians who resorted to intraethnic outbidding as a means to attain power (De Votta 2007). Similarly, elite Tamil politicians used Tamil chauvinism to grab political power. This resulted in systematic ethnic segregation in the country thus creating 'Sinhala Nationalism', 'Tamil Nationalism' and even 'Muslim Nationalism'. The growth of this consciousness badly impinged on the national 'Sri Lankan' identity.

### **Education, Language and Ethnicity**

"Every education system has the potential either to aggravate the conditions that lead to violent conflicts or to heal them" World Bank (2005). Sri Lanka provides a good example for the former. For instance, since the colonial era the local school system was separated along social status and ethno-lingualism. This was evident in the three tiered school system that existed under the British; viz: English medium, bilingual and vernacular schools (Kandiah 1984); those who attended fee levying

English medium schools were offered white color jobs. Interestingly, Tamils had more opportunities for English medium education as a result of establishing missionary schools in the North and East. This eventually resulted in over-representation of Tamils both in higher education and public service. Thus non-elite rural Sinhalese majority felt discriminated and this frustration generated ethno-based nationalistic chauvinism among the Sinhalese. Consequently, they won the demand to make Sinhala Language the official language of the country with the help of shortsighted politicians, which limited the number of Tamils employed in the government sector in contrast to the domination they enjoyed over the Sinhalese under the British. The situation was refueled by the introduction of ‘policy of standardization’ in 1972 that allowed underprivileged Sinhala students to secure places in universities on proportionate representation. However, the minority Tamils felt this to be a great injustice and thought that they were systematically being marginalized by the majority Sinhalese (Ross and Savada 1988). Furthermore, Free Education Scheme introduced in 1945 mainly facilitated undoing the class segregation not the ethnic segregation since a large number of schools happened to be ethnically exclusive or monoethnic as the school system got away with ‘English medium’ compelling Sinhala children to attend Sinhala schools and Tamils to Tamil schools.

### **National Curriculum**

National Curriculum plays a vital role in promoting positive interethnic relations by inculcating the idea of unity among diversity dispelling prejudice, discrimination, racism and ethnocentrism. However, during the first few decades after the independence, the curriculum seemed to have not taken this important aspect into consideration. This is especially evident in centrally written textbooks prescribed in the country’s education system, which appeared to be more harmful than enriching the ethnic unity because in most instances, they depicted ethnically biased negative ‘facts’ about minorities (Bannon 2003). Indeed many observers argue that the curriculum planning dominated by the majority ethnic group in Sri Lanka was a key reason for the acceleration of the violent terrorism. In this regard Perera et.al (2003) stresses the importance of “reaching consensus on some of the fundamental and most sensitive issues such as ‘whose history, selected by whom, and for what purpose’ where they present the idea of having regional variations in the curriculum to match the aspirations of respective communities. Adding to this the teachers who handled those textbooks have no knowledge and training to meet the challenges of a multiethnic society as teacher training courses have failed to cater to this need (WB 2005).

Producing negative attitudes, values, and social relations underlying civil conflict and violence is less well understood by the policy makers in the education systems of many countries which face violent combats World Bank (2003). Similarly, as discussed, in Sri Lanka too education has its partly contribution to linguistic nationalism that gradually led to a disastrous ethnic conflict where Tamil youths began to mobilize and demand for separate state, backed by the Tamil power-greedy politicians. In fact, the issue of equity in education became a highly symbolic rallying point and a key tool in the recruitment of Tamil terrorist cadres (Bannon 2003).

The political solutions brought so far before the general public by the Sri Lankan governments in power were opposed by the majority including the minorities, because people perceived them as threats caused by mistrust, wrong attitudes and perceptions. It was mainly due to failure to have the correct 'mindset' in the people to accept a political solution that respects pluralism. This situation can be attributed to education and its failure in instilling value of social cohesion to build 'social capital' in an ethnically diverse society (World Bank 2005). In fact, Tawil (2003) stresses, there are three key factors that relate national curriculum and conflict as

- Languages and medium of instruction
- Standardized curricula that plural societies maintain, a "fictive image of cultural homogeneity
- Perceptions of bias or exclusion in the curriculum"

This is quite evident in Sri Lanka. Wickrema & Colenso (2003) say, Sri Lanka "...offers the most vivid example of curriculum changes serving as an explicit issue in conflict, where a shift in medium of instruction to the national languages in the 1950s and 1960s "...resulted in fewer opportunities for interaction between Sinhalese and Tamil children and youth. Divided by language and ethnicity they increasingly lost the ability to communicate with each other, leading to alienation and mutual suspicion (p. 5)". Therefore, as stressed by Bannon (2003) it is of paramount importance that any national education curriculum in a multicultural nation should

"...consider how diversity is represented in the content of teaching, in the choice of language of instruction, in the modes and content of teacher training, in pedagogical practice, and in the stereotypes that textbooks and reading materials convey, explicitly and implicitly."

## **Present Context**

The National Education Commission was established in 1991 with the mandate of advising the legislature on a stable policy on education so as to eliminate disparities. It recognizes nine National Goals which extend beyond the formal education of a child, of which three are directly aimed at creating cohesion and nurturing of a continuous sense of deep and abiding concern for one another among different ethnic groups in the country (NEC 1992). The reforms emphasizes on overhauling the whole system where an attempt was made to maintain equality in education with the idea of inculcating a widespread brotherhood and mutual trust among the people of many ethnic groups, religious faiths (NEC 1997). The report stresses that "...responsibility for value education rests firmly on the shoulders of the principal, the teachers and adults in the child's environment." Hence, it is very clear that schools are expected to play a vital role in inculcating values and attitudes towards ethnic cohesion in the country. As such, in 2003 the NEC introducing National Framework on General Education in Sri Lanka proposes promoting Peace Building, Civic Values and Social cohesion through education using a number of strategic innovations. (Refer NFGE 2003).

Today, in the post conflict era there are more opportunities to have the correct 'mindset' leading to confidence-building and agreement that enhances mutual trust amongst people provided that the correct attitudes are inculcated in the children using education. In fact, the European Council (2005) stresses that the only way to combat terrorism is intercultural education promoting democracy in schools and thereby create a 'sense of solidarity' among people living together in the same community, irrespective of their cultural backgrounds and ethnic groups. Therefore, it is quite apparent that one of the main 'Challenges in Post Conflict Sri Lanka' is to heal the wounds of all groups by promoting civic attitudes and action in schools where human rights are respected irrespective of cast, creed, race, etc. Having recognized this, NEC (1997) introduced National Goals of Education where democracy and citizenship concepts have been integrated in a number of ways into curricular while emphasizing the significance of co-curricular activities so that what is learnt could be practically used.

### **Research Objectives**

The present research attempts to find answers to the following questions:

1. Are there differences in enrollment, attendance and outcomes such as performances in general examinations, among different ethnic groups?

2. Are there differences or variation of perceptions and values pertaining to attitudes: readiness to accept equal rights, diversity, in different ethnic groups that positively or negatively contribute to social inclusion?
3. What further steps be taken to change attitudes, practices, etc towards a more cohesive and democratic environment in schools and thereby promote pluralism in the country?

## Research Design

**Research Context:** A ‘multiethnic school’ was selected, assuming that multiethnic schools provide opportunities for more interaction between the students of different ethnicities. The students were representative samples of Tamil, Muslim and Sinhala randomly selected from the Advanced Level section representing Mathematics, Science, Commerce and Arts streams, which comprised 70 from each major ethnolinguistic group whose average age was 17 years. All these students have studied Social studies, History which directly has lessons on democracy, human rights, pluralism and indirectly in other subjects such as English Language. Teacher sample was a representative sample comprised 55 graduate teachers in the Advanced Level Section.

1. From majority ethnic group : 40 teachers (18 male/22 female)
2. From minority : 15 teachers (11 Tamil/04 Muslims)  
(10 male/05 female)

## Collection of data

To collect data, four separate questionnaires for Sinhala, Tamil/Muslim students, Sinhala and Tamil/Muslim teachers were administered. In preparation of questionnaires, opinions reflected at informal discussions with two teachers and students from each ethnic group were utilized. Each questionnaire comprised 14 multiple or binary questions and one essay type. Unstructured group discussions were conducted where necessary for clarifications. The objective of using multiple choices was to safeguard the objectivity and anonymity of data so as to facilitate expressing of real feelings. Before administering the questionnaire, students were briefed on the importance of the research, their contribution and also the value of being frank in answering the questions. Furthermore, each question was explained by the writer and she was present throughout the answering process for any clarifications by the students. In the case of Tamil classes another Tamil teacher was also present.

The data collected from the Muslim students in the Sinhala medium classes and in the Tamil medium classes were separately analyzed to trace any differences.

### **Teachers' Questionnaires**

Two separate questionnaires were administered among the teachers of majority ethnic group and teachers of minority ethnolinguistic group. However, Tamil teachers were reluctant to respond for unknown reasons. Hence, the writer was compelled to exclude the minority teachers from the present survey.

## **Findings and Discussion**

### **Question 1**

*Are there differences in (i) the enrollment (ii) performances in public examinations (iii) participation in management (staff & students) among different ethnic groups?*

(i) Enrollment: The sample school in this research provides a very good example for what is found in literature: “multiethnic schools tend to remain largely ethnically exclusive in terms of enrolment, etc.” In spite of being a ‘multiethnic school’ the majority ethnic group represents 86% of the student population in contrast to 14% of minority students. However, interviews revealed that no proportionate enrolment procedure is followed in enrollments. It was also revealed that number of Grade-I Tamil Medium classes has not increased in parallel to Sinhala medium classes that increased from one to eight whereas Tamil medium classes remain at two. On the other hand, the disparity in number of classes further increases from Grade 6 where the Sinhala Medium classes increase up to fifteen while number of Tamil Medium classes remains the same. It was revealed that even though the mother tongue of Muslim students is Tamil, they prefer to have education in the Sinhala Medium or English Medium. It was also evident that enrollment of Muslims continues to increase in the past few years which might be a result of increasing Muslim population in the district.

(ii) Performance in the Public Examinations: However, analysis of GCE (A/L) exam performances shows that there is no much difference between different ethno-linguistic groups as far as the percentages of student passing rates are concerned. For instance, the passing rates of Tamil medium and Sinhala Medium are almost equal.

(iii) Participation in School Management: The positions at management and supervisory levels are predominantly held by the majority race. In fact, in the 173 long history of the school, it has never

had either Principal or Vice-principle from any minority group other than the British who served before the independence. It is also evident that the majority ethnic group greatly dominates the minority in relations to student leaders: Senior Prefects and Stewards. Hence, on the whole, it is clear that in spite of being ‘multiethnic school’ this school verifies opinions depicted in the literature review i.e. “multiethnic schools tend to remain largely ethnically exclusive in terms of management, policy making and enrolment, etc.” even though any significant difference in academic achievements of different ethnicities is not traceable.

## **Question 2**

*Are there differences or variation of perceptions and values pertaining to attitudes: readiness to accept equal rights, diversity, in different ethnic groups that positively or negatively contribute to social inclusion?*

### **Sinhala students’ perceptions on their interaction with minority students**

Students’ perceptions of the majority ethnic group show a clear difference between how they interact with Muslim and Tamil students. For instance, only 46% has Tamil friends whereas 93% has Muslim friends. On the other hand, 75% of Sinhala students believe their Muslim friends are trustworthy while only 50% of them think their Tamil friends are trustworthy. This difference can be attributed to the fact that the Sinhala students get more chances to interact with Muslims as they have Muslims in their Sinhala medium classes.

### **Sinhala students’ perceptions about how they feel in front of the minority students**

Positively 66% and 71% of students feel no difference in front of their Tamil and Muslim colleagues respectively. However, it was noted that the rest of the opinions reflects negative feelings which can be calculated into 33% in relation to Tamil students and 29% in relation to Muslim friends, which is not conducive to have very positive social interaction between the majority and the minority within the school.

### **Sinhala students’ perceptions on equality among the different ethnicities in the school**

The data revealed were interesting and contradictory. Even though 90% believe that all ethnic groups are treated equally in the school in responding to question more specific questions, only 59% accepts that Tamils are equally treated in the school while 79% believe that Muslims are treated equally in the school. This situation is not very positive because it is the students who belong to the majority feel that minority students are not treated equally, not the minorities themselves whose perceptions on this

regard can be far more negative. Moreover, 33% believe that they should enjoy more rights in the school than the minority students. This superiority complex is completely in contrast to what they learn in the core curriculum. Interestingly, even 18% of majority students have felt that they are unfairly treated within the school because of their ethnicity, which cannot be attributed to any reason according to the prevailing realities in the school. But interviews with some students revealed that they were discriminated in some instances such as sports when the ‘authorities’ are from another ethnicity. In addition, 76% of the majority students have understood that the school does not have enough activities to develop intercultural understanding between the different ethnic groups in the school.

### **Sinhala students’ willingness to share power**

It was evident that majority students do not like ‘leaders’ from other ethnic groups and it also seems that higher the position more the dislike. Hence, it is clear that the majority students are not ready to share power with the minority especially at the national level.

### **How Sinhala students prefer to identify their school and their identity**

Quite optimistically 83% of students of the majority ethnic group accept that the school is a multiethnic school. Similarly, 83% of the students prefer to be called as ‘Sri Lankan’ which is a positive perception. But substantial percentage (17%) prefers to identify themselves as ‘Sinhalese’.

### **Analysis of Data - Tamil/Muslim Students**

### **Minority students’ perceptions: interaction between them and Sinhala students**

The data clearly shows that there is a difference in social relations between Muslim students in Tamil medium classes and Sinhala medium classes where 100% Muslims in Sinhala Medium classes admit they have Sinhala friends in contrast to the Muslim students in Tamil medium classes which is 50%. This again proves that the more chances that they have to interact with the students of other ethnicities the better understanding they gain. Moreover, it is interesting to see the contrasting perceptions that the minority students have with that of the majority students. For instance, only 46% Sinhala students say that they have Tamil friends, but quite contrastingly 77% Tamil students say they have Sinhala friends. This may be due to the lack of willingness to accept Tamil students as their friends, which may have been resulted from ‘perceived superiority’ they have internalized being the advantaged racial group over the others (Helms 1990 depicted in Ma 1997). Likewise a greater number of minority students has positive perception on trustworthiness of the majority students which is 65% whereas only 45% of Sinhala students believe Tamil students as trustworthy. This also shows



that it is mostly the majority who cannot or rather unwilling to reach out minority students. Unfortunately, the responsibility of healing the wounds of discrimination of minority lies on the hands of majority, by respecting minority right to have equal rights irrespective of any difference. Hence, it appears that what the students learnt in the curriculum has failed to promote social cohesion among.

### **Minority students' perceptions about how they feel before Sinhala students**

Moreover, a larger segment of minority students feel no difference in front of majority Sinhala students which is a positive factor. But, it is also evident that 40% of Tamil students and Muslim students, quite a large segment, do not feel comfortable with the majority Sinhala students, which is not a favorable situation.

### **Equality among the different ethnicities in the school - minority students' perceptions**

65% of the Tamils students accept they are equally treated in the school whereas a lesser number of Muslim students i.e. 62% think similarly. Furthermore, 72% Tamil students believe that the school does not conduct enough extracurricular and co-curricular activities to promote interethnic understanding. Students' responses revealed that the present situation in the school is not contributing much to have good relationships between different ethnic groups in the school. For instance, only 44% believes they are well represented in clubs and societies common to all ethnic groups. Hence, there seems to be a lot of space for improvements. On the whole, where the responses of the Muslim students in the Sinhala medium are compared to that of Tamil medium it is very much noticeable that the latter have much more positive perceptions than their counterparts. This again proves that much more the students of different ethnic groups interact with each other there is better understanding/tolerance among them and also 'knowing' the facts will have less positive outcomes unless there is opportunities to practice what is learnt, among the different ethnic groups.

### **Analysis of Data: Teachers of the majority ethnic group**

#### **Sinhala teachers' perceptions on their interaction with Tamil/Muslim teachers**

The data revealed that the teachers of majority ethnic group have quite positive perceptions towards their colleagues who belong to minority ethnic groups. Yet the slight differences towards Muslim and Tamil colleagues are fairly interesting and unpredictable especially regarding the trustworthiness. They seem to trust Tamil colleagues more than Muslims. However, this may be due to the less

number of Muslim colleagues in the Advanced Level Section, so that there are fewer opportunities to interact with Muslims.

### **Willingness to share power**

According to data, the teachers of the majority ethnic group do not like to have ‘leaders’ from other ethnic groups and similar to Sinhala students’ opinions, the higher the position the more tendencies to be the dislike. Hence, it appears that the teachers of majority ethnic group do not like to share power equally with the minority groups, which can only be attributed to prejudice.

### **Teachers’ perceptions on Muslim/Tamil Teachers**

It is fairly positive that greater percentage of teachers from the majority ethnic group does not feel any difference before their colleagues of minority ethnicity i.e. 84% and 80% Tamil and Muslim colleagues respectively.

### **How Sinhala teachers prefer to identify their school and identity**

According to data, 31% of the teachers in the sample prefer to be called as ‘Sinhalese’ instead of ‘Sri Lankan’, which is fairly a large percentage. This is not a very conducive situation to ‘National Solidarity’. On the other hand, if the teachers who are supposed to promote inclusion and pluralism in students are this much chauvinistic it is questionable whether such personnel would be able to achieve the targets aimed by the national curriculum in achieving social cohesion.

### **Equality among the different ethnicities in the school – Sinhala Teachers’ perceptions**

According to the responses of Sinhala teachers, more than 90% believe that all ethnic groups should be treated equally and they are treated so as they accept that democratic governance prevails in the school. Yet, 30% believe they should have more rights than other ethnic groups. For they being the majority of the country it is not a very conducive situation in school and society at large, because they are the very same personnel who are supposed to ensure the ethnic equality and inclusiveness in the minds of students. When these responses are compared with the corresponding responses of Sinhala students the percentage happened to be more or less same i.e. 30% and 33% of teachers and students respectively. But, in contrast to views of Sinhala students on availability of extracurricular activities to promote interaction between the students of different ethnicities, 55% teachers believe that activities are enough whereas greater percentage of students i.e. 76% think that it is not enough. And 63% teachers also believe that the activities to promote intercultural understanding between the teachers of majority ethnic group and minority are not enough.

On the whole, it is clear that a greater percentage of teachers have more negative perceptions than the positive especially sharing equal rights with their counterparts from minority communities, which definitely affects the students' perceptions. This may be due the lack of proper understanding about the value of national solidarity, democratic values and the right of minority to be treated without any discrimination. The reasons for this can be the lack of proper teacher training with regard to the national issue and basic human rights.

### ***Some Responses of the Sinhala students to essay type question***

*"Even though there are many opportunities for us we do not use them due to the mentality of some of us. We like to be in groups of our own Tamil students".*

*"As we can associate with all ethnic groups in the school we have been able to work with different people with an open mind."*

*"In the school we have separate classes for Sinhala and Tamil. So we don't have chances to communicate with them. We don't know about their traditions. We even do not know each other."*

*"We mustn't have separate Sinhala Medium, Tamil Medium classes"**"Even though I feel there's no separation between Sinhala and Tamil people I think there's some kind of (I can't explain it) distance between us"*

*"We can solve this problem only when we (Sinhalese) are ready to accept a man from other ethnic group as the president of the country"*

*"It is quite normal in any atmosphere for a minority to feel segregated and extremist to take advantage of it"*

*"Definitely there is a division between Sinhalese and Tamils in the School. But there is no conflict"*

*"Within the school the most talented should be given the place. This should be common to both students and teachers, not other things like ethnicity."*

### ***Some Responses of the Tamil/Muslim students***

*"Because both can't speak the same language so they develop a bad opinion about others"*

*"A simple way to prevent the conflict in our school is maintain English as the main language in every meeting and every function where both communities take part"*

*"No solution until every Sri Lankan feel 'we're not Sinhala, Tamil or Muslim; we're Sri Lankan"*

*"We are treated unfairly in the school. I was knocked out and a Sinhalese boy was taken by the coach while I got enough points. Also my friend was into the team but he was not given a choice to play even a match"*

*“Tamil medium classes are given corners of the school. If Tamil medium classes are with the Sinhala Medium classes we can get more friends”*

*“They are not giving equal rights to Tamil boys. We can’t join in sports because they are treating Tamil language not equally.”*

*“We are not the majority of the country. Any how we like to get our rights equal to other ethnic groups. We also want a very good leadership to this country.”*

*‘In our school I feel most of the Sinhala boys do not differentiate Tamil boys. But teachers (most of them) blame us saying our ethnic group. Normally when you talk about ethnic was among Sinhalese all of them support and try to say that they are 100% perfect. But we, Tamils tell the right and wrong things in both sides.*

## **Conclusion**

The education reforms and policy changes have made an attempt to help the people of this country to be responsive to the national issue by fostering values of inclusion, equality, human rights, etc. However, the responsibility of achieving these does not lie only on policy planning, curricular designing, textbook writing, etc., but greatly in the hands of the school which is supposed to create an environment to practice what is learnt through good classroom practices as well as the extracurricular activities such as sports, clubs and societies, etc. However, as is evident in the findings of the present research such steps that the schools can take have been limited by the education system itself for schools being largely ethnically segregated institutions other than the few multiethnic schools available in Sri Lanka. The findings also prove that even the so-called multiethnic schools remain largely ethnically exclusive in terms of management, policy making and enrolment where dominant ethnic group enjoys more power over the minorities thus denying ethnic equality which may have mainly resulted by the limitation of enrollments to Tamil medium. However, quite optimistically it appears that this disparity has not affected the academic performance of the minority students as evident in the sample school.

It was also evident that the majority Sinhala community in the school (both students and the teachers) is not ready to share equal rights with the minority. This may have been resulted from ethnic prejudice which is detrimental to have genuine ethnic cohesion or ‘national solidarity’ as a nation. It was also very much clear that there are differences in the perceptions between the Muslims in Sinhala medium classes and Tamil medium classes with regard to social interaction, trustworthiness of Sinhala students. This shows it is only when the students of different ethnicities learn together in the

same classroom using the same medium of instruction they have better understanding and respect for each other. In other words, this proves that the separation of students according to medium of instructions negatively impinged on their attitudes towards the other ethnic groups. Irrespective of the fact that students study in the same school, when they are separated according to the medium of instructions opportunities for practicing what is learnt in the curriculum are very few. Moreover, the findings of this survey clearly confirms that the concepts and theories introduced by the new reforms with the aim of promoting interethnic relations would not have much effects on the minds of children if they are not made to experience such concepts and theories practically in the teaching/learning process and trialing them in reality within the same classroom environment.

In brief, here the findings clearly show that the multiethnic environment in schools will not have much benefit unless the students of different ethnic backgrounds are made to work together in the same classroom. This clearly confirms what Wickrema & Colenso 2003) claim: the shift in medium of instruction to the national languages in the 1950s and 1960s “...resulted in fewer opportunities for interaction between Sinhalese and Tamil children and youth. Divided by language and ethnicity they increasingly lost the ability to communicate with each other, leading to alienation and mutual suspicion (p. 5)”.

Teachers play a very important role being the grassroots practitioners who take everything decided by the education system to the child. Especially, in an Asian culture like ours teachers can immensely help students to become more inclusive and pluralistic so that they are less likely to fall into conflicts. However, the findings of the survey suggest that teacher perceptions on diverse nature of Sri Lankan society and accepting the right of the minorities to live without any sort of discrimination are not positive enough for facilitating students’ learning to achieve a coherent and just society. Hence, it appears that steps taken so far by the education system to enhance social cohesion, democratic feelings, cohabitation, equality in the students as one of its goals are not bringing in the expected achievement levels due the faults in the system itself.

Finally it must be noted that this study is not without limitations. On one hand, the sample selected for this research is a ‘multiethnic’ school where the minority and majority groups get at least ‘some chances’ to interact with each other. Hence, the findings of the present research cannot be generalized as the perceptions and opinions of majority and minority groups of the country as in most cases these two parties do not get such chances when they are in monoethnic schools, which is the common practice of the country. When considering the findings of this research it can be hypothesize

that the perceptions of students in monoethnic schools could be far more negative towards each other, which deserves a comprehensive analysis.

## **Suggestions**

In view of all above the following suggestions are presented.

- Encourage students to offer Civics and Citizenship education in the G.C.E. (O/L) by making it a compulsory subject in the GCE (O/L) Examination.
- Promote bilingual or trilingual education starting from the lower secondary classes so that the children from different ethnic groups can study together.
- Arrange seminars and workshops for the Civics & Citizenship Education, History teachers emphasizing the practical side of the subjects not just the concept and theories. In other words, teachers should teach these subjects not only to the brains of the students but hearts so that they will practice what is being taught in the real life.
- Teacher development programmes be introduced to educate teachers on accepting the real nature of Sri Lankan society i.e. multicultural, multiethnic and multireligious and to promote respect for diversity and equality so that they can promote social cohesion by propagating such ideas in the tender minds of children
- Teacher professional development on lesson handling i.e. to help them in finding out the real aims of the lessons in the textbooks especially on how to utilize lessons to develop not only the cognitive and psychomotor domains but also affective domain that each and every lessons aims to achieve. For instance, through the theme 'Sharing and Caring' in the English textbooks teachers should understand that it is not only the development of English Language fluency that is aimed but also values and attitudes pertaining to that theme.
- Introduce innovative programs to develop a dialogue to promote national identity among the students of different ethnicities to minimize the ethno based identity

- Produce textbooks that enhance social cohesion and are sensitive to the different ethno-cultural aspects
- Make it compulsory to have brother/sister schools of other ethnicities in case of monoethnic schools and create opportunities for the students of these schools to interact constantly through various interschool co-curricular and extra-curricular activities.
- Introduce teacher exchange programmes between such schools to teach Tamil to Sinhala students and Sinhala to Tamil/Muslim students.
- Set up more ‘multiethnic’ schools where medium of instruction is English so that the students of all ethnic groups can learn together in the same class facilitating ethnic integration.

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**HUMANITIES, INTERNATIONAL RELATIONS AND LAW**

**TECHNICAL SESSION III: LANGUAGES**

Chaired by Dr. Mrs. Ratwatte

Director Post Graduate Institute of English Language, Open University of Sri Lanka

### **Summary**

*Extensive reading has been identified as a very powerful method to develop literacy in any language, but it cannot be promoted easily among post primary school children just by preaching about its applied linguistic virtues. The teacher in a setting directly affected by the long armed conflict may often be faced with the challenge as to how reading could be promoted among children traumatized by experiences of violence and insecurity. A paper on “Pedagogical Inputs in Promoting Extensive Reading in English Among Post Primary School Children in Conflict” by EA Gamini Fonseka focused on enhancing English through extra reading adopted through contextually designed methodology to select materials and the practicing methods. In coming to conclusions with respect to methodology, the author held that there is a need for taking the issue case by case, rather than using the same methodology in all cases. A scheme of extensive reading in English for a setting like that of the war-affected areas of Sri Lanka should involve carefully designed inputs. Accordingly, the author proposed to gather material that suits the post traumatic conditions and the needs of bridging gaps in the war trodden society aligned with English grammar and other language guides.*

*A paper on ‘Applicability of English Language Teaching Methodology in Teaching Engineering Subjects to Promote Active Learning’ by WCDK Fernando and HDBN. Indrarathne had its focus on the application of active learning methods in Civil Engineering classes. Its findings included several positive outcomes: improved absorption, higher levels of learning, improved engagement in learning, better communication and other soft skills and improved teacher-student relationship etc. and said that because of the improvement the student could avoid boredom too.*

*PHVR Karunananda presented a user friendly Sinhala phoneme grapheme conversion in Sinhala language proposed a computational modeling technique to use applied linguistics for speech recognition in a paper titled “Developing a Digitalized Phoneme to Grapheme Conversion Model for Sinhala Language”.*

*Another paper on Free and Systematic Variation in Second Language Learners’ Writings found that second language learners are initially at a primary stage called free variation, in which they use two or more forms to express one meaning. The learners then move to the next stage called systematic variation where they tend to adhere to a consistency of the relationship between form and meaning. However, it is evident that there is more free variation than systematic variation of errors in English writings in a group of intermediate level students. For example, they vary in using relative clauses, negative markers, definite articles and ‘to infinitive’. Absence of subject and shift of tense are other*

*common free variations. The findings are useful for language practitioners of English to identify what errors to correct and when to correct them since learners' errors are identified as developmental.*

*A Study on Primary School Students' Errors on Word Problems (T. Mukunthan) sought to identify the reasons for students' weaknesses in word problems using certain primary school students as a sample. The findings indicated that more than three quarters of students made errors in the first three stages i.e. before performing calculations, the reason being the lack of skills in the first language. Since, a single teacher is responsible for teaching both Language and Mathematics at Primary School such teachers should prepare the students to learn Mathematics during Language sessions.*

## **Pedagogical Inputs in Promoting Extensive Reading in English among Post-Primary Schoolchildren from the Conflict-Affected Territories of Sri Lanka**

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### **Introduction**

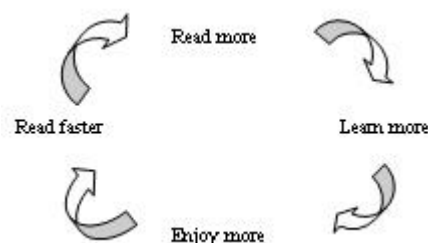
Although extensive reading has been identified as a very powerful method to develop literacy in any language it cannot be promoted easily among the post-primary schoolchildren just by preaching about its applied linguistic virtues. Adolescents are fundamentally drawn to various fun activities and among such activities extensive reading in general may occupy a least important position. Voluntary extensive reading in English can be even less significant in a list of fun activities prioritizing the delights of a post-primary schoolchild growing up in a non-English speaking setting. Compared to such normal conditions and circumstances, the teacher in a setting directly affected by the thirty-year long armed conflict may often be faced with the challenge as to how extensive reading could be promoted among a group of children traumatized by experiences of violence and insecurity. In fact a scheme of extensive reading in English implemented in such a non-English speaking setting should involve carefully designed inputs in enhancing grammatical knowledge, explaining vocabulary, guiding in taking notes and keeping diaries, answering comprehension quizzes, discussing experiences made while reading, narrating the reading contents, etc. Therefore this paper attempts to present a few guidelines inspired by Bell (1998) in streamlining pedagogical inputs in a carefully thought-out programme of extensive reading that concerns the post-primary schoolchildren from the conflict-affected territories of Sri Lanka.

### **Extensive Reading in Educational Life**

Extensive reading can be defined as an approach to language learning, including foreign language learning, developed by means of a large amount of reading (Day 2002). Unlike in intensive reading, which is considered legitimate in school settings in Sri Lanka and most other countries and in which all semantic, and even grammatical and syntactical contents are formally and consciously learnt, in extensive reading the learners view and review unknown words in specific contexts, enjoying a cognitive freedom to infer their meanings, and proceed in their acquisition of language (Maley 2009). The purposes of such reading are usually to seek pleasure, information, and general understanding (Prouse 2011). As such, extensive reading can provide exposure to extensive comprehensible language, which is highly beneficial for language acquisition (Krashan 2009). It also helps to

facilitate good autonomous reading habits and self-imposed motivation for reading. On the basis of these virtues of extensive reading, a rationale for establishing a system of extensive reading in a school setting can be developed by drawing inspiration from the cycle of growth by Nuttall (1996):

- the more they read, the more they learn
- the more they learn, the more they enjoy reading
- the more they enjoy reading, the faster they read
- the faster they read, the more they read



The key to the success of the progress depicted in this diagram is enjoyment, resulting from the provision of interesting texts at the right level so that students can read or view easily without much help from teachers or from dictionaries. In the comprehensive account of the benefits of extensive reading provided by Bell (1998), it is clear that it can provide comprehensible input; enhance learners' general language competence; increase students' exposure to the language; increase knowledge of vocabulary; lead to improvement in writing; motivate learners to read; consolidate previously learned language; help to build confidence with extended texts; encourage the exploitation of textual redundancy; and facilitate the development of prediction skills. Although there are such great virtues in extensive reading it is a challenging task to establish an educational culture where extensive reading is a primary practice.

### Extensive Reading Research Findings

This paper argues about the impossibility of promoting extensive reading among the post-primary schoolchildren just by preaching about its applied linguistic virtues. There are negative beliefs about extensive reading as a strategy that works only with more successful and more motivated students, and will not with those who are unmotivated and unsuccessful in language classes. The basis of these beliefs is, as Mason & Krashan (1997) report, that these poor students lack the grammatical knowledge and vocabulary required for reading comprehension and enjoyment. This kind of negative position about extensive reading is supported by results achieved at badly conducted research like the one reported by Horst, Cobb and Meara (1998) where 34 university lower-intermediate students in Oman performed unsatisfactorily at a 45-item multiple-choice test and a 13-item word association test after reading aloud a simplified version of Thomas Hardy's *The Mayor of Casterbridge*. Their test results indicated that they had picked up an average of only five new words out of a text of 21,232

words. It is obvious from this scenario that loud reading will not help in extensive reading for pleasure and global understanding. The negative research findings made here are contradicted by the positive results reported by Mason & Krashan (1997) from an action research carried out at a women's university in Osaka, where the experiment group performed better than the control group, with many of the once reluctant students of EFL becoming eager readers. Here the subjects were provided with reading materials and a didactic atmosphere to work, in accordance with the general parameters of reading for pleasure and global understanding. As demonstrated in these two settings, attitudes to extensive reading research experiments could be fine-tuned with reference to Broughton et al. (1978) who argue that extensive reading must imply a "relatively low degree of understanding" sufficient for pleasure reading. Their position can be reinforced with the premise maintained by Susser and Robb (1988), "If the student finds the book too difficult to enjoy, the extensive reading procedure requires that the book be changed, and not that the student be made to study it more closely. The level of global understanding required varies with the student's language proficiency, the nature of the text, and other factors." Even Krashan (2009) presents 81 generalisations in favour of extensive reading made out of research carried out in different situations emphasizing the requirement to set aside time for recreational reading, to permit the students to read whatever they like (within reason), and to dispense with tests on what they read. The kind of patience with the extensive reading efforts of the students conveyed by them applies efficiently to the rehabilitation mechanism developed in favour of the children in the northern and eastern territories of Sri Lanka recently recovered from the LTTE terrorism.

### **Impact of the Thirty-Year Long Armed Conflict on Children's Literacy**

The saddest and greatest victims of the thirty-year long armed conflict launched by the LTTE terrorists in the northern and eastern territories of Sri Lanka have been the children. On recovering the lands in June 2009 some precarious findings were made about the damage caused to the children in this fatal disaster.

"The conflict has disrupted education for an estimated 250,000 children; teachers have been displaced, schools occupied by IDPs, and existing services stretched due to heightened insecurity. Multiple displacements during 2008 have prevented thousands of children from performing at the required school standard and are at risk of dropping out" (UNICEF, 2009).

The rehabilitation of the child victims who had been directly affected as a result of being LTTE cadres has become a new issue as the children in general form a vital part of the population of these

areas. Clarifying the misconceptions about the humanitarian record of Sri Lanka, Dr Palitha Kohona, Sri Lanka's Envoy to the United Nations, expressed the following views:

“UNICEF recorded over 5,700 cases of child recruitment by the LTTE from 2003 to 2009. Others have suggested a figure closer to 20,000. Child soldiers were often deployed to attack villagers with machetes, used as suicide bombers... Adopting the principle of restorative justice and not retributive justice, these children were placed in institutional rehabilitation and received access to education, vocational training, health care and psychosocial support. Even though one child had confessed to killing 126 civilians.... Following their rehabilitation process they were all reunited with their families in May 2010. These institutionally rehabilitated former child soldiers are now continuing community-based rehabilitation. The rehabilitation and reintegration of child soldiers was a priority for Sri Lanka. Sri Lanka managed this process with its extremely limited resources and in effective partnership with the UNICEF.” (Asia Tribune 2011).

It is realised that there are two categories of child victims in the recovered territories. The first category is composed of the children who have been indirectly affected by the situation as a result of the collapse of peace and the dysfunction of the services in their domestic environments, and the second category is composed of the children who had been abducted by the LTTE and recruited as child soldiers. The difference between them lies in the attitudes they have cultivated towards violence in their respective capacities in this scenario as sufferers of violence and executors of violence. In the Sri Lanka government's humanitarian effort the rehabilitation of both these categories of victims is addressed. In order to make this effort fruitful, a strong extensive reading programme is found to be indispensable as it has the potential to help a child to leave behind his or her traumatic past and move into a pleasant environment where he or she can easily cultivate qualities desired of a child to have in adjusting himself or herself into the rehabilitation and reintegration processes and become a decent citizen one day.

### **Extensive Reading in light of Rehabilitating the Traumatized**

A group of traumatized children just recovered from a terrorized social environment needs so much of therapeutic support in a process of rehabilitation. In order to immunize them against the long-established morbid developments in their natural environment caused by violence, angst, apathy, uncertainty, and anxiety, they need some hedonistic processes to harmonize themselves to the fellow members of their community and to keep themselves occupied in a healthy way. In that sense the

function of the basic disciplines identified as literature, music, dance, theatre, cinema, painting, sculpture, sports, handicrafts, horticulture, gardening, etc. is invaluable. All these disciplines have the potential to inculcate healthy social values in the young minds and transform them into cheerful humans, while their other needs such as food, medicine, counselling, clothing, family, friends, and shelter are satisfied. At the same time all these disciplines involve an assembly of some technical guidance, training, equipment, material, and space. Comparatively, of all these disciplines the most economical to pursue and enjoy is literature. The pursuit and enjoyment of literature imply reading for pleasure. It needs only books with pleasurable stuff in terms of material or equipment. If there are really appropriate books, even with a little technical guidance, reading can be introduced to a child as a medium of pleasure. When it comes to pleasure-oriented extensive reading, unlike in intensive reading, the technical guidance plays a very little part. Books with pleasant stories presented in a comprehensible type language incorporating a configuration of expository devices, textual and graphic, and maybe even sonic, inspire in the children a kind of zeal to read. The element of suspense good on-going stories can achieve in children is powerful enough to keep them bound to the activity of reading. When they develop a knack to read this way it starts growing along with a kind of enthusiasm that gets enhanced almost daily. A rehabilitation process supported by a strong extensive reading programme developed on these lines will succeed along with long-term positive results. The most crucial result of the entire exercise will be a literate and peaceful community harmonized to the environment. In the long run extensive reading will become pivotal in the rehabilitation process the children undergo.

### **Pedagogical Inputs in an Extensive Reading Programme**

The practical advice presented by Timothy Bell can be adopted efficiently in establishing and conducting extensive reading programmes in the northern and eastern territories of Sri Lanka for the benefit of the children who have been deprived of their childhood delights in numerous ways. Accordingly, extensive reading programmes can be established in schools in the care of the teachers dedicated to the children's welfare. Bell's model draws attention to ten areas of importance in the following way:

#### **1. Maximize Learner Involvement**

A number of logistical hurdles have to be overcome in order to make an extensive reading program effective. Books need to be transported, displayed and collected at the end of each reading session. Considerable paperwork is required to document the card file system, reading



records, inventories, book reports and in maintaining and updating lists of titles. Students should therefore be encouraged to take an active role in the management and administration of the reading program.

## 2. The Reader Interview

Regular conferencing between the teacher and the students aimed at monitoring of individual progress provides opportunities for the teacher to encourage students to read widely, show interest in the books being read, and to guide students in their choice of titles. By demonstrating commitment in their own reading, teachers can foster positive attitudes to reading, in which it is no longer viewed as tedious, demanding hard work, but as a pleasurable part of their learning.

## 3. Read Aloud to the Class

The model of pronunciation provided thus by the teacher acts as a great motivator and encourages many students to participate in classroom reading. Students gain confidence in silent reading because they are able to verbalize sounds they previously could not recognize.

## 4. Student Presentations

Short presentations on books read by students play an absolutely crucial role in orally exchanging information about the books as most of the book choices made by students tend to result from recommendations made by friends and not by the teacher.

## 5. Written Work Based on the Reading

Effective reading will lead to the shaping of the reader's thoughts, which naturally leads many learners to respond in writing with varying degrees of fluency.

## 6. Use Audio Material in the Reading Program

Audio recordings of books read aloud and of graded readers on cassette provide the learners with a model of correct pronunciation which aids word recognition, and exposes students to different accents, speech rhythms and cadences. Student confidence in their ability to produce natural speech patterns and to read along with the voice of a recorded speaker is central to maintaining their motivation to master the language as a medium for talking about their reading.

### 7. Avoid the Use of Tests

Extensive reading programs should be "without the pressures of testing or marks" (Davis 1995:329). The use of tests runs contrary to the objective of creating stress-free conditions for pleasure reading because it invokes images of rote learning, vocabulary lists, memorization and homework. Extensive reading done at home should be under the learner's control and not an obligation imposed by the teacher. By their very nature, tests impose a rigor on the learning process, which the average student will never equate with pleasure.

### 8. Discourage the Over-Use of Dictionaries

While dictionaries certainly have a place in the teaching of reading, it is probably best located in intensive reading lessons, where detailed study of the lexical content of texts is appropriate. If learners turn to the dictionary every time they come across an unfamiliar word, they will focus only on the language itself, and not on the message conveyed. This habit will result in slow, inefficient reading and destroy the pleasure that reading novels and other literature are intended to provide. Summarizing comments on the extensive reading done by his subjects, Pickard (1996:155) notes that "Use of the dictionary was sparing, with the main focus on meaning".

### 9. Monitor the Students' Reading

In order to run an extensive reading program successfully, effective monitoring is required, both to administer the resources efficiently, and to trace students' developing reading habits and interests. A card file system can be used to record titles and the dates the books are borrowed and returned. Input from the monitoring process helps to record students' progress, maintain and update an inventory of titles, and locate and select new titles for the class library. It therefore serves both the individual needs of the reader and the logistical task of managing the reading resources.

### 10. Maintain the Entertainment

Teachers need to invest time and energy in entertaining the participants by making use of multimedia sources to promote the books (e.g. video, audio, CD ROM, film, etc.). They should also exploit the power of anecdote by telling the students about interesting titles, taking them out to see plays based on books, exploiting posters, leaflets, library resources, and even inviting visiting speakers to give a talk in class on a book they have read recently. In these

ways, teachers can maintain student motivation to read and secure their full engagement in the enjoyment the program provides. (Adapted from Bell 1998)

The ten hints Bell has made above contribute to the development of a good model to initiate an extensive reading project. This is viable in a country like Sri Lanka as the children's behaviour is so favourable for social work of this type. In order to maximize learner involvement in a project like this it requires distributing the responsibility of maintaining the resources among the children and it is obviously possible with the Sri Lankan children. When the children are integrated into a certain cultural framework through extensive reading the reader interviews the teacher hopes to hold will be possible. Sri Lanka has a cultural habit of reading aloud and that can be introduced easily into the enrichment sessions of extensive reading. The habit of storytelling in the local culture can be adopted in promoting student presentations based on their reading. Already text-based written exercise is a feature in literature studies in all the three languages spoken in Sri Lanka and as a result written work based on the reading can be introduced with little effort into an extensive reading programme. There are standard audio books on the internet as well as facilities in the local situation to develop audio recordings of various recommended reading materials. So it is possible to try such techniques in this type of programme to help the children in their pronunciation and flow. The relaxed social environment alone is sufficient to keep discipline among the participants in this type of programme in Sri Lanka as there is already an intellectual atmosphere in every part of Sri Lanka. Therefore tests can be easily dispensed with in an extensive reading programme. If graded-reading books with illustrations suitable for different age groups can be provided the children's dependency on dictionaries can be controlled. In order to monitor pupil reading an extra effort is not necessary when the element of entertainment is maintained throughout the programme. So it is realised that the teachers' commitment is necessary in every aspect of such programme.

Bell's model for the establishment and conduction of an extensive reading programme has been inspired by an experience he achieved in Yemen. "The Republic of Yemen is one of the poorest and least developed countries in the Arab World, with a formal 35% employment rate, dwindling natural resources, a young population and increasing population growth. Yemen's economy is weak compared to most countries in the Middle-East, mainly because Yemen has very small oil reserves." (Wikipedia) Compared to Yemen, the conditions of the northern and eastern territories of Sri Lanka are far more favourable for their inhabitants. Soon after the recovery of the lands from the LTTE terrorism, numerous development programmes have started along with a steady resettlement scheme for the internally displaced people. Parallel to these, if an extensive reading programme in English covering the entire school system in this

particular geographical area could be established and conducted, the children would be fast recovered from their traumatised condition.

## Conclusion

Since the victory over the LTTE terrorism, in terms of updating education and the literacy rate in English, various programmes have already been launched in the northern and eastern territories of Sri Lanka. So far to my knowledge the concept of extensive reading has not come to play any role in the lives of the children there. I wonder whether this is due to ignorance or negligence. However, at this symposium where we discuss ways of facing the “challenges of post-conflict Sri Lanka” it is extremely important to focus our attention on developing the English language skills of the children of the war-ravaged areas of the island. In that sense right now the most practical step to take is to introduce a carefully thought-out programme of extensive reading in English parallel to the school programme.

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## **Develop a digitized Phoneme to Grapheme conversion model for Sinhala language**

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### **Introduction**

In any language, reliable speech recognition is a hard problem, requiring a combination of many techniques, however modern methods have been able to achieve an impressive degree of accuracy. [6]

The field of speech recognition aims to convert speech signals into written word sequences. There are many applications where speech recognition cannot only be helpful but is also necessary. Different implementations of speech recognizers are used increasingly around the world. Examples are dictation systems, translation systems, information retrieval systems, telephone services, control devices, identification systems, learning programs and many more. In short, recognizers are used whenever communication is involved. [2]

The large number of applications indicates even larger variability in the definition of the speech recognition task. We may want a system to work well not only with command words, but also with continuous speech; not only with read speech sequences but also with spontaneous speech [9]. Another example is that we may not be happy with a system that works only with vocabulary for a specific task or only in a quiet environment, but we may want it to work with large vocabulary or in a noisy environment. One of the major challenges of speech recognition is the variability of speech: two identical utterances, spoken by the same person may result in two different speech signals. An important issue is the ability of the system to recognize accurately even if there are some bigger differences in the pronunciation like dialects or disabilities. [2]

The popular speech recognition process is statistical in nature and is based on Hidden Markov Models (HMMs).[1] Since speech recognition is probabilistic, the most probable decoding of the audio signal is output as the recognized text, but multiple hypotheses are considered during the process. Recognition systems generally have no means to distinguish between correctly and incorrectly recognized words.

The task we chose for the evaluation of our method is P2G ( phoneme-to-grapheme) transcription in Sinhala language, which can also be regarded as a straight speech recognition in which the acoustic

model is perfect. In order to input Sinhala speech to a computer, the user sends phoneme sequences to the computer. Then the computer is indexing the grapheme values to the input phoneme or phonemes combination according to P2G matching algorithm. The output is the most appropriate character for the input phoneme or phonemes combination. The traditional methodologies such as end point detection, Zero crossing level and sound wave energy statistics are used for isolated phoneme recognition. [7]

### **The speech recognition for Sinhala language**

This project attempts to examine the signal processing technique with support of MATLAB, and to apply them to build a Phoneme Grapheme relationship in Sinhala language. Also describe the characteristics of Sinhala language, how text and speech data have been collected and preprocessed and how a Sinhala recognizer for continuous speech has been initialized and trained. Speech data is collected from 5 native Sinhala speakers. The speakers are reading text, which has been collected from random word list.

To carry out the task of phoneme to grapheme (P2G) conversion, we used a phoneme feature database and grapheme assemble algorithm. The digitized phoneme database for Sinhala languages on which the training of the P2G converter is based, is a main part of the currently speech recognition model. It consists of all phoneme digitized values sort according to the energy level.

The phoneme assemble algorithm assembles performs the phoneme organization of the Sinhala language corpus. It considers three condition of phoneme arrangement of phoneme of the word to create relate grapheme. Spoken Sinhala contains 40 segmental phonemes; 14 vowels and 26 consonants, including a set of 4 pre-nasalized voiced stops.[4]

### **Displaying speech signal**

Matlab is widely used environment for signal processing and analysis.[3] In this research, we introduce a MATLAB software tools for speech analysis. It provides a few built-in functions that allow one to import and export audio files. Colea is a MATLAB software tool for speech analysis. This is designed for researches who already have had interaction with the speech analysis and to modify components for their own research. The source code in Colea is MATLAB also available for three platforms, Windows, Unix and PC, which users can download and install on user machines.

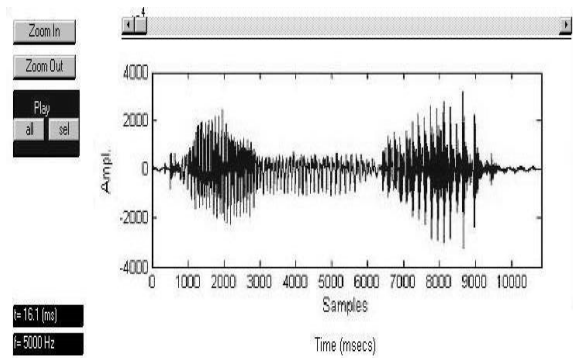


Figure 3.1 Display word /gamba/ on COLEA desktop

### Phoneme detection

A set of 20 words is chosen to represent the Sinhala phoneme in our recognizer. Phoneme detection is the main task of identifying phonemes feature to build phoneme data base for Sinhala language. This problem is also referred to as phoneme segmentation. Some are used for training and the others are used for testing. The MATLAB signal processing tools and the Colea application allowed for examine the basic linear fittings of phoneme energy level and obtaining relevant values of coefficient 1, coefficient 2 and norm of residual.

The display of energy level and waveform distribution of each word were follows.

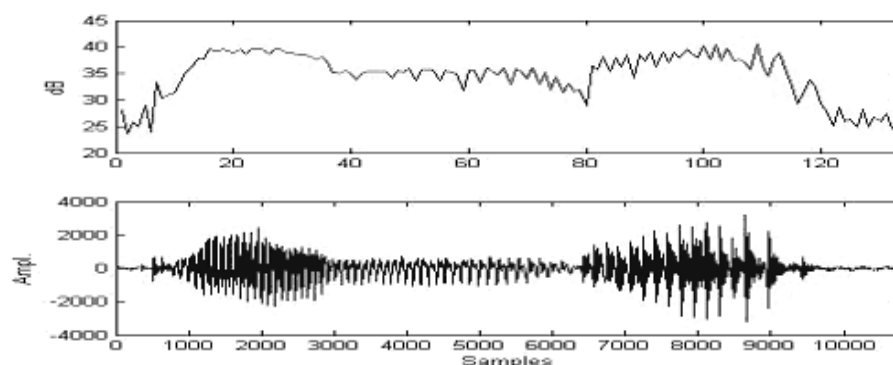


Figure 4.1 Amplitude and Energy distribution of word /gamba:

### Detecting Phoneme by manually

A speech recognition system operates in two modes:[10] training and testing. During training it summarizes the characteristics of a set of phonemes, which are afterwards utilized by defining the



most probable sequence of sound units for a given speech sequence. During the recognition phase, these models are employed for testing unknown input speech.

As shown by Figure 4.1 for each word, an acoustic model was analyzed in a two step procedure. Initially, an acoustic signal was analyzed for the Amplitude and Energy distribution patterns. This acoustic model was utilized in order to extract the phonetic representations of the words with multiple pronunciations. Next, the manually extracted phonemes were used to train new acoustic models following the same procedure. Specifically, basic linear fittings of phoneme energy level were utilized. An accurate and fast extraction procedure is a necessary tool for developing speech recognition and phoneme to grapheme systems.

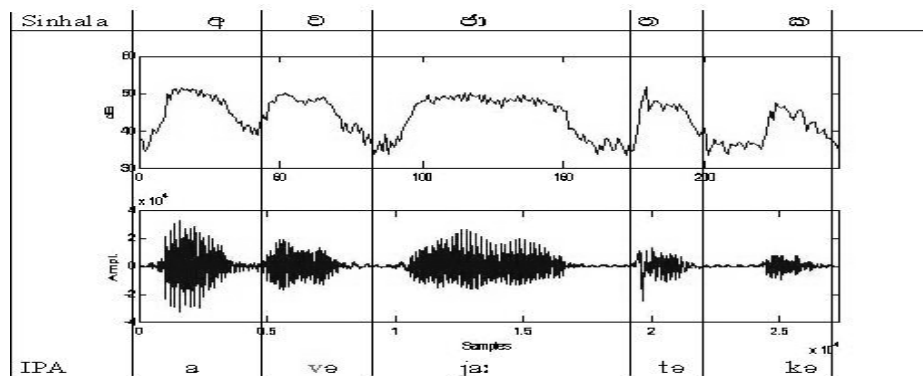


Figure 4.2 Phoneme extraction

### Obtain the linear fitting graph for each phoneme

Numerical results of basic fittings (linear) of detected phonemes are calculated according to the following formula

$$Y = p1 * x^1 + p2$$

**p1= coefficient 1, p2=coefficient 2**

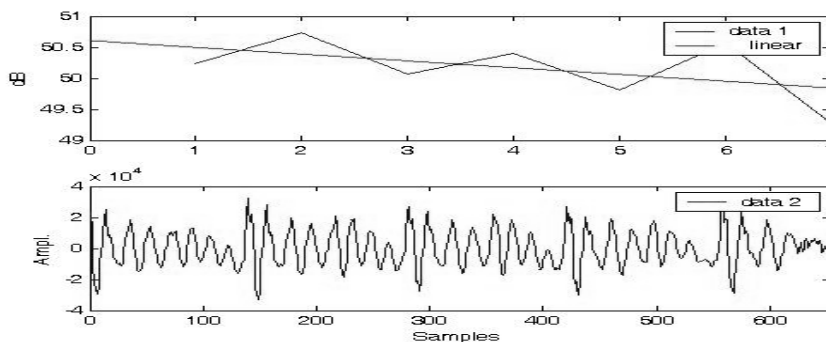


Figure 4.2 Basic fittings for phoneme /a/

Coefficients:

$p1 = -0.10892$ ,  $p2 = 50.607$

Norm of residuals = 1.0307

### **Modeling**

We engaged in two separate approaches for develop the model. In the first part of our research we could successfully built a database of a unique phoneme features for the isolated phoneme in Sinhala speakers. The phoneme mapping database consists of three child data bases. To build these data bases we considered the energy level of the isolated phoneme. We examined the basic linear fittings of phoneme energy level and obtained relevant values of coefficient 1, coefficient 2 and norm of residual.

### **Training data**

Word	Pho neme	Coef 1	Coef 2	Norm of Residual
පමං	a	-0.38	49.54	4.33
අවාර්	a:	-0.23	48.84	4.29
කුච්ච	ʼæ	-0.90	48.06	2.70
කුච්	ʼæ:	-0.01	49.70	2.79
ච්චි	i	-0.96	49.35	3.26
ච්චි	i:	-0.06	50.18	4.49
කුච්	u	-0.02	49.80	4.57
කුච්කුච්	u:	-0.01	51.27	1.81
කෙච්ච	e	-0.07	49.20	0.47
කෙච්ච	e:	-0.01	49.80	1.95
කොකොච්	o	-0.37	50.02	3.83
කොකොච්	o:	-0.02	49.77	3.57
කෙච්ච	e	-0.21	50.40	2.54
කොකොච්	ə:	-0.07	46.91	7.37
කොකොච්	k	-0.59	46.39	3.21
කෙච්ච	g	1.27	48.66	2.50
අවාර්	c	1.24	48.03	6.00
අවාර්කක	j	1.22	40.81	2.89
පාච්ච	t	1.21	36.56	4.22
කුච්	d	1.01	50.05	4.31
කොකොච්	t	3.16	44.62	0.00
අවාර්කක	d	0.08	49.21	0.96
අකක	n	-0.36	50.11	5.79
පලකුච්	p	0.96	47.88	3.61
කොකොච්	b	0.61	49.51	1.54
මං	m	0.30	49.92	5.33
අච්	ɸ	0.61	51.69	1.54
පමං	y	0.62	49.56	1.72
අවාර්	r	0.49	48.35	4.79
පලකුච්	l	0.14	50.56	1.97
අවාර්කක	v	-0.11	48.63	2.31
ච්ච	ʒ	0.02	48.29	3.82
පමං	s	0.47	49.90	2.72
කොකොච්	h	-0.52	50.12	6.97
කෙච්ච	f	1.01	50.13	3.00

The system trains the value for each phoneme in the table. Table 4.1 Training data for each phoneme

### Testing data

Testing data consist from randomly selected phoneme value from the Sinhala corpus. We normalized testing data by the getting the mean.

Table 4.2 Training Testing data comparison

Phoneme	Coefficient 1		Coefficient 2		Norm of residuals	
	Training data	Testing data	Training data	Testing data	Training data	Testing data
a	-0.38	-0.44	49.54	49.50	4.33	2.83
a:	-0.23	-0.55	48.84	50.43	4.29	3.55
æ	-0.90	-0.17	48.06	48.06	2.70	3.17
æ:	0.22	-0.13	49.70	49.70	2.79	2.79
i	-0.96	-0.05	49.35	49.95	3.26	3.21
i:	-0.06	-0.15	50.18	50.18	4.49	4.49
u	-0.86	-0.10	49.80	49.86	4.57	4.35
u:	-0.01	-0.17	51.27	51.27	1.81	1.81
e	-0.05	-0.04	49.20	50.98	0.47	1.36
e:	-0.01	-0.01	49.80	49.80	1.95	4.08
o	-0.37	-0.37	50.02	50.02	3.83	3.83
o:	0.05	-0.02	49.77	49.77	3.57	3.57
ə	-0.21	-0.25	50.40	51.13	2.54	3.20
ə:	-0.07	-0.07	46.91	46.91	7.37	7.37
k	-0.59	-0.07	46.39	48.49	3.21	3.37
g	1.27	-1.12	48.66	48.66	2.50	2.62
c	1.24	0.77	48.03	48.03	6.00	6.00
j	1.22	1.24	40.81	47.87	2.89	2.34
t	1.21	1.43	36.56	36.56	4.22	4.22
d	1.01	1.21	50.05	50.05	4.31	2.36
ʈ	3.16	1.01	44.62	48.35	0.00	4.35
ɖ	0.08	1.07	49.21	48.36	0.96	1.78
n	-0.03	0.08	50.11	50.31	5.79	4.14
p	0.96	-0.38	47.88	48.94	3.61	3.48
b	0.61	0.93	49.51	51.61	1.54	2.78
m	0.30	0.40	49.92	50.30	5.33	4.82
ɱ	0.61	0.20	51.69	51.69	1.54	1.54
y	0.62	0.61	49.56	49.56	1.72	1.72
r	-0.49	0.62	48.35	48.35	4.79	3.54
l	0.14	0.60	50.56	50.56	1.97	2.86
v	-0.11	0.14	48.63	50.43	2.31	4.30
ʃ	0.02	-0.24	48.29	48.29	3.82	3.82
s	0.47	0.02	49.90	49.90	2.72	2.72
h	-0.54	0.47	50.12	50.12	6.97	6.02
f	1.01	-0.02	50.13	50.13	3.00	3.00

## Discussion

This research found about the articulatory behavior of Sinhala speakers. The speech signal was analyzed on MATLAB and normalized first before performing the detection. It can be noticed that the long vowels are showing maximum value for coefficient 1 of each pair. According to the table the mean of all long vowels show minus values. The vowels can be identified as low-energy vowels because the tongue is in a neutral middle-of-the-mouth position, and it doesn't take much effort to produce it.

In Sinhala language there are 14 vowels. All the phonemes that do not match the criteria of vowels are consonants. Compared to consonants, the production mechanism of different vowels is quite

similar. There are large differences between consonant classes, and thus consonants are here divided into six subclasses: stops, fricatives, nasals, tremulants, laterals, and semivowels.

When we concerned stops of Sinhala language it shows less than 48.64 value for coefficient 2. The least values are /k/ and /t/. Also phoneme /k/ in the word Kohomba show a minus value for coefficient 1. It associate with phoneme /o/ when pronouncing. Table 4.6 shows norm of residual for stops /d/, /b/, /g/ that is between 2.37 and 2.61. The phoneme /p/ and /t/ between 3.52 and 4.22.

Nasals in Sinhala language are always voiced consonants which are produced by letting the air flow through the nasal cavity by lowering the velum, and closing the vocal tract. Fricatives are produced through constriction somewhere in the vocal tract, in the pharynx (rarely) or at the glottis narrow enough to produce noisy turbulent air flow. In the Sinhala language the fricatives are voiceless, except /h/ which can be voiced between two vowels.

There are two fricatives in the Sinhala language [/h/,/s/] and phoneme /f/ can be found in loan words. According to Figure 4.6 and Figure 4.4 norm of residual for phoneme /h/ shows maximum value and coefficient 2 shows minimum value. The vocal tract is blocked by pressing the tip of a tongue against the alveolar ridge. However, there is a passage on both sides of the tip of a tongue to let sound waves and air flow freely. The Sinhala language has one lateral /l/.

Semi-vowels are much like vowels, but the constriction of the vocal tract is more powerful, less stable, and more context dependent. These are /j/ and /v/. Within the Sinhala speeches semivowels performs maximum value for coefficient 1 and minimum for coefficient 2.

In the Sinhala language /r/ is produced by letting the tip of the tongue vibrate against the alveolar ridge. The rate at which the tongue vibrates is typically 20 to 25 Hz. The vibration produces an effect similar to amplitude modulation. [2]

The Figure 6.1 and Figure 6.2 compare the results of performs the relationship between testing and training data in leaner fitting formula of energy level which was aimed to find the coefficient 1. The testing data is compared using training data which can be seen in the table 4.9. The comparing is performed behavior for each of the data sets and the coefficient 1 is estimated.

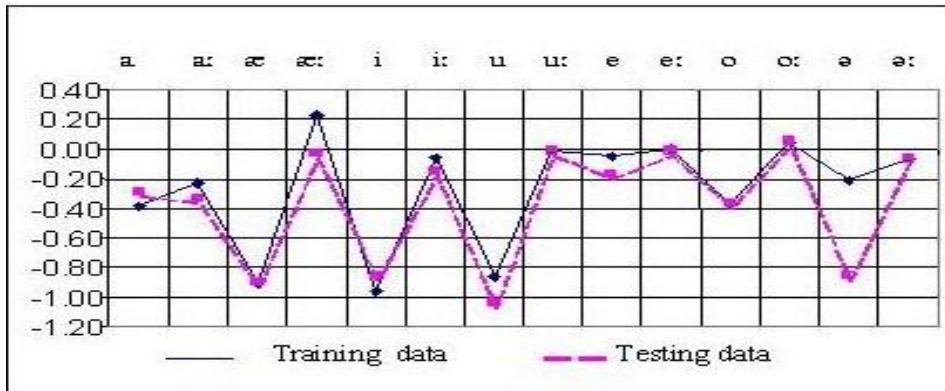


Figure 6.1 Relationship between testing and training data for coefficient 1 (vowels)

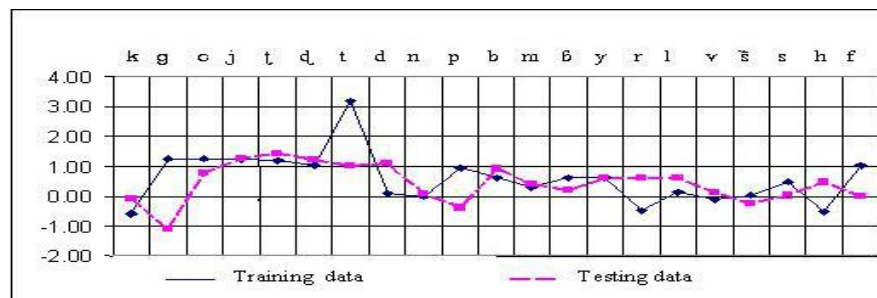


Figure 6.2 Relationship between testing and training data for coefficient 1 (consonant)

To get more accuracy phoneme mapping we proposed to test all above values from 3 databases. The format of database is shown as follows (Figure 6.3). It can take as input digits (or phoneme values) of feature values with a corresponding character symbol.

		Value range	-1.04 — -0.9	-0.90 — -0.85	-0.85 — -0.80	-0.80 — -0.37	-0.37 — -0.33	-0.33 — -0.29	-0.29 — -0.17	-0.17 — -0.15
			u	æ	i	ə	o	a:	a	e
Value range			சு	அ	இ	ஊ	ஓ	ஔ	ஐ	ஃ
-1.02 — -0.38	k	க	க	க	க	க	க	க	க	க
-0.38 — -0.24	n	ந	ந	ந	ந	ந	ந	ந	ந	ந
-0.24 — -0.02	v	வ	வ	வ	வ	வ	வ	வ	வ	வ
0.02 — 0.08	h	ஹ	ஹ	ஹ	ஹ	ஹ	ஹ	ஹ	ஹ	ஹ
0.08 — 0.14	ʃ	ஷ	ஷ	ஷ	ஷ	ஷ	ஷ	ஷ	ஷ	ஷ
0.14 — 0.20	d	ட	ட	ட	ட	ட	ட	ட	ட	ட
0.2 — 0.47	l	ல	ல	ல	ல	ல	ல	ல	ல	ல
0.47 — 0.60	m	ம	ம	ம	ம	ம	ம	ம	ம	ம

Figure 6.3 Phoneme mapping data base

## Developing phoneme assemble algorithm

To carry out the task of phoneme-to-grapheme (P2G) conversion, we used both an energy level of phoneme value - database and a phoneme assemble algorithm. Phoneme assemble algorithm (PAA) is based on the syntax of Sinhala phonemes corpus (Figure 6.1.1). It considers three kind of phoneme arrangement of the word. Basically these arrangements are used to retrieve relevant grapheme. The second part of the speech recognition system is Phoneme assemble algorithm.

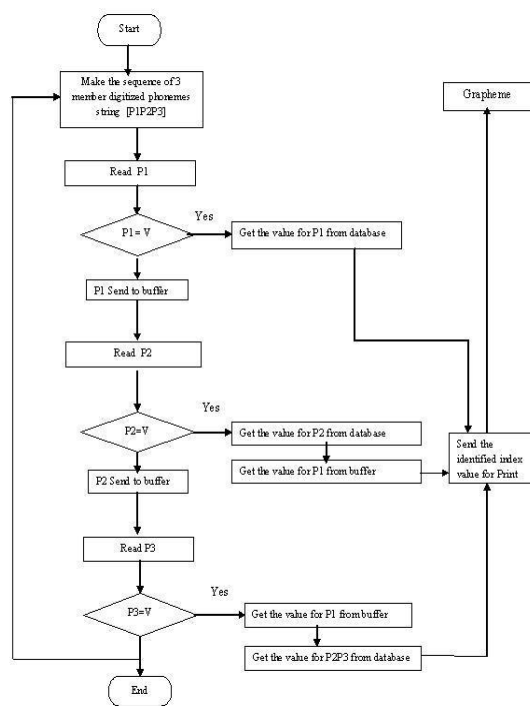


Figure 6.1.1 phoneme assemble algorithm

The main tasks of the algorithm are as follows.

1. Getting the detected coefficient 1 value of phoneme (P)
2. Classified the phoneme as a vowel or a consonant
3. Check the Syntax of phoneme
4. Find the index value from database
5. Send the relevant text to print.

## Conclusion

Despite the recent successes in the Automatic Speech Recognition field, the acoustic-phonetic features of speech and their variability with context and speaker are not fully understood yet.[7] More

research is still needed to achieve a good understanding of this topic in order to build improved front-end processing systems that are able to extract the useful, information-rich, acoustic features. This knowledge is expected to have a profound effect on the automatic speech recognition systems whose performance can significantly improve by integrating more knowledge into their design. Our research is concerned with this problem. We studied the acoustic-phonetic characteristics of continuous speech from multiple speakers.

This research is performed on MATLAB based digital signal processing and traditional speech recognition methodologies such as end point detection and Zero crossing level.[3] [5] Our main task was recognition of isolated phoneme in Sinhala language. In addition an algorithm has been developed and implemented to P2G process with the considering syntax of Sinhala. The algorithm relied on a search grapheme which is not seen in phoneme stack and make it to print.

### **Future work**

We have explored various speech recognition techniques. Development of these will continue; especially the computational implementation. Investigation will also be carried out on whether the total system could be benefited by a hardware implementation on a DSP and ASR. This will be considered if the software implementation performance is deemed too poor. The critical importance is, collecting a sufficiently large database of Sinhala phonemes. This database is essential to train the core ASR unit for recognition.

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## Free and Systematic Variation in Second Language Learners' Writings

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### Introduction

Second language learners' own system of knowledge or interlanguage includes a considerable variation than in the first language acquisition (Ellis, 1994, p.119). Interlanguage studies have become popular in the recent years as they viewed learners' errors in a totally different view: the errors belong to learners' own system of knowledge. However, the term 'interlanguage' was first used by Larry Selinker in 1972, while adapting from Weinreich's (1953) term 'interlingual'. Moreover Nemser (1971) referred to it as 'approximative system' and Corder (1971) used the term 'idiosyncratic dialect' (Brown, 1987, p.169). Interlanguage is the systematic language used by second language learners at a particular stage of learning, which deviates in certain ways from the forms of the target language. The learner creates an interlanguage using different learning strategies such as language transfer, overgeneralization and simplification. In interlanguage, second language learners switch between both correct and incorrect utterances. Thus, variable forms emerge constantly in learner language. In addition, the rules that constitute the learners' knowledge at any state of interlanguage are not fixed, but they are open to amend as the learners are in a process of learning in the interlanguage continuum. Therefore, "Second language data do not represent a static phenomenon, even at a single point of time" (Gass and Selinker, 2001, p.222).

A role for both free and systematic variation in interlanguage was proposed by Rod Ellis in 1987. According to Ellis, free variation is considered as the primary stage where two or more forms are involved to express one meaning. Then learners move to the next stage which is called systematic variation, in which learners tend to adhere to a consistency of the relationship between form and meaning (1987, cited in Gass and Selinker, 2001, p.237). Thus, learners' move from free variation stage to systematic variation before they come to the final stage in which they achieve the correct form and meaning relationship. The following table depicts the above mentioned four stages of interlanguage continuum.

Stage 1	Stage 2	Stage 3	Stage 4
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<sup>232</sup> Email : [chamila@yahoo.com](mailto:chamila@yahoo.com)

One Form	Free Variation	Systematic Variation	Similar to target language
no you are sitting here	No look my card. (no+V) Don't look my card.(Don't +V)	Don't look my card. Don't take book. I no have book. He no say anything.	Don't take the book. I did not say anything.

Table 1: The Stages of Interlanguage Continuum (Ellis,1984,Gass and Selinker,2001,p.223 cited in Ratwatte,2006,p.13).

There are numerous contradictory views on variation in interlanguage. Different studies on free variation such as Cindy (1986),Buhn(1989) and Wagner-Gough(1975) found out that free variation occurs at the early stages of development in interlanguage and then it disappears when learners develop organized L2 systems. On the other hand, systematic variation or variation of two or more sounds or grammatical forms contextually is found in phonology, morphology and syntax. There are number of factors such as linguistic, sociolinguistic and situational factors that have an influence on systematic variation (Gass and Selinker,2001,p.223).Variation caused by phonological environment was studied by Dickerson(1975),Sato (1984) and Young(1991), whereas the influence of sociological factors on variation in interlanguage was studied by Schimit(1977). Besides, adjustment of a speech style according to the situation and speaker was studied in relation to the 'Speech Accommodation Theory' by Giles and Smith in 1979. Convergence and divergence are two types of strategies used by speakers to adopt to each others speech(cited in Gass and selinker,2001,p.230). Labov(1969,1970) identified that variation depends on the context of speech(ibid,p.231).Based on Labov's claim Tarone in "Interlanguage as a Chameleon" argued that interlanguage is variable due to changes of linguistic environment(ibid,p.231).She identified that variation in interlanguage depends on two aspects: vernacular style and super ordinate style which depend on the social setting of a speech event. Her findings include that learners' grammatical system exhibits more systematicity or consistency in the vernacular style as the least attention is paid on the forms of one's speech than the super ordinate style in which most attention is paid on the form. Ellis claims that the sociolinguistic inquiry of variation includes three paradigms: (1) the Labovian paradigm,(2) the dynamic paradigm and (3) the social psychological perspective of Speech Accommodation Theory. Apart from them, Ellis introduces a psycholinguistic model of language production based on the distinction between planned and unplanned discourse which influences L2 variation(1994, p.121). According to Ellis,in the

sociolinguistic model the Labovian paradigm pays attention to speech styles and variable rules. Labove distinguishes social factors which influence intra-speaker variation and stylistic factors such as intra-speaker variation. Social factors such as social class, age and gender can account for variation among speakers. For example ‘-ing’ is pronounced as /In/ in many dialects due to gender and social class (Fischer, 1958, cited in Ellis, 1994, p. 122). Further Labove identified variation caused by different speech styles and social context.

According to Ellis though Labove’s model is sociolinguistic, it also incorporates a psycholinguistic factor: ‘attention’. Further Ellis identifies that systematic variation occurs in relation to situational factors like style shifting and linguistic context. Under the dynamic paradigm variation in interlanguage is studied on the basis of how language change takes place. Bailey depicted how a theory of language change can account for synchronic variability with his ‘Wave Theory’ which accounts for both systematic effects of both social and linguistic factors. On the other hand Bickerton identified how different speakers could be located at different point in the continuum of interlanguage due to three types of variation: (1) inter-speaker variation as some speakers may have access to one variety and others have other varieties, (2) intra-speaker variation which means when speakers have access to more than one language they tend to code-switch due to situational factors such as the topic of the discourse, purpose and addressee etc, (3) free variation: when speakers first acquire a new feature and it is less likely to be alongside an existing feature and to be used to express the same meaning. Bickerton claims that free variation occurs in those speakers whose language systems are unstable and he sees variability as a group phenomenon, however it is rejected by Preston (1989) as studies on second language acquisition are focused on individual learner not on a group. According to the psycholinguistic model, speech is considered as both planned and unplanned (Ochs, 1979, cited in Ellis, 1994, p. 130). This study identified evidence of both free and systematic variation in an essay writing of a group of English language learners.

### **Scope of the Study**

The sample of this study included 25 essays of the selected adult students of intermediate level, who had studied subjects in G.C.E(A/L) Science stream, and their first language is Sinhala. All had at least a “C” pass in G.C.E (O/L). Further, they had followed G.C.E (A/L) General English. The errors found in them were categorized in relation to both free and systematic variation. Each student wrote the essay as an analysis of Romesh Gunasekara’s short story “Carapace” simultaneously within 30 minutes in the class room. The accuracy of the following grammatical elements were focused

1)English articles- a and the, 2) relative clauses,3) to infinitive,4)3<sup>rd</sup> Person Singular and 5)Present Continuous Tense. The errors found in those grammatical elements were mostly of two types: free variation and systematic variation.

## Results

The followings list depict an examples of both free and variation on each grammatical element. The percentage of students under each category is also mentioned. Comparatively, the amount of free and systematic variation is measured.

### 1.Free Variation: Articles

#### 1.1 Article “a”

##### 1.1 Free variation

- e.g. (a) This is ...very interesting story.  
(b) Vijaya is a poor man.

##### 1.2 Systematic variation

- e.g. (a) Carapace is about ... tragedy story.  
(b) It has ... deep meaning.  
(c) It is ...strong affair.

#### 1.2 Article “the”

##### 1.3.Free variation

- e.g. (1)The society is not giving freedom to them.  
(2)Society has made some rules.

##### 1.4Systematic variation

e.g. This story tells about the feelings of the young lovers. Also it describes the boundaries that stands against the real love.

The following table depicts the percentages of both free and systematic variation found in the errors of the articles a and the.

Article	Free Variation	Systematic Variation
A	40%	4%
the	20%	12%

Table 2: Variation of Articles “a” and “the”

40% of students had free variation in the use of the article “a” as they are not in a uniformity of the use of it yet. Though they are at the intermediate level this particular grammatical element has not been mastered well. Altogether, 68% of free variation of the English articles was depicted in the given task. Therefore, the second language teachers should pay more attention to develop the accuracy of the use of articles though their students are at intermediate level. Though the students depict accuracy in the use of tense or prepositions, when it comes to the use of articles they are at a low level in the interlanguage continuum.

## 2. Variation of Present Continuous Tense

### 1.3 Free variation

(a) He is trying to give us a hidden idea about love and marriage.

(b) The writer tries to depict that love, attraction is a carapace that hides many aspects.

### 1.4 Systematic Variation

(a) That is the message that the writer is going to convey through this story.

(b) The society is not giving freedom to them.

4% of students had free variation in the use of Present Continuous Tense, and similarly 4% of students had systematic variation of Present Continuous Tense. As I noticed in teaching Sri Lankan English language learners, they have a tendency to use Present Continuous Tense mostly, where they have to use Simple Present Tense. Therefore, they should be given instructions on the meaning and use of the tense to let them avoid the inaccuracy of using other tenses where they have to use Present Continuous Tense.

## 3. Variation of 3<sup>rd</sup> Person Singular

### 1.5 Free Variation

(a) It is shown the difference between poor people and rich.

(b) The rich man wants to marry her.

## 1.6 Systematic Variation

- (a) Everyone like to exchange their ideas.
- (b) Anura Perera want to marry her, but she doesn't like.

Free variation of the 3<sup>rd</sup> Person Singular was 12% and systematic use of it was only 8%. In the second language acquisition studies this particular grammatical component is placed as the last stage of the second language language acquisition continuum. Though the selected students are of intermediate level, they are uncertain of the use of the 3<sup>rd</sup> person singular.

## 4. Variation of Negatives

### 4.1 Free Variation

- (a) Always it not happen.
- (b) Love does not care about mone

### 4.2 Systematic Variation

Avoidance of negatives

At intermediate level, the students do not depict variation in the use of negatives much, as it is just 4% of students depicted free variation in the use of negatives. However, most of the students had avoided using negatives. It can be seen as a strategy they use to make their writing accurate.

## 5. Variation of “to infinitive”

### a. Free variation

- (a) ...the boy has to be rich more than the girl.
- (b) Everyone has to well educated.

### b. Systematic variation

- (a) Many parents search for a higher class person to get marry with their daughter.
- (b) Deviation of society cannot break easily.

“To infinitive” is a problematic grammatical element even to students of intermediate level. Therefore, the selected students too depicted 8% of free variation and 4% of systematic variation.

## 6. Variation of Relative Clauses

### c. Free Variation

(a) A carapace is an object that an animal uses to get protection.

(b) Thus as we concentrate on this story that a love story the writer is trying to give us....

### d. Systematic Variation

a. The story tells us about an individual person (a) who is someone (b) who is like an animal and who is living in a shell.

The following table depicts variation in the use of relative clauses.

Initial Stage	Free Variation	Systematic Variation	Target Like	Total Variation	Avoided
4%	8%	4%	16%	32%	68%

Table 3: Variation of Relative Clauses

The avoidance of relative clauses is 68%, which reflects the students' strategy of making the writing easier and accurate. Thus, teachers should pay a special attention to let the students use relative clauses as they only write simple sentences. 68% of students avoiding relative clauses is the most noteworthy result of this study. Since this study collected free writings of students and I did not force them to write long sentences. Hence, the results depict how students avoid writing complex sentences. Second language teachers who focus on developing their students writing skill should pay a through attention to the avoidance of their learners. Students of intermediate level need more practice in writing complex sentences.

## Conclusion

The results give evidence of the fact that there is a great deal of free variation in the selected intermediate level of students as they are not in conformity with the target system. They varied in using relative clauses and definite article. Further, systematic variations found include the use of Present Continuous Tense, negative markers, prepositions and articles. At the stage of free variation, the selected group of learners is still not in conformity with the target system. Some of the following



examples of free variation are typical errors of low proficient learners. In analyzing the amount of both free and systematic variation occurred in the selected four scripts, it can be identified that the learners are at a stage of development with a great amount of free variation. According to Ellis, at any stage of development, the learners' interlanguage comprises a system of variable rules (1985, p.278). Therefore, these "variable rules" makes interlanguage inconsistent.

A kind of variation on task differences, is introduced by Ellis as "task-induced variation" to cover the variability evident when learners perform different tasks (Ellis, 1994, p.135). This idea is also confirmed by Tarone (1982, 1983, 1985, 1988, 1990) who argues that as second language learners perform different tasks, their production of some grammatical, morphological and phonological forms will vary in a particular manner. Tarone (1979) claims that language varies with a subtle shift of situation just as a chameleon changes as its surroundings change. She proposes that the interlanguage of L2 should be viewed as a variable system, a system that changes when a linguistic environment changes. She then reports that performance of second language learners on a written grammar test varied from their performance when attempting to communicate orally. There is also ample evidence which suggests that learners perform differently in a grammaticality judgment task and in oral production. It is hypothesized that the particular type of task learners are required to perform will result in variation in their performance. Variable rules make learner language inconsistent. According to the results of this study, free variation is higher than systematic variation, e.g. the use of articles it is 68%. However the variation is depends on the topic familiarity, task condition, task type and planning time. This study identified the stages of variation of the learners in relation to specific grammatical elements which are always problematic to the second language learners. Most importantly, this study found that the students use avoidance of negatives as well as relative clauses in their writing. The examples of variation reflect their struggle in mastering the second language in their way to the target language. Yet, their interlanguage errors are developmental. Most of the second language teachers are frustrated when they meet the same mistake again and again in the writings of their learners. Thus, they should have an insight of the types of errors and the fact that the learners are in an interlanguage continuum.

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- Ellis, R. (1994). *Second Language Acquisition*. Oxford: Oxford University Press.

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## GALLERY



*Vice Chancellor Major General Milinda Pieris greeting the Commander of the Air Force Air Marshal HD Abeywickrama to the 2011 Symposium (IMG\_1591)*



*The DVC of KDU ushering in the Commander of the Navy Vice Admiral DWAS Dissanayake (IMG\_1580)*



*The VC welcoming the Commander of the Army Lt. General J Jayasooriya (IMG\_1593)*



*Greetings between the Minister for Foreign Affairs and the Secretary to the Ministry of Defence (IMG\_1627)*



*The Secretary Defence speaking to the Commanders of the Tri Forces (IMG\_1624)*



*Foreign Delegates at the Symposium (IMG\_1662)*





*Secretary to the Ministry of Defence observing the Symposium programme (IMG\_ 1665)*



*Vote of Thanks by Symposium Chair Mr. MM Jayawardena (IMG\_2027)*



*A Question and Answer session (IMG\_ 2049)*



*Secretary to the Ministry of Defence awarded a special commemorative plaque (IMG\_1775)*



*Hon. Minister Dr. Sarath Amunugama presented with a token of appreciation for his participation as the Chair of the Plenary Session(IMG\_1850)*



*Hon. Minister Patali Champika Ranawaka introducing the Engineering Plenary Session (IMG\_1859)*



*Mr. Mohan Pieris, Attorney-General*

*participating in the Plenary Session discussion  
(IMG\_1896)*



*The audience just before the commencement of  
the Medical Plenary session (IMG\_1935)*



*Lalith Weeratunge, Presidential Secretary*

*presented with a commemorative plaque from  
the Plenary Session Chair  
(IMG\_1903)*



*Prof. Shantha Hennanayake presented with a  
plaque by Hon. Minister Dr. Sarath Amunugama  
(IMG\_1854)*



*Prof. Carlo Fonseka being presented with a*

*commemorative souvenir (IMG\_1983)*



*Prof. Ranil Fernando and Dr. Varuna  
Navaratne conducting a Medical Technical  
session (IMG\_2120)*





*Symposium Chair participating in the discussion (IMG\_1980)*



*Vice Chancellor, University of Kelaniya, Prof. Sarath Amunugama, conducting the Social Sciences Technical session (IMG\_2024)*



*Distinguished delegates at the Symposium (IMG\_2112)*



*Vice Chancellor University of Sri Jayawardenepura and Mr. Bernard Tilakaratne, Former Ambassador to the People's Republic of China (IMG\_2179)*



*Vice Chancellor University of Colombo, Prof. Kshanika Hirimburegama at the cocktail*



*Post Symposium Discussions at the cocktail*

**SOCIAL SCIENCES**  
**PLENARY SESSION**

Chaired by Hon. Dr Sarath Amunugama  
Senior Minister of International Monetary Cooperation

### **Summary**

*In view of the underachievement of Sri Lanka's economic development potential in the post independent era, two university Professors actively involved in research and policy making were called to present papers on crucial issues of socio - economic development in post conflict Sri Lanka. Dr.Ranjith Bandara, Senior Lecturer in Economics at the University of Colombo, brought to notice that most policy shifts had failed to make the necessary structural changes in society that would have lead to social integration. It was also brought to the attention of the audience that Mahinda Chinthanaya in 2005 and the Mahinda Chintana Randoratuwa - the ten year plan – has been able to initiate those vitally required changes society. According to the speaker, Mahinda Chinthanaya and Mahinda Chinthana Randoratuwa are the only policies that have attempted to address social integration issues as a precondition for socio - economic development.*

*Prof. Shantha Hennayake, the Head of the Department of Geography at the University of Colombo, too echoed the sentiments of Dr. Ranjith Bandara in the fact that Sri Lanka's policy makers had failed to introduce an effective method to build an integrative approach for social cohesion. He further emphasized the fact that there is a dire need of attitudinal change within the mind sets of the people of Sri Lanka irrespective of their cast, religion or ethnic belonging to reach the goal of 'one country - one nation. Prof. Hennayake listed out the different stakeholders of this task, including the government, political leaders and the public. According to Prof. Hennayake, a country's education system is one of the most important mechanisms that could be geared towards accomplishing this mission. He chose the USA Kindergarten education system as an example of the creation of national identity of Americans right from their very young years. Prof. Shantha Hennayake proposed a collective identity of "Sri Lankans", which should not be confined to the National Identity Card, but that which should be solidified within the collective mindset of the population.*



## Social Integration and Economic Development

*Dr. Ranjith Bandara, Chairman, Sri Lanka Foundation Institute*

Good evening, Chairman of the session, Honorable Sarath Amunugama, the gentlemen at the Head Table, Hon. Champika Ranawaka, Mr. Lalith Weeratunge, Secretary to the H.E. the President, senior academics, officers, ladies and gentlemen.

I have been a teacher for 20 years in the University. Today I have two challenges; one is to speak after two prominent personalities, entertainers, and then managing this limited amount of time. The Deputy Vice Chancellor insisted on keeping strictly to time, and I have prepared the presentation, but of course I don't think that I will use it. I might use it here and there when I need it. I cut short the title "*The Social Integration by promoting Economic Development: Sri Lankan Experience*".

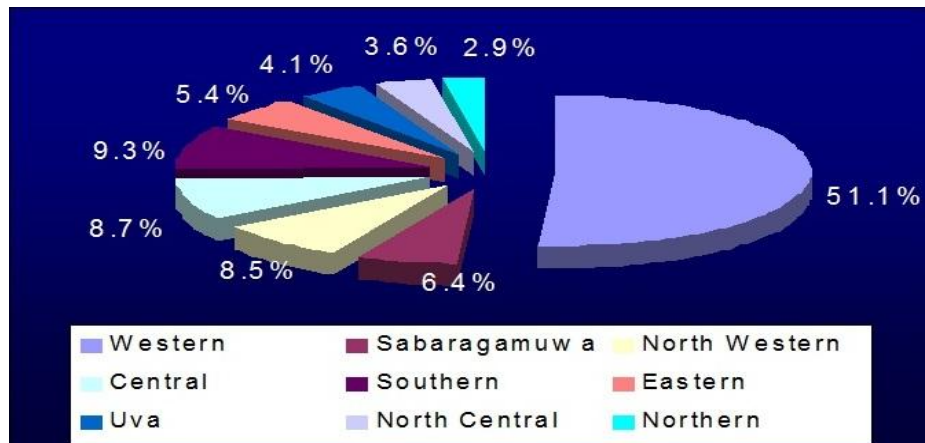
We Sri Lankans have been divided in terms of A, B, C, D, E, F up to Z. This has further widened with colonial influences. We are all aware the distinction between *Udarata* Sinhala, *Pahatharata* Sinhala is one of them. With political independence this has further widened with the multi party democracy. Now we have Sri Lanka *karayo*, UNP *karayo*, JVP *karayo*, and we refer to ourselves by our political affiliations. We have gone through a number of political reforms, constitutional changes and constitutional amendments but this serious issue of social integration has not been taken into account in a serious manner.

Now, let's look at the main policy thrusts in Sri Lanka over a period of 60 years. In my opinion, there are three major economic policy shifts. Just after Independence till 1956, we had the post colonial economic policy, where we were trying to please our colonial masters. We never looked at what we want. Then of course we had inward looking economic policy, the so called closed economic policy, followed prominently in the period of 1956 to 1960 from 1970 to 1977. From 1977 to 2005 we have had an outward looking economic policy known as open economic policy.

None of these policy shifts have taken any serious initiatives into the serious concern of "social integration". We witnessed two youth uprisings, one in 1971 and the other one in 1987. We also witnessed 30 years of ethnic conflict. We sacrificed almost a quarter million of lives of youth. Over a 1.5 million Sri Lankans left Sri Lanka. Now over a 2 million Sri Lankans are working outside of Sri Lanka.

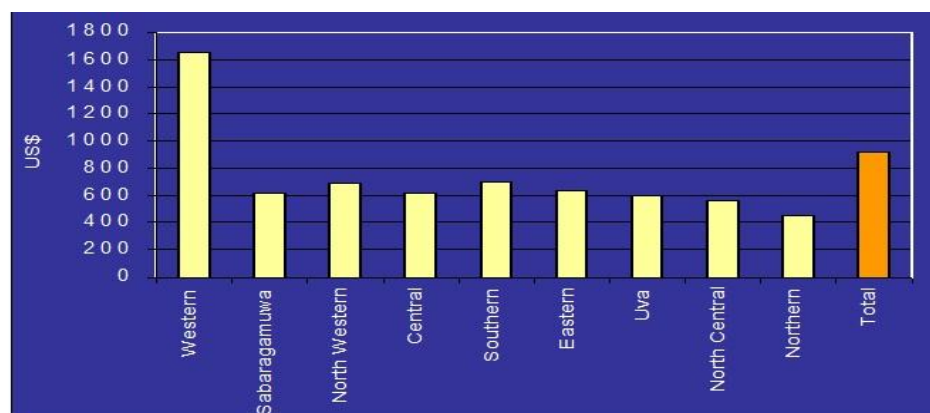
## Equitable Distribution of Growth

**Provincial Contribution to GDP (2004)**



This is the Distribution of economic growth at the provincial level in 2004. This signifies the popular proverb “kolambata kiri gamata kekiri”, meaning 51 % comes from the western province. Let’s look at other aspects as well. This is per capita income in 2004.

**Per Capita Income (US\$) by Province (Factor Cost Prices) 2004**



It took us almost 60 years to reach 1,000 dollar target of per – capita income per year. Now I can be an economist or a practicing economist and what I felt was that we need to promote an economic policy that facilitates the process of social integration. We failed to make an effective social integration policy till 2005. We have never looked at with the introduction of economic policy that required the integration of different social segment as a necessary condition.

In 2005, for the first time in the history, we were able to introduce a broad economic policy framework. Honorable Chamika Ranawaka who is here was also part of it. We looked at the social integration as an important element in economic development. “The Mahinda Chinthanaya” came out

as a result. In 2010, putting a further step, “Mahinda Chintanaya Future Vision” came out and the ten year plan the “Mahinda Chintanaya Ran Doratuwa”, which is a policy framework that the every possible single segment in the society to be integrated looking at the possible political settlement, focus on consciousness building, leading to lasting sustainable peace, reconciliation and settlement, integrate positive attributes to make market economic policies in line with domestic aspirations, improve economic prospects with equitable distribution and finally facilitate the economy to be largely driven by private sector while encouraging to be more dynamic and holistic.

Further, it incorporates the strategies to cover all possible segments in the economy such as, external trades, enhancing economic growth, infrastructure development and human resource development, more productive public sector, strengthening the industrial sector, improving technology and resource development. In agricultural sector, the subsistence orientation should transform into commercially beneficial agriculture and need to make it productive, increasing the value addition and strengthening the food security along with the sense of climate change. Further, Sri Lanka need shift from import based industries to higher value additions and Sri Lanka is not any longer sending its raw materials to foreign markets. Moreover the service sector should promote export of services, tourism, port services, telecommunication, information technology, BPOs etc. “Mahinda Chintanaya” itself is a quiet ambitious programme that further lay emphasis on legal reforms, strengthening the public - private sector partnerships, single agency to co -ordinate infrastructure development, governance and public sector rationalization etc..

I believe reinforcing social integration is also needed in building a national culture, instruments, and finally, designed social policy need to be seen through the diversity lens.

Thank you very much.

## **Attitudinal Changes as a Necessary Condition for National level Social Integration in Sri Lanka**

*Prof. Shantha Hennayake, Head of Department of Geography, University of Peradeniya*

Good afternoon everybody. Honorable Minister Sarath Amunugama, the Chairman of the session and the others in the head table. Honorable Minister Champika Ranawaka, Presidential Secretary Mr. Lalith Weeratunge, the Vice-Chancellor and the Deputy Vice Chancellor of the Kotelawala Defence University, officers in the Army, Navy, Air Force and the distinguished guests. It is a great honor to be here today.

I have been coming to Kotelawala Defense University for the last six years to give lectures in the MSc. Defense Studies Programme. Before 2009 May 19<sup>th</sup> when I left Peradeniya my wife used to say that I should come back home alive. After 2009 May 19<sup>th</sup> that statement was never uttered. In fact there is no reason to fear any longer. For that, I thank you gentleman of our armed forces. Similarly, I used to say the same thing to my son when he went to Trinity College. Now he doesn't go to Trinity but he comes to Colombo but I don't have to say that. Thank you, gentleman once again creating this peaceful environment in our nation.

Let us go the presentation. The title given to me is "Attitudinal changes as a necessary condition for national level social integration in Sri Lanka". Let me, at the outset; tell you just two things that are not in the formal presentation. Attitudes come from two sources: one is the material reality that we live in. Those attitudes are facts. Then attitudes are also formed by ideology. They are not facts but fantasies. With respect to the problem that we have been facing in this country we have both these attitudes. Unfortunately, very often what is discussed under the rubric of attitudes is not the factual ground realities, but the fantasies of some of the people have and carry in their own minds. Often, these were ideologically extreme fantasies.

First, before we say that attitude changes are necessary, we need to know what is meant by the concept of "nation". Then we need to examine the attitudes that are detrimental to the national integration and who is responsible for those detrimental attitudes. After that we need to identify the attitudes that are supportive of national integration and who is responsible in creating those positive attitudes.

There are a lot of lawyers here, I may be even wrong here, but the “state” is a legal entity just as the “citizenship” is also a legal entity. As you may agree, that Prabakaran while fighting against Sri Lankan state he was, to the best of my knowledge, a Sri Lankan citizen.

But ladies and gentlemen, the concept of “nation” is not a legal entity. Although we always refer to the United Nations, it is really about United States. Nation is an effectual category, it is something in your heart. You may notice that the “national” identity card that we have says that we are Sri Lankan citizens but it doesn’t say that I am member of a Sri Lankan nation. The NIC cannot say that as the membership of the nation is in your heart. The membership of a nation is too effectual and that is why the level of identity with a nation varies depending on one’s attitude. You may have noticed that Prabakaran was still a Sri Lankan citizen while fighting against it, but he was never a member of the Sri Lankan nation. He refused to become one. This difference between the state and the nation is something we all need to comprehend.

I don’t think there is a problem of citizenship of Sri Lanka, as I mentioned even Prabakaran was a Sri Lankan citizen. But the problem is that we don’t have “Sri Lankans”, “Sri Lankan nationals” or members of the Sri Lankan nation. How many of us would identify ourselves in a deeply felt sense, not artificially, that we are members of the Sri Lankan nation? This is one of the biggest problems we face.

The attitudes detrimental to the national integration are taken from many sources including the new papers, academic writing, and political propaganda, speeches made in the Parliament and even at the United Nations. One of the most prominent detrimental attitude that is found is labeling and treating Sri Lanka as a purely a Sinhalese state!

Very often these attitudes are inculcated by the Tamil nationalist extremists who have been arguing against Sri Lanka as they were committed to separatism. During my sabbatical at University of California, Los Angeles (UCLA) I did an extensive research on federalism. The UCLA Library has a Sri Lankan section and most of the books that was available there were authored by Tamils in support of Tamil nationalism and separatism. I guess that anyone who enters the Sri Lanka section at UCLA to learn about Sri Lanka would come up with totally different picture marred by anti-Sri Lankan views. This is far from the ground reality of the country.

The Second detrimental attitude is that there are two nations in Sri Lanka; there is a Sinhala nation and there is a Tamil nation. Yes, there is a Sinhala nation that has organically evolved over two and a

half millennia. But, whether there is a Tamil nation in Sri Lanka is not correct if not debatable. In fact, the objective of the post-independence Tamil political project in Sri Lanka was to artificially create a Tamil nation challenging the Sinhala nation. To say the least this ended up in failure as it was unrealistic.

Third, detrimental attitude is that there is an exclusive Tamil homeland in the Northern and Eastern Provinces of the island. The present provincial boundaries in the island were created by the British during the early colonial period in 19<sup>th</sup> Century. They were drawing the boundaries of the Northern and the Eastern Provinces for administrative convenience; they were never demarcating the Tamil homeland which if there was one should be much more meaningful and internally defined.

The other detrimental attitude is that Sri Lanka is a “Sinhalese state” and the minorities, specially the Tamils are “permanently discriminated” in this country. Anyone who realistically examines Sri Lankan political sociology would find this to be absurd to say the least.

These are attitudes which are detrimental to the national integration and these are the attitudes have immerged more from ideological postulates than from the ground realities.

Now who is responsible who creating these attitudes in this country. Primarily among them are the extremist ideologists among both the Tamil and the Sinhalese. The LTTE and the Tamil apologists and all other sympathizers of the separatist cause were responsible for propagating these attitudes. Their propaganda efforts were so powerful and effective, almost the entire world began to believe including very experienced political leaders among the Sinhalese.

As you know, while today we are proud that we have won the war against LTTE terrorists, there was a time when our own politicians were directly and indirectly supporting the LTTE. These are historical realities and there is nothing to hide. Then, come the intellectuals in this country. I know this well as an intellectual myself. My colleagues, some of whom were at Peradeniya University, who then left for greener pastures, some still there, were intellectual apologists to the LTTE separatist cause and nurtured the unrealistic Tamil nationalist ideology. Some of them appeared in LTTE web sites, others wrote books about it and yet others used every seminar, conference both here and abroad in support of the above unrealistic Tamil dictates.

It is one thing to sympathize with Tamil nationalism and their rightful grievances, but supporting Tamil separatist ideology is a totally different game altogether. Sadly many of those ideologists and apologists were deriving their strength from the LTTE but when the LTTE was decimated, these intellectual supporters and the apologists who wrote on behalf of Tamil separatism have also disappeared. This is intellectual dishonesty at the highest level, or could it be belated realization of fact from fiction.

Then those in the larger Sri Lankan society who were involved in ethnic riots are also largely responsible. Riots took place on three occasions 1950, 1970 and 1983 any Sinhalese, Tamil or a Muslim who had anything to do with ethnic riots is very responsible for these negative attitudes that has been created by the fear of life. The fear of life that Tamil and the Sinhalese feel in this country had its origin in ethnic rights. However, the Sri Lankan society has matured so far that reoccurrence of such riots is if not an impossibility is only a distant reality.

Now, what are the attitudes supportive of national integration? What is the kind of attitude we need? We need to look at the ground realities.

Let us start from the Constitution of Sri Lanka. Sri Lanka is a single sovereign state. Whether you want to qualify our constitution as a unitary or a federal one does not matter as the simple reality is that it is a single state. There are no two states here we are a one state. Unless we have this attitude, this right attitude in the hearts of every Sinhalese, Tamils, Muslims we will not be able to have the right national integration.

Sri Lanka is one nation. We have many ethnic groups Sinhalese, Tamil some times when we look back and history and define nation in different ways. I myself have said that Sinhalese are a nation, Tamils are a nation in the making, but it was a failed project. Some people say Muslims are not even an ethnic group but a religious group. Be that as it may, the fact is that we need to consider ourselves today as members of the Sri Lankan nation. Not only the Tamils but even the Sinhalese and the Muslims have to develop and inculcate this attitude.

Sri Lanka is as much as one nation is also a multi ethnic state. Sri Lanka is not a state belongs to one ethnic group be they Sinhalese, Tamils, Muslims, Burghers. So as far as citizenship is concerned everybody is equal in Sri Lanka and Sri Lanka is the homeland of all of its citizens. This is the attitude that we have to inculcate among ourselves. Any citizen of this country can live anywhere in

this country. The Sinhalese should be able to live anywhere in this country and the same applies to members of other ethnic groups as well.

The last of the supportive attitude that we require to build national integration is patriotism. We should put the country first and all other identity secondary at all occasions. It is very sad to see what happens during elections. There are no Sri Lankan then, instead we have the UNPers, we have the SLFPerss, we have the JVPiers, we have the TNAers. During other times you may the Sinhalese, the Tamils, the Muslims. Yet other times we may have the Buddhists, Hindus, Christian, and the Muslims. Where are the Sri Lankans?

The right attitude is that we all are Sri Lankan all the time and the Sri Lankanness should become the first and foremost identity. This is not to say that we need to give up our ethnic identity, far from it. I am a proud Sinhalese, I am a proud Sinhalese Buddhist. But at the same time I feel that I am a proud of Sri Lankan as well. National identity and ethnic identities are contradictory. In fact they are complimentary we need to realize this ourselves we need to pass this message to others.

Now I come to my last point. Who is responsible for creating the right attitude? First, is the state, the state of Sri Lanka. The state is a very illusive term consisting of every person, every institution in the country. State includes from the President of the country right down to the ordinary person on the street or paddy field.

Let us look at this more pragmatically. Here today, we have, government representatives, two of them are Ministers. As Ministers you are responsible for creating that attitude in this country. Here today, we have representative from the Presidential Office. The highest administrative officer in the country – Secretary to the President is here. You are responsible for that creating the Sri Lankan identity.

All other levels of government e.g. Parliament is hugely responsible for creating the right attitude. The political leaders whether they are in the Parliament or not should give their priority to the nation, not just their political party as we see today. Where is the Sri Lanka in them? For example when our armed forces were fighting against the LTTE which was hell bent on destroying the country, the politics took the upper hand and some politicians ridiculed the gallant effort and the victories of our armed forces. The political leaders too should realize that while they are members of their own political party and trying to win elections, that is their game, but they are all Sri Lankans and they should inculcate that SriLankanness among their own party supporters as an essential requirement. The civic leaders of the country, where ever they may be, are all responsible for creating this attitude.



Education system in the country is perhaps the most responsible for creating the right attitude among its future citizens.

Ladies and gentleman let me just tell you a small story. The lesson from this story is a challenge. There are two prominent representatives from the Sri Lankan Cabinet here; I am challenging you to implement this in the future. I went to Matale St' Thomas' College. It had Buddhists, Christians and Muslims students. Every morning before we start the school the Buddhist goes to one place, Christians goes to another place, Muslims goes to another, and Hindus goes to yet another. We prayed to different Gods in these segregated locations. We started the day with this division. Our children start schooling when they six years old and remain in the school system for the next 13 years. By the time they leave the school system we have created good Buddhists, Christians, Hindus, Tamils but not the Sri Lankans! Now compare this with what happens in the United States of America. There, from kindergarten onward, the very first thing they do when they start the school is reciting the pledge of allegiance to the nation and flag by keeping their right hand on the heart. They do that for five days of week, some 40 weeks a year for 13 years. By the time they leave the school system they have created perfect American nationals.

Why can't we do this, why can't we send national flags to each and every class room in the school in this nation and develop a pledge of allegiance of our own. We have the expertise to do this. We have the need. What is lacking is the will. This is the challenge I am posing to this audience and the nation today. I think it is my responsibility as an intellectual to tell you, the media, and the country at large the right story about our nation based on facts, not ideology.

Thank you very much.

**SOCIAL SCIENCES**  
**TECHNICAL SESSION 1**

Chaired by Professor Sarath Amunuga  
Vice Chancellor University of Kelaniya

### **Summary**

*This session included presentations on conflict and environment related issues with economic implications. Among them, a paper on “Problems of Socio-Economic Development in Navithanveli Divisional Secretariat Area of Ampara District: A Study of Post Communal Riots' Era” by S.M. Aliff, M.A.M. Fowsar, from the Faculty of Arts and Culture, Department of Social Science, South Eastern University, aimed to discuss the disparities among different communities in terms post-conflict recovery: resettlement, road accessibility, etc. However, the author was not able to prove the reasons for such disparity. The audience questioned about the impact of the attitudinal factor on existing conflicts, and the author agreed that it can be one of the reasons for different conflicts and said that he could not take up the matter in the study.*

*Another study on “Resettlements and Recovery of Livelihood of 2004 Tsunami Victims of Ampara District with Special Reference to Maruthamunai Village” focused on the recovery from Tsunami in Kalmunai. The paper cited a 50% balance recovery yet to be achieved. The author is of the view that there is a coordination problem with respect to the Post Tsunami development programs, and that it has contributed to setbacks in the progress.*

*A study on Policy Guidelines for National Defence as a Public Good, the researcher MM Jayawardena, Head of Department of Social Sciences at the Kotelawala Defence University proposed the systems approach as a policy guideline for national defence in the present context as well as in the future possible scenarios. According to the analysis, national defence needs have be addressed and performed effectively in the short run, as well as in the long run. If national defence can be performed in line with this theoretical presumption of national defence as a public good, then it is compatible with the economy and will contribute to the economic growth and development. The presenter gave attention to the performance of national defence against the separatist war, and tested the applicability of the proposed systems approach as a policy guideline. Responding to a question from the audience, “whether the vicious cycle can come up again”, the author said it depends on the wild cards that come in to play and the effectiveness of national defence in that particular situation. If national defence is performed effectively and efficiently with the guidance of the system approach the vicious cycle will not develop.*

## **System Approach as a Policy Guideline for National Defence in Sri Lanka**

*MM Jayawardena, Department of Social Sciences, General Sir John Kotelawala Defence University*

### **Introduction**

Sri Lanka has been struggling with the separatist war for more than half of the post independent era. The governments under different regimes, policy makers and also economists were not precise about the roots, outcomes and the national defence policies against conflicts, including the separatist struggle. This particular scenario is firstly, an outcome of inherent confusions with respect to the challenges of national security and economic development and secondly, due to the ambiguous theoretical knowledge with respect to national defence expenditure and economic development (Sandler and Hartley, 1995, Jayawardena, 2011). Furthermore, in the context of regional level socio economic and political scenarios and the global level socio economic and political developments, Sri Lanka as an island nation in the Indian Ocean has become a central country in the region due to its geopolitical location in the Pacific Asia. Therefore, national defence, the issues of separatist struggle;<sup>233</sup> and other security threats and the challenges of economic development of Sri Lanka has been sensitive to regional and global level socio economic and political relationships. Even in the post conflict era after defeating the Tamil terrorism, the conditions have not been changed substantially. Therefore, firstly, national defence needs to be substantial in its size, secondly national defence needs to be effective and efficient and thirdly, it should be aligned with economic development.

During the period of 30 years prior to 2006, national defence as a public good was not performing with substantial effectiveness against the targets of national security and economic development. However, the effectiveness of national defence in the latter period has enabled Sri Lanka to defeat the LTTE militarily, but yet needs to guarantee the prevention of such threat in the future to enjoy perpetual peace in the country which is a necessary condition for national defence to contribute in economic development as a public good.

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<sup>233</sup> The multi-polar relationships of separatist struggle as the major determinant of national defence that links with India and its Tamil community, the other Tamil communities in the world including the Tamil Diaspora and, economic development and finally the linkages with national defence demand careful policy consideration against the challenges of national security threats and economic development.

Under these circumstances, there has been a need for a proper systematic approach to establish a comprehensive policy guide along with complementary measures for national defence to functions effectively and to find a sustainable solution against the separatist struggle and other possible conflicts that guarantee long run peace in the country. This kind of comprehensive solution in which national defence policy plays an important role has become crucial in achieving economic growth and development in Sri Lanka in the context of separatist struggle and other possible threat on the national security. Here, the system approach<sup>234</sup> that can be tailored to suite the Sri Lankan context is identified as a base for effective policy consideration for national defence, against the national security threat and the challenges of economic development

## **Methodology**

Giving attention to system approach, the empirical information with respect to national defence along with separatist war and separatist struggle, economic development and other related components and sub systems (Refer to Figure 4) of those with multi-polar relationships are retrospectively and prospectively analysed critically in line with interpretive method to propose the system approach as a policy guideline for national defence as a public good.

## **System Approach as a Policy Consideration for National Defence as a Public Good**

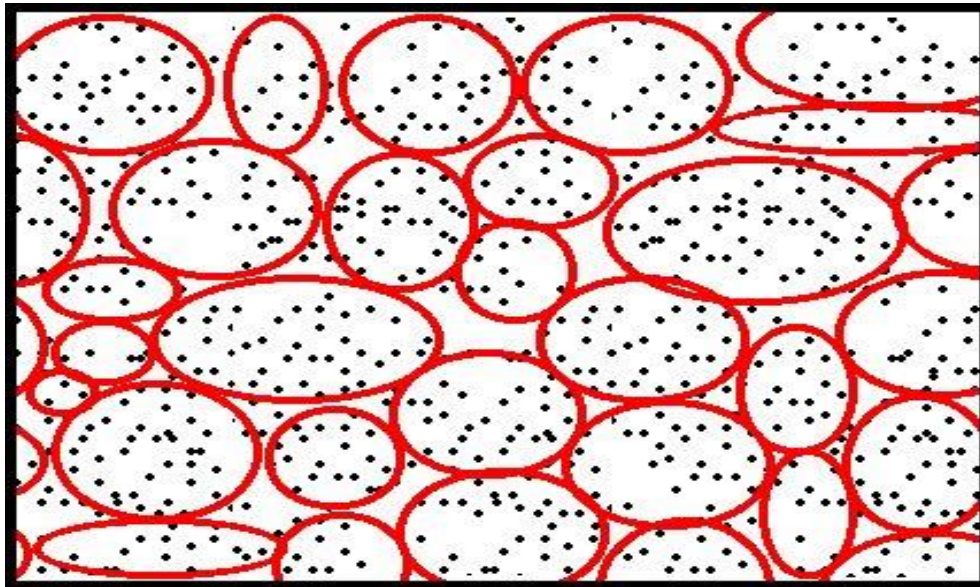
The system approach is a strategy introduced originally in positive sciences, specifically in engineering sciences in the mid 20<sup>th</sup> century. The same approach has been used by Maturana and Varela (1979, 1980, and 1988) in their Santiago Theory of Cognition. Because of its result oriented empirical importance against the complicated contexts, the system approach has been later used in other disciplines, including social sciences, where there are inherent complexities that could not be dealt with the positivists approaches (Capra, 1996). In order to use a system approach in social sciences, the scope of the system should be tailored to suite the particular context of the issue,

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<sup>234</sup> The system approach is a comprehensive method which is used to study on complicated problems. Originally this has been used in studying engineering problems in the mid of 20<sup>th</sup> century. Later in the 20<sup>th</sup> century this has been used in medical sciences as well. In 1979, Maturana & Varela have used the system approach in their Grounded Theory of Cognition. According to Miller who used the system approach has said that there are 20 critical systems within are 8 sub systems. According to the system approach the components of the system rotate as polarized mechanism. Under the system approach in line with hierarchy, polarization of components and systems etc. are studied. The system approach given attention to the nature of the nested character in the system

because in reality things are connected to each other with infinite number of components and relationships of the respective context. Thus, the system approach needs to demarcate the scope of the specific system where the important components are identified before studying them and their relationships (See Figure 1).

**Figure 1 A Dummy of a Spatial Picture of a System**



According to the system approach there are components and subsystems within a system. The subsystems and the components in a system hold hierarchical structures as smaller sub systems or components. The polarization (duo or multiple) as sub systems and components depend on the nature of system reality of the particular context<sup>235</sup>. This is very much applicable in the social sciences more than in natural sciences as the issues are intertwined with each other in line with the respective dynamic process that is connected to space, time, matter and energy that are beyond human control. Therefore, there is a need for a careful balance at the component level, system level and also at holistic level of the issue.

The deconstruction and the reconstruction is the main mechanism under system approach that is important; firstly, in understanding the nature of the problem and secondly, to identify the remedial measures for a targeted aim of solution to the issue that aligned with multi-polar relationships.

### **2.3 Working Hypotheses of the Study**

In the evaluation of the system approach as a policy guide the following working hypotheses are made.

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<sup>235</sup>Available at <http://www.vssd.nl/hlf/boo1.htm>.

- I. Effectiveness is a necessary condition for national defence as a public good but not sufficient.
- II. Effectiveness and efficiency are necessary and sufficient conditions for national defence as a public good

### **Application of System Approach for Effective National Defence**

In the context of the economic set back in Sri Lanka, the N&E problem, the expansion of national defence, and economic development are taken as major subsystems that are intertwined with each other. In the application of the system approach to find a solution there is a need for; firstly, deconstruction of the prevailing system and secondly, reconstruction of a new system. Here, both deconstruction and reconstruction should be carried out simultaneously with necessary changes and repairs with respect to the identified components or the subsystems. Here the flexibility, as well as stability/rigidity is important in decision making because of the dynamic nature of the issue and the importance of the consistency which affects the productiveness of the individual components, subsystems, as well as the whole system towards the targeted objective.

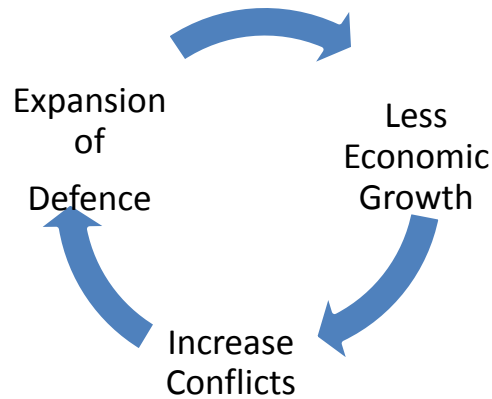
In order to make changes with respect to the sub systems and the identified components, there is a need for the identification of different dimensions of the components and their relationships with other components and sub systems of the system. According to the system approach, the number of relationships under each component (variable) is dependent on the nature of the disciplines that the particular component is linked (e.g. with respect to the N&E problem, Sociology, Psychology, Economics, Political science, Anthropology, Diplomacy, Information Technology, Engineering knowledge etc. are the main disciplines that are linked with the components and the sub systems of the separatism issue).

In order to apply the system approach as a strategic consideration for the separatist struggle, there is a need for identifying the components/variables and subsystems that are linked with the issue.

Separatist struggle, national defence and economic development are the major components needed to be given attention in the system. During the last thirty years, the N&E problem, national defence and economic development have been intertwined with each other and therefore, there is a need for studying these three issues together at first, and then they should be treated separately (See Figure 2). In essence, national defence, the separatist struggle and

economic development are cyclically rotating and have become a vicious cycle in the context of Sri Lanka (see Figure.2 and 3).

**Figure 2 Vicious Cycle of the Separatist Struggle (Conflict)**



Source: Author

**Figure 3 Major Sub Sets of the Sri Lanka Issue and their Relationships**



Source: Author

**Table 1 Exclusive and Non-Exclusive Subsets of National Defence, Separatists Struggle and Economic Development in Sri Lanka**

Category	The linkage	Remarks
A	ND, Sep. and Dev. Are connected each other	Needs to all three components together and separately
B	ND and Sep. are connected each other.	Needs to look at ND and Dev. separately and together
C	Connected to Dev. And ND	Needs to look at Dev. And ND



		separately and together
D	Connected to <i>Dev.</i> And <i>Sep.</i>	Needs to look at Sep and Dev. separately and together
E	Connected to only with <i>ND</i>	Needs to look at National defence alone
F	Connected to only with <i>Dev.</i>	Needs to look at Development alone
G	Connected to only with <i>Sep.</i>	Needs to look at Separatism alone

Note: *ND*-National defence, *Dev.*- Development, *Sep* – Separatism

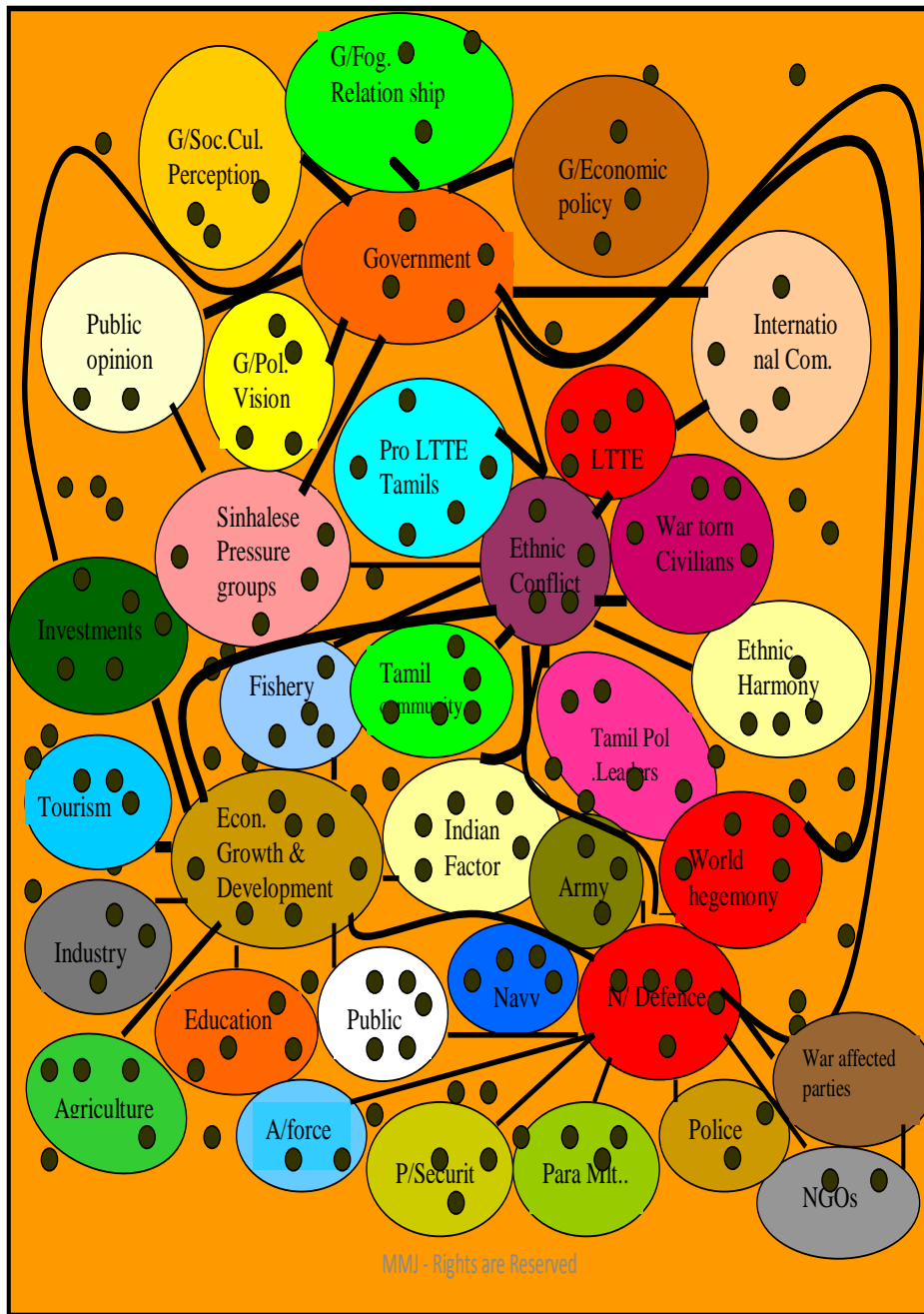
Source: Author

In order to break the vicious cycle by giving attention to the sub sets separately and collectively in the deconstruction and reconstruction, it can be converted into a victorious circle. If this is successful it would open the path for development. In order to carry out deconstruction and reconstruction successfully, there is a need for a critical analysis of each and every component either individually or/and collectively, while giving attention to the supplementary components with bipolar and multi polar relationships of the respective components.

### Scope of the System Model

The system identified under the vicious cycle (Figure 2) and the subsets in the Figure 3 can be further detailed with the intervened variables related to the major components in line with the system approach. Here, the major components given in Figure 2 and 3 are added with “government” which has become significant because of its increasing number of relationships with other components in the system. Here the major components also can be considered as subsystems. There are certain other components polarized around the identified major components. Table 2 denotes the components of each subsystem and their relationship. Each of these components under the sub systems are linked with other components in the system either directly or indirectly, whilst having a linkage with the other components and subsystems as well.

### Figure 4



Source: Author

**Table 2 -Major Components of the System and their Complementary Relationships**

National Defence	Separatist Struggle	Econ. Growth & Development	Government
Terrorism(LTTE)	LTTE	Separatism	National Defence
Public	Tamil politics	Tourism	Separatism war
Government	Tamils in North & East	Investment	Economic growth & development.

SL/Army	Tamils in outside North & East	Industries	Foreign Policy
SL/Navy	Tamil nationalism	Agriculture	Economic Policy
SL/Air Force	India	Fisheries sector	International perspective
SL/Police	Tamils around the world	International trade	Media
Paramilitaries	NGOs	Public	Tamil politics
Private security Companies	Economic growth & development	Defence expansion	Sinhala Buddhist nationalism
NGOs	International intervening	Education	Tamil nationalism
War affected parties	National defence	Government	Public
India	Media	Media	
Media (Local Foreign)	Tamil Diaspora		
International perspective			

Source: Author

According to the identified system classifications, there are micro level components, as well as sub systems which are polarized within a particular scope. Thus, the whole system functions in line with hierarchy level relationships or center periphery relationships. However, in the practical situation there are certain isolated micro level components that function independently, but affect the different components/systems depending on the context of the dynamic process. The dark dots within and outside the sub systems are micro components. (See Figure 1). There is no limit for such components. These micro components can either be increased or decreased or can be converted into a major component or a sub system. A component can become a sub system once certain components, either existing or a new, become polarized around a particular component. The relationships can be either bipolar or multi-polar. In the context of Sri Lanka the major components or the subsystems are national defence, the separatist struggle, government of Sri Lanka, economic growth and development and national defence. According to table 2, some of the components are linked with more than one system and component; whereas certain other components are with restricted relationships. The components given within the demarcated sub systems can be identified

as the major components (dark dots in Figure 1) that are with limited bipolar or multi-polar relationships. However, still these relationships are important in directing the system/components towards targeted objectives. In the deconstruction and the reconstruction of the new system the cyclic rotation and the relationships of subsets have to be given careful attention in line with targeted objectives.

The components and the subsystems depicted in Figure 4 are connected both at inter and intra level. In the deconstruction and reconstruction of the system, enhancement of the awareness<sup>236</sup> of the problem, the relationships between variables, the targets etc. among stake holders without distortion is a prime requirement. According to the system approach, the system is taken as a net work mechanism and proposes individual programs with respect to the components, as well as the sub systems, both at micro level and macro level (See Figure 4).

All the sub systems and components and their relationships with major components or subsystem are empirically have been not in line with the system approach referred in this study, at least up to 2006. In this study the period prior to 2006 is referred as “beginning of war”. Since 2006 to 2009 referred as the stage one of the later period. Thereafter the post 2009 is considered as the stage two of the post war period. At the beginning of the war, there was no proper understanding of the relationships or the value of deconstruction and reconstruction of the components and system. As a result the programs of each system and components were not complementarily benefitted each other in achieving the objectives of the individual programs as well as the objectives of national defence against separatist war as a whole. As a result national defence was not substantially productive. This particular complementary benefits observes in the post 2006 in both stage I and II and therefore mutual benefits of national defence towards its effectiveness can be observed in the latter period of war. As far as the effectiveness and efficiency of national defence is concerned, there is a need of transformation of the existing system towards a productive system. In the transformation of the existing system, deconstruction and reconstruction in line with the system approach is a prime requirement.

## **Deconstruction and Reconstruction in the System Model**

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<sup>236</sup> Awareness here referred to the feelings of the stake holders with respect to the particular problem. The understanding and feelings is two different things. Understanding is not necessarily will lead to feelings which are important in generating the desired out comes .However understanding is important in making general conditions for the stake holders to have feelings which is important in the complementary mechanisms that enhance the effectiveness of programs.

In the deconstruction and reconstruction of a new system the core components or the sub systems should be rigorously analyzed retrospectively and focused on the conclusions. It also should be analyzed in a prospective perspective to make predictions that support forward policies with respect to national defence and economic development. In the past, the subsystems or the subsets of the issue (economic development, ethnic problem and national defence) have not been in the manner explained here as a system approach, especially in the early period of war. As a result, national defence has not been effective enough in the face of challenges to deliver necessary conditions towards the end of the prolonged ethnic war to make necessary conditions for economic development. However in the later periods existing system was transformed into desirable system that enabled to deliver results towards the defeat of the national security threat in the country which is empirically close to system approach.

## **Conclusions**

National defence as a government activity in the face of a national security threat has become the first priority of the government. The thirty years of conflict related experience in Sri Lanka witnesses that national defence in Sri Lanka is intertwined with the separatist struggle and economic development in the country. In a situation where the inter relationships between national defence, the separatist struggle and economic development have neither theoretically nor empirically been cleared sufficiently, there is a need for new approaches to be considered in policy consideration with respect to the decisions regarding national defence, the ethnic issue and economic development. Such system enable to equip the defence structure with substantial forward defence strategies and can prevent possible losses and cost to the economy. The system approach with critical analyses regarding national defence, separatist struggle and economic development as the major components or subsystems is useful in making appropriate decision making. According to the system approach, there is a need to deconstruct and reconstruct of the existing system with a focus on a new system that aligned with appropriate mobilization of the closely associated components such as government and other complementary conditions towards effective national defence as a public good (See Figure.4). The deconstruction and the reconstruction of national defence, separatist struggle and economic development as the major components or sub systems, will enable to break the existing vicious cycle of the issues and make it as a victorious cycle with long lasting peace that is aligned with national defence until the guarantee of sustainable peace. In this effort a new net work mechanism that accommodates programs and action plan has to be identified while giving attention to the deconstruction of the existing system. In this exercise the existing subsystems and the

components have to be converted to the compatible components and subsystems with necessary changes towards sustainable peace that enable national defence to proceed as an economically productive public good. Once such condition is created there is a need of maintenance of such effective national defence to make it compatible with economic development and sustainable peace. In this exercise the major components, as well as the sub components/systems need to be adjusted appropriately along with the complementary conditions. Such peace is very important for sustainable development which is identified as a millennium development goal.

### **Recommendations**

Effectiveness is a necessary condition for national defence as a public good and therefore it should be given the first priority of the government budget. Both effectiveness and the priority of government consumption are mutually coexisted. Therefore there is a need of a continuous maintenance of such effectiveness until national defence become efficient in the long run. In order to achieve such conditions there is a need of dynamic system approach. Therefore Maintenance of dynamic system approach that could capture policies with respect to national defence, national security threat and economic development is recommended

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**SOCIAL SCIENCES****TECHNICAL SESSION II**

Chaired by Dr. NLA Karunaratne  
Vice Chancellor, University of Sri Jayawardenapura



### **Summary**

*S.K. Mohomed Ali and R.K Chaminda Kumara, from the Department of Geography, at the University of Ruhuna, based their contribution to this forum with a area relevant to the beloved national past-time – cricket. Their empirical study revealed that there were 308 international matches played since Sri Lanka gained ICC status in 1982 (Tests- 83, ODI- 225). Many matches are cancelled, abandoned and end in no result due to rainfall on the day of the play because match scheduling has been done without due consideration to the rainfall Season of the climatic zone in which the stadium is located. Cancellations entail heavy financial loss to the nation. Grounded rationality of the study, he explained, was that there are virtually no studies on international match scheduling and rainfall in Sri Lanka. Research presenter identified rainfall season of the climatic zone in which the stadium is located have to be given priority in scheduling of matches. Further he said a weather station in each Stadium is mandatory for long term planning.*

*Mrs. Ali answered a question raised from the audience on how they considered global seasons when they conducting the research as “this study was a preliminary whether we will be able to consider second matter global season as a nation we have to think whether country’s interest over foreign match schedulers interest”.*

*A Sociological study on youth motivations on Drug free Sri Lanka by Gihani De Silva, Sanjeewani Karunarathna, from the Department. of Social Sciences, University of Sabaragamuwa, emphasized the need for a drug free Sri Lanka, and appreciated the policies to that effect implemented by the present government to build a better Sri Lanka. She stated the government’s goal of eradicating the menace of drugs from Sri Lanka by 2015 and saving the countries youth from the perils of the drug menace is of vital importance. This study was focused on reasons and motives for drug use among the university students. They include, special occasions/parties which are a part of university sub-culture, peer group pressure, relationships, physical and psychological stress of studies, and others. Ms Gihani suggested that formulation of national policies, enforcement of the law, leadership programs,, counseling centers and such can be used as the pillars to carry out the message.*

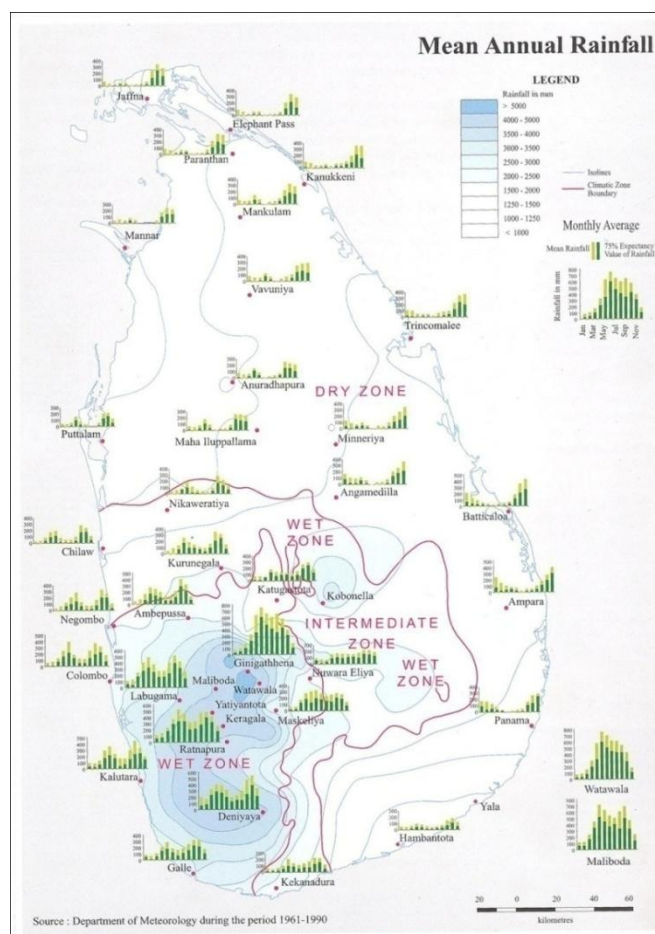
## A preliminary investigation into the impact of rainfall on One Day International (ODI) match scheduling and cancellations in Sri Lanka (1982-2010)

*S.K.Mohamed Ali and R.K.Chaminda Kumara, Department of Geography, University of Ruhuna.*

### Introduction

Sri Lanka has four major climatic zones. They are the Wet, Dry, Intermediate and the Arid Zones. The major rainfall seasons are South West Monsoons (SW), North East Monsoons (NE), and Inter monsoons I & II (IM). The NE Monsoons bring rain during November to January, IM during April & October and SW monsoons during May to mid September. SW monsoons and NE monsoons affect the northeastern and southwestern areas while IM1 and II affect the entire country. The arid bands around Mannar and Hambantota receive the lowest rainfall in the island. Figure 1 shows the rainfall pattern in Sri Lanka according to climate zones.

Source: Survey Department, 2007



There are 8 international cricket stadiums in Sri Lanka. Figure 2 shows the location of the international stadiums in Sri Lanka. They are located in the Dry (2), Wet (5) and IM (1) zones. Pallekelle stadium is located in the WZ/IM boundary with more Wet Zone characteristics. The WZ stadiums have dominated the number of matches being played. On the other hand, being in the rainfall active zone, more matches have been cancelled due to rainfall on the day of the play.

**Figure 2:** International stadiums in Sri Lanka



Source: Field Survey, 2011

When considering the climate, stadium location, match scheduling and cancellation there is a clear relationship among these factors (Zubair, 2009). Poor scheduling during the main rainfall season of the playing stadium has been disastrous, with high percentage of cancellations in both the Wet and Dry Zones. In stadiums where rainfall pattern of the playing location has been considered during scheduling of matches, matches have been least affected by rainfall. Of the total ODI matches cancelled 92.7 % have been played in the Wet Zone stadiums. Of the total ODI matches played in the Dry Zone stadiums in Sri Lanka only 0.7 % has been cancelled. In most of the cricket playing countries the playing stadium is backed by an efficient weather radar that provides vital weather information, both short and long term (Australian Bureau of Meteorology, 2010). In Sri Lanka this is not so.

## **Rationality**

Virtually there are no studies on international match scheduling, cancellations and the impact of rainfall in Sri Lanka. Match cancellations, abandonment and matches that have ended in no result give an indication that ODI matches have been scheduled ignoring the impact of rainfall. Blind scheduling has resulted in match cancellations, which in turn entails heavy financial loss to the nations and the sponsors. It also results in local and worldwide spectator disappointment. Thus a study of this nature became mandatory.

### **Objectives**

The objectives of the study were to understand the scheduling of ODI matches according to climatic region, to see the relationship between match cancellation, abandonment, no result and rainfall, to estimate the financial loss due to cancellations and to propose the best period for ODI scheduling in Sri Lanka according to the playing stadium.

### **Data and methodology**

Institutional data on the ODI matches played in Sri Lankan cricket stadiums were collected from the Sri Lanka Cricket Board, Colombo (Sri Lanka Cricket Board, Colombo, 2010) on the total number of ODI matches played in Sri Lanka since achieving ICC status and the daily rainfall values from the Department of Meteorology, Colombo (Department of Meteorology, 2010) for 28 years from 1982-2010. The match data was sieved to obtain the total number of cancelled, abandoned and matches that have ended in no result. A simple Time Series Analysis was done. Interviews, discussions and personal communication with the SLCB (Chintaka 2010, Anonymous 2011, Fernando, 2011) and Sports Ministry (Senanayake, 2011) personnel were used as supplementary methods.

### **Analysis**

#### **Match scheduling and cancellations**

**Table 1 :** Number of One Day International (ODI) matches played by different countries in Sri Lanka (1982 – 2010)

Country	ODI Matches
Australia	26
New Zealand	30
England	16
Pakistan	44
India	81
West Indies	17
South Africa	19
Zimbabwe	13
Bangladesh	20
Kenya	03
U.A.E	02
Netherlands	02
Sri Lanka	187

Source: Generated from SLCB data, 2010.

Table 1 shows that countries from both hemispheres have taken part in ODI matches. The highest number of matches have been played by India among the Asian countries and Australia from other regions. Sri Lanka has played 187 matches as the host country.

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**Table 2:** Number of ODI matches played in the Sri Lankan stadiums by month

Stadium	J	F	M	A	M	J	J	A	S	O	N	D
R.Premadasa	2	7	5	1	-	3	22	31	25	2	2	6
S.S.C	2	4	4	4	-	-	14	18	12	-	-	3
P .Saravanamutu	-	-	-	-	-	-	-	-	-	-	-	-
Asgiriya	-	-	2	1	-	-	-	01	-	-	-	2
Pallekele	0	0	0	0	0	0	0	0	0	0	0	0
Galle	-	-	-	-	-	3	02	02	-	-	-	-
Dambulla	1	2	1	-	7	7	6	15	-	3	1	-
Sooriyawewa	-	-	-	-	-	-	-	-	-	-	-	2
Total	5	13	12	6	7	13	44	67	37	5	3	13

Source: Generated from SLCB data, 2010.

According to Table 2 the highest number of matches have been played in the SW monsoonal months of July (44) and August, while very few matches have been played during the NE monsoonal months, from November to January. Only 13 matches have been played in February which is the driest month in Sri Lanka. This indicates poor scheduling of matches, where the rainfall factor has not been given due consideration.

**Table 3** shows the total number and percentage of ODI's abandoned, cancelled or has ended in 'no result' according to rainfall seasons and stadiums.

**Table 3:**Total number and percentage of ODI matches abandoned, cancelled or ended in no result according to rainfall seasons and stadiums (1982-2010)

Stadium	Zone	NE	IM 1	SW	IM 2	Total	%
R.Premadasa	WZ	3	2	7	4	16	44.0
S.S.C	WZ	0	2	9	0	11	31.0
P.Saravanamuttu	WZ	1	0	0	1	02	6.0
Asgiriya	WZ	0	0	1	0	01	3.0
Pallekele	WZ	-	-	-	-	-	-
Galle	WZ	0	0	3	0	03	8.0
Dambulla	DZ	0	0	1	0	01	3.0
Sooriyawewa	DZ	2	0	0	0	02	6.0
Total	DZ/WZ	06	04	21	05	36	

Source: Generated from SLCB data, 2010.

Table 3 shows the highest percentage of abandoned, cancelled and no result matches (44.0) has been in R. Premadasa stadium, followed by the Sinhalese Sports Club (SSC) both of which are located in the Wet Zone. The highest cancellations have been in the SW Monsoon season in both locations. In the Dry Zone stadiums, the highest cancellations have been in Sooriyawewa where both the matches scheduled have been cancelled. This is due to match scheduling in the NE Monsoon which is the main rainfall season. Dambulla shows the lowest cancellations with 3.0% (as match scheduling has been done in its dry season).

**Table 4** shows the total number and percentage of ODI matches abandoned, cancelled or ended in no result due to rainfall according to the months.

**Table 4:** Total number and percentage of ODI matches abandoned, cancelled or ended in no result due to rainfall according to months (1982-2010)

Stadium	J	F	M	A	M	J	J	A	S	O	N	D	Total
R.Premadasa	0	0	2	0	0	1	0	6	4	0	2	1	16
S.S.C	0	0	0	2	0	0	3	6	0	0	0	0	11
P.Saravanamuttu	0	0	0	0	0	0	0	0	1	0	0	1	02
Asgiriya	0	0	0	0	0	0	0	1	0	0	0	0	01
Pallekele	0	0	0	0	0	0	0	0	0	0	0	0	00
Galle	0	0	0	0	0	3	0	0	0	0	0	0	03
Dambulla	0	0	0	0	0	0	0	1	0	0	0	0	01
Sooriyawewa	0	0	0	0	0	0	0	0	0	0	0	2	02
Total	0	0	2	3	0	4	3	15	5	0	4	5	36
%	0	0	6.0	8.0	0	11.0	8.0	42.0	14.0	0	11.0	14.0	100

Source: Generated from SLCB data, 2010.

According to months the highest cancellations have been in August with (42.0%). According to stadium, the highest cancellations have been at R. Premadasa and S.S.C, both of which are located in the Wet Zone. It is interesting to note that the highest number of matches played (Table 2) has also been in August. This shows that poor scheduling of matches have ended in high cancellations.

Table 5 shows the type of match cancellations according to the rainfall season.



**Table 5:** Type of match cancellations according to rainfall seasons (1982-2010)

Season	Abandoned	No Result	Cancelled	Total	%
NE Monsoon	03	01	02	06	17.0
IM 1	00	02	01	03	8.0
SW Monsoon	08	08	06	22	61.0
IM 2	01	04	00	05	14.0
Total	12	15	09	36	
%	33.0	42.0	25.0		100.0

Source: Generated from SLCB data, 2010.

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The highest type of cancellations has been matches ending in No Result. Both abandoned and cancelled matches also take a high percentage. In all three types of cancellations the highest percentage of 61.0 has been in the SW Monsoon season

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Table 6 shows the number and percentage of matches cancelled due to poor match scheduling according to climatic zone.

**Table 6 :** Number and percentage of matches cancelled, abandoned and ended in no result due to poor match scheduling according to climatic zone and rainfall seasons (1982 -2010)

Stadium	Total	NE	IM 1	SW	IM 2
Wet Zone					
R .Premdasa	16	03	02	07	04
S.S.C	11	00	02	09	00
P .Saravanamuttu	02	01	00	00	01
Asgiriya	01	00	00	01	00
Pallekele	00	00	00	00	00
Galle	03	00	00	03	00
Total	33	04	04	20	05
%		12.0	12.0	61.0	15.0
DZ- Dambulla	01	00	00	01	00
Sooriyawewa	02	02	00	00	00
Total	03	02	00	01	00
%	100.0	67.0	00	33.0	00

Source: Generated from SLCB data, 2010

The highest percentage of cancellations has been in the Wet Zone with 61.0% in SW Monsoon season and 67.0 in the Dry Zone in the NE monsoon indicating poor match scheduling.

### Financial Loss

It is estimated that an ODI match entails an expenditure of SLR 30 ( $\pm 10\%$ ) million. (Personal communication: Anonymus, 2010). Thus the expenditure for the 36 cancelled ODI matches during the study period is around SLR 10.8 ( $10\pm$ ) billion. This is a loss to the nation and the sponsors.

### Results

There are 8 international stadiums. Thirty six, ODI matches have been Cancelled, Abandoned or ended in No Result due to rainfall on the day of the play. Between 1982 and 2010 the highest number of match cancellations have occurred in August (SW Monsoon season). In the Wet Zone stadiums the highest percentage (61.0) of matches scheduled during SW monsoon have been Cancelled, Abandoned or ended in No Result. In the Dry Zone stadiums both matches scheduled during NE monsoon had been cancelled due to rainfall. National financial loss due to cancellations is around SLR 1.23 ( $\pm 10\%$ ) billion. Further there is local and worldwide spectator disappointment due to cancellations. Cancellations have been done between 0.2 – 50.7 mm of daily rainfall

## **Recommendations**

Rainfall season and climatic zone of the stadium have to be given priority in scheduling of matches. In the Wet Zone, match scheduling is most suitable from early February to mid- March. SW monsoonal months of June, July, August and IM months of April and October should be avoided in the Wet Zone. In the Dry Zone, NE monsoonal months of November, December, January and IM2 month of October should be avoided. Time of play has to be considered in match scheduling. Morning schedules are preferable especially in the IM months due to evening down pours. A weather station in each stadium is mandatory for long term planning.

## **Acknowledgement**

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**SOCIAL SCIENCES****TECHNICAL SESSION III**

Chaired by Shanika Hirimburegama,  
Vice Chancellor, University of Colombo

### **Summary**

*In this session Prof. U.K. Jayasinghe-Mudalige and others presented a paper on “Mainstreaming Agro Biodiversity to Improve Nutrition Security and Livelihoods”. In this study they have focused on obesity and chronic diseases, such as diabetes, and carried out a study on physical and psychological health friendly plant species in a tank based village in Gampola. The study recommends extrapolative studies to expand such cultivation and marketing in the future that would provide healthy diets for future generations in Sri Lanka.*

*Another study carried out on “Positioning Sri Lanka's Soft Power within the Clash of Civilizations Susantha Goonatilake Royal Asiatic Society” suggested that a small state like Sri Lanka could maintain strategies to win the hearts and minds of the world and can become competitive as a nation. According to the author, India and China use Buddhism as a soft power and capitalize on conditions in their competition in the world. The author believes that Sri Lanka, with her documented historical prominence in the dissemination and promotion of Buddhist teachings among other nations, and her unique geo-political position in the region, can also utilize Buddhism as a soft power in the progress of the country.*

## Mainstreaming Agrobiodiversity to Improve Nutrition Security and Livelihoods: A Marketing Approach for Under-utilized Plant Species in Sri Lanka

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### Introduction

A considerable faction of Sri Lanka's population faces the issue of nutritional deficiencies due to the intake of cheap and filling food instead of nutritious ones which is commonly referred as "hidden hunger". The deficiencies range from micronutrient to essential vitamins that essentially increase the occurrence of malnutrition conditions amongst the children, women, and other vulnerable groups. Current concerns among nutritionists are low birth weight, energy protein malnutrition such as stunting (chronic malnutrition), wasting (acute malnutrition), and underweight, nutritional anemia, Vitamin A deficiency and iodine deficiency disorders. Parallel to this, the country sees an upsurge in cases of chronic diseases such as diabetes, obesity and cardiovascular diseases. Overweight and obesity have been pointed as the root cause in the dramatic increase in incidents of hypertension, diabetes, heart disease, cancer and other psycho-social problems among the Sri Lankan population (Ministry of Healthcare and Nutrition, 2010). It is evident that the primary determinant behind these two rather opposite developments is dietary simplification. Recent reports have indicated that close to seven percent of the working population are underweight, with about 34 percent being overweight and another seven percent being labeled as obese (Hettiarachchi, 2011). Left unchecked, these two forms of threats are impending bottlenecks for national human resource development in the post-conflict era of Sri Lanka. Diversifying the consumption patterns, or in other words dietary diversification, to include a broad range of plant species is, hence, recommended to improve the health and nutrition status of Sri Lankans.

Sri Lanka, being amongst the 34 biodiversity hotspots in the world, is famous for its unique ecosystems characterized by the agriculture, forest, inland wet zones, marines and coasts etc. among

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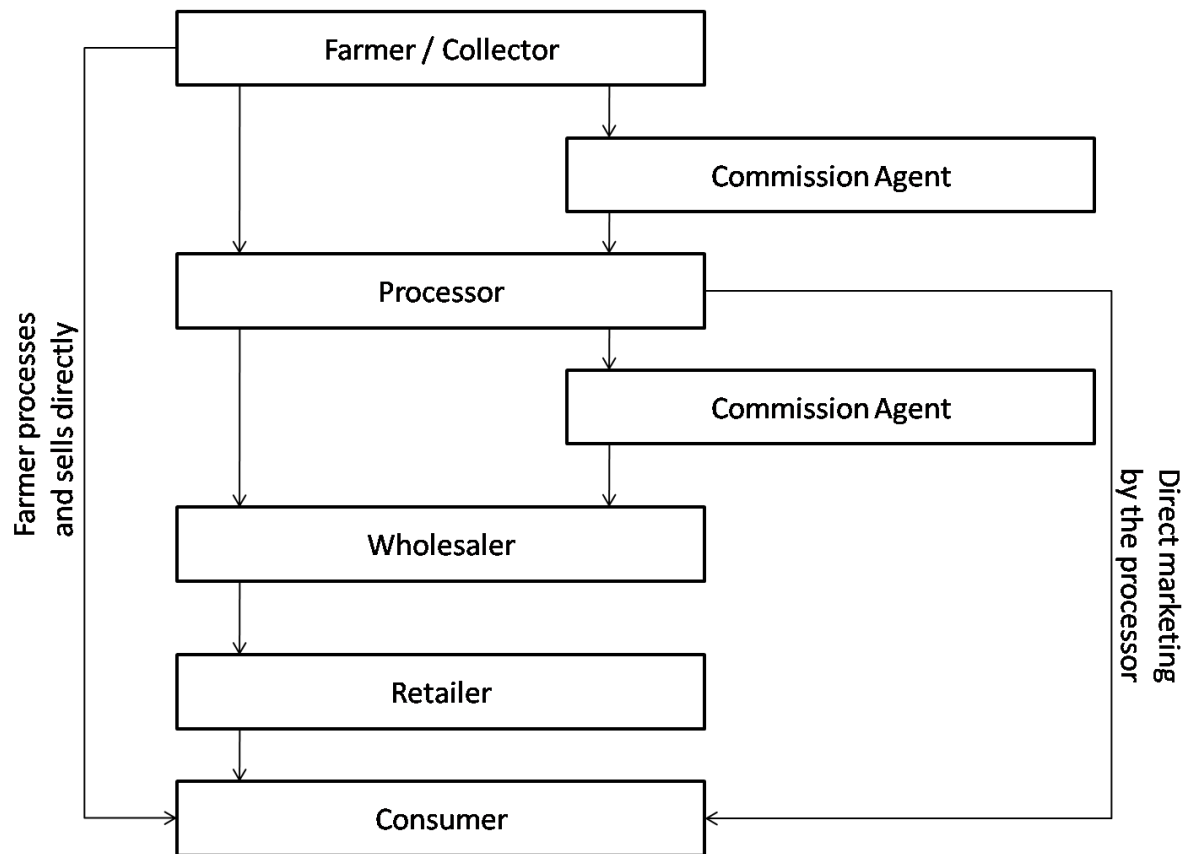
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these, agricultural ecosystems are linked to the national food supply systems for the most part and are often subject to the premises of commercial cultivation and degradation. This is further exacerbated by the over-dependence on a few plant species for food production. In Sri Lanka, the domains of agricultural production, biological environment and farming systems are interlinked closely and strongly. The concept of agrobiodiversity within this context arises. Much of this agrobiodiversity is either eroded or being lost due to intensive commercial cultivation practices, involving major food crops and animal breeds. Nevertheless, studies have revealed the existence of hundreds of ‘minor’ species that are grown, reared or collected particularly in marginal, mostly rural environments in Sri Lanka. These species are commonly termed as neglected or underutilized species (NUS). Therefore, the utilization of those NUS, which are nutritionally rich have been discovered as the best candidate for the task of diversifying Sri Lankans’ consumption patterns (IFPRI, 2011).

## **Marketing Facet of Agro biodiversity Conservation and Sustainable use in Sri Lanka**

### **An Overview of the Marketing Approach**

On the understanding that any program to espouse underutilized plant species to answer the nutritional problems in Sri Lanka needs to consider these different facets that underlie the sustainable exploitation of the social and economic potential of these species, including the production, regulation and marketing facets. Marketing in its broadest economic sense is defined as the set of economic and behavioral activities that are involved in coordinating the various stages of economic activity from production to consumption (Purcell, 1979); when discussed in the context of food and agricultural products, marketing is defined as the performance of all business activities involved in the flow of products and services from the point of initial agricultural production until they are in the hands of consumers (Kohls and Uhl, 1990). For general purposes, from an institutional perspective, the understanding as to be that of marketing as an activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large. A generic marketing chain is illustrated in Figure 1.



**Figure 1: A Generic Marketing System**

There are many reasons why marketing is important for agrobiodiversity conservation and sustainable use: (1) Markets affect the entire agrobiodiversity system directly and indirectly; (2) Local markets play an important role in generating growth of rural incomes; (3) Lack of access to markets is seen as key constraint to the eradication of rural poverty; (4) Market potential will create and enhance the conservation of and research on agrobiodiversity; (5) Marketing links and engages the different stakeholders in the agro-social system; and (6) Marketing has increasingly gained attention in recent years as a tool for linking supply capacities to market opportunities (Looy et al., 2008; Bernet et al., 2003). Four activities in agrobiodiversity marketing can be defined (Will, 2008): (1) Production (transforming natural resources and inputs); (2) Processing (transforming raw materials); (3) Trading (linking supply and demand); and (4) Consumption (buying, preparing, consuming).

### **Different Marketing Approaches in Sri Lanka: Practices and Cases**

#### ***Marketing of “Kola Kenda” & Roadside Stalls***

One of the most common biodiversity-sourced products marketed is the “kola kenda”, a porridge prepared out of a number of green leaves / vegetables to a traditional recipe, and commonly



consumed at breakfast. Today the production and selling of “*kola kenda*” has taken a dramatic turn, where roadside vendors, sell “*kola kenda*” in bowls or glasses for customers travelling to work or on other occupations in the morning hours, especially on the main bus roads, and along highways. This industry has been fuelled by the ever increasing popular belief about the nutritional value of “*kola kenda*” and the hectic work schedule of many living in the urban cities and sub-urban areas of Colombo, Gampaha, which makes it difficult to prepare and consume a proper breakfast at home.

### ***Marketing Systems of Rambutan, Beli, and Wood apple***

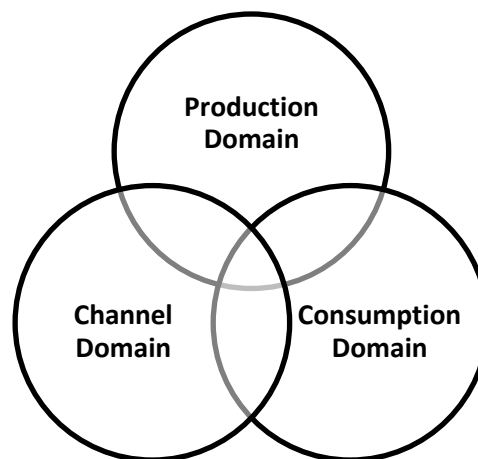
Rambutan (*Nephelium lappaceum* L.), Beli (*Aegle marmelos* Correa), and Wood apple (*Feronia limonia* L.) are three underutilized crop species identified in Sri Lanka. These three crops elucidate a broader socio-economic spectrum of underutilized crop species in Sri Lanka: rambutan is already being commercialized and cultivated to a significant extent; beli is perceived by most growers as being an ‘uneconomic crop’, and a ‘wild crop’ and thus features at the opposite end of the spectrum from rambutan and wood apple is traded on a significant scale in Sri Lanka yet not as much as rambutan and can thus be placed somewhere between the positions of the two other crops (Barry, 2007; 2008).

### **Issues and Constraints in the Marketing of Neglected and Underutilized Species-sourced Food Products**

Missing output markets, market imperfections and market failures have been reported as being the major constraints for marketing products from NUS (Gruère et al., 2006). These are exhibited within the production-marketing systems as a number of critical issues (Giuliani, 2005; Jaenicke and Höschle-Zeledon 2006): (1) Nonexistent or poorly organized marketing system; (2) Insufficient / no systematic production; (3) Highly scattered production; (4) Low productivity; (5) Actors and expertise not organized and articulated; (6) Lack of competitiveness in terms of price, quality and presentation; (7) Lack of market information; (8) Lack of transport and processing infrastructure; (9) High transaction costs; (10) Ill-developed market infrastructure; (11) A genuine lack of coordination along the supply chain; (12) Lack of market transparency and trust among the market chain actors; (13) Weak understanding of consumer preferences / customer dynamics; (14) Low demand and/or Latent demand; (15) “Hidden” market; (16) Legal, financial and social barriers for market expansion.

### **Conceptual Perspective for Agro Biodiversity-Sourced Food Product Marketing**

In order to better understand dynamics, gauge performance, improve functioning, and develop systems, of agrobiodiversity-sourced food product marketing, we propose the following conceptual framework, consisting of three domains: production, channel and consumption (Figure 2), following the works of Gruere et al. (2007), Giuliani (2005), Breitschuh (2004), Gruere et al. (2006), Kruijssen et al. (2009), Jaenicke and Höschle-Zeledon (2006) and Will (2008).



**Figure 2: The Domains Perspective for NUS Marketing**

The following aspects are considered under the Production Domain: (1) Location – where are the agrobiodiversity located, in which agro-ecosystem?; (2) Production practices (cultivated, reared, collected, hunted) – what is the currently adopted production practices at the specific site?; (3) “Grower” / “Producer” led alliances or linkages (farmer associations, community-based organizations) – what form of social involvement is present? ; (4) Productivity – what is the productivity at the site of production, in terms of the food product sourced? ; and (5) Infrastructure / organizations – what is the different infrastructure available at or near the site or any form of organization that is linked with the agrobiodiversity system? .

Under the Channel Domain, lie the following aspects: (1) Arrangement of market actors, institutional capacities, and exchange facilities – how are the different market actors, institutions arranged and how developed are the capacities of institutions to support the exchange function and what are the exchange facilities available?; (2) Channel intermediaries – who are the different intermediaries in the marketing channel? ; (3) Functioning and efficiency of value chains – what is the level of functioning and efficiency of the marketing chains?; (4) Market outlets – what are the types and numbers of the different outlets available?; (5) Business and financial service suppliers – are there any such complementary service providers? ; (6) Type and level of integration – how and to what extent are the

different entities integrated within the marketing system? ; (7) Processing and product development – what is the level and extent of processing and new product development in the value chain?; (8) Value addition – does value addition occur within the market channels?; and (9) Distance to market – what is the distance to reach a potential market or selling arrangement, both physically and resource-wise?.

The following aspects are covered under the Consumption Domain: (1) Level and type of demand – what is the nature of the demand for agrobiodiversity-sourced food products?; (2) Awareness – what level of awareness does the consumer bases possess?; (3) Consumer preferences – what are the general and specific preferences of the market?; (4) Purchase decisions – what are the factors involved in the customer purchasing process? ; (5) Areas of human behavioral change – what are the different behavioral dimensions that need to be changed for acceptance of such food products? ; and (6) Market development – what are the avenues for developing new or existing markets? .

It is often the case that throughout the different studies and projects all over the world, dealing with the marketing facet of neglected / underutilized species, attention has focused primarily either only on the channel domain or one the three domains in isolation. The domain that has had the least focus is the consumption domain. When operationalizing the marketing aspects of NUS, all three domains will need to be addressed, and further, this domain perspective could be used as guiding tool for decision-making.

### **Empirical Assessment of Neglected and Underutilized Crops Marketing Utilizing the Domains Perspective**

Two agrobiodiversity systems were selected as part of the National Project '*Mainstreaming Biodiversity Conservation and Sustainable Use for Improved Human Nutrition and Wellbeing*' implemented by the Ministry of Environment and the Department of Agriculture: (1) A tank-based agricultural ecosystem and (2) Kandyan home garden ecosystem. The village of Gampola in the Giribawa Divisional Secretariat, North Western Province and the village of Udadumbara in Udadumbara Divisional Secretariat, Central Province were chosen to represent the two ecosystems respectively.

A series of field visits to the sites were undertaken between June and August 2011 and Rapid Rural Appraisal techniques were adopted to study the social economic systems in the villages, by means of

Key Informant Surveys, Focus Group Discussions, Depth Interviews and Participant Observations. Preliminary findings from the study and reports about the situation in the country as a whole are as follows.

The tank-based dry zone agricultural ecosystem at the site of Gampola village exhibits direct agri-marketing dimensions: mostly undiversified production, unsystematic foraging/collecting and middle-men led marketing. In some instances, contract farming practices (such as the cultivation of gherkin) can be observed as well. When it comes to the tank resources, collection of edible plants/roots and leaves have been recorded. Nevertheless, the proper channels for this are not clear, with the tank being rented to outside traders. Although fishing is carried out, market systems are very minimal or non-existent. Surprisingly, for the community the lack/underdevelopment of marketing channels is not considered as a bottleneck for livelihood development. Perhaps they have become dependent on the middle-men to carry out the function of linking to buyers. Another critical factor is the presence of contract farming, in partnership with some leading agribusiness enterprises, which was observed as a community-wide activity. The home garden-based ecosystem at the Udadumbara village exhibits a marketing system that is generically different from the Gampola site. The home garden has created a form of self sufficiency for the community, with them having to look for outside purchasing only for a few selected products. The output of their cultivation/rearing activities is either sold through middle-men or taken by traders to the town on public transport (such as the school bus). The development of the road leading to the village has greatly enhanced these trading activities in recent times. However the community does feel the need to improve the existing marketing system, since they are well aware of income losses as a result of middle-men and transport charges. Value addition as a mitigatory/adaptation strategy is virtually non-existent, and this needs urgent attention.

There are no visible production practices adopted and, if available, it is highly scattered throughout the island and only a minimal amount is cultivated/reared/collected/hunted for own consumption at a minor scale and non-commercial engagement. Further there are no market extensions from these points as well. Grower/producer led alliances or linkages (farmer associations/community based organizations) are very rare except for principal crops such a paddy and there is a great need for processing infrastructure and organization, to initiate primary processing. Broadly speaking, just like in other countries the low productivity of NUS is a significant cause behind this situation. All of this result in market imperfections and consequently a suboptimal market equilibrium. Another issue is the perceived low economic returns, among rural communities, for any commercialization initiatives for NUS. Improving the production domain should be taken within a conservation-commercialization

paradigm and effectively guided towards a market oriented production. Two methods could be the strengthening of farmer organizations and formation of community-based organizations.

A proper arrangement of different market actors, institutional capacities or exchange facilities cannot be observed for agrobiodiversity products in Sri Lanka. There are some instances where different channel intermediaries are present, basically small scale village level collectors, medium-sized traders and even large-scale formally registered traders. Even here, high transaction costs are faced due to lack of information and trust among the different market chain actors and a lack of processing initiatives throughout the channels. We have further observed a genuine lack of coordination along the existing supply channels. Therefore functioning, efficient value chains have not been established for products sourced from NUS. Furthermore many of the potential channel members (e.g. intermediaries of other major crops, etc) perceive a risk in trading of such agro biodiversity-sourced food products. In rural areas a low degree of trading for these products have been reported, while a select few products are even at present heavily traded in urban centers (e.g. processed products from wood apple, traditional yams, etc). Improving the channel domain could be undertaken by utilizing a number of related methods, such as participatory value chain analysis, holistic filiere approach, resource to consumption approach, horizontal and vertical integration, empowering channel members, institutional capacity development, and investing in processing infrastructure.

The consumption of NUS is often limited to those from the surrounding community of these resources. Many of the villagers especially those that belong to the “older generations” were aware of these species and have a tendency to support their continued existence in the environment. Nevertheless, there is a very limited knowledge among the younger generation about these species and their properties. The typical household/individual consumes what is grown/reared/collected/hunted and sells the surplus if a good price is available. A few plant species (e.g. green leaf varieties) are utilized for creating traditional food items (e.g. kola kenda) and some (e.g. siyamabala) have a much wider consumer base. It is very much clear that substantial and actionable output markets are absent for these biodiversity-sourced food products. Some of the prominent selling points are the Sunday “Pola” and roadside stalls (spot markets).

However, in the demand side, it is recognized that the marketing landscape is dynamic like never before in the country and socio-cultural and demographic changes have created numerous opportunities and threats for such agrobiodiversity-sourced nutritious food products. In the context of agrobiodiversity-sourced food products we could define two broad consumer segments: the first is

generally the health conscious and economically stable group and the second is the relatively nutritiously vulnerable segment and a latent demand is present among both groups. Nevertheless there is a lack of awareness among the general public about the true nutritional benefits of agrobiodiversity and about its worth for conservation. In addition to this there is significant confusion among consumers about the benefits and values from such food products. Improving the consumption domain will need to be engaged through customer research, social marketing, branding, packaging, labeling, certifying, niche markets, awareness and education programs. The present agrobiodiversity marketing system in Sri Lanka inherits a number of key issues stemming as gaps from the contexts described above. They can be primarily categorized into three as: missing output markets, market imperfections, and market failures. A deeper discussion is warranted for proper policy and effective actions.

### **Risks in Adopting a Marketing Perspective**

There are a number of systemic risks associated with adopting a marketing approach for conservation and sustainable utilization of agro biodiversity (Will, 2008). The principal risk in the creation of forces which drive the increasing of too much market (a non-finalized market) outside the niche that is available on the consumption side for NUS sourced food products. This would ultimately lead to the second possible risk, the formation of an un-balanced market. With consumers recognizing the nutritional benefits of food products from NUS, there will be an increase in demand for such products, which can switch production to unsustainable monoculture plantations, leading to unsustainable exploitation of the resource base; coupled with such a market-based approach discussed earlier here, appears the threat of a sudden surge in market demand for a product, which in turn may lead to indiscriminate harvesting practices and overexploitation of natural resources. The discussion in this section stresses the importance of a holistic approach that brings these species under cultivation and at the same time re-governs the market for these species in order to bring sustainable benefits to the poor communities maintaining and utilizing them.

### **Acknowledgement**

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**ENGINEERING AND OTHER TECHNICAL SCIENCES****PLENARY SESSION**

Chaired by Hon. Champika Ranawake

Minister of Power and Energy

## **Summary**

*By considering theoretical and practical aspects of engineering and other technical sciences with respect to economic growth and development in post conflict Sri Lanka, Mr. Lalith Weeratunga, Secretary to His Excellency the President, Prof. Ananda Jayawardena President of Sri Lanka Institute of Engineers, Prof Dileeka Dias and Dr. Ajith Pasqual of the Department of Electronic and Telecommunication Engineering were invited to speak on selected areas of Engineering and Technical Sciences. Mr. Lalith Weeratunga while giving consideration to the demand and the potential for ICT in the post conflict scenario, wanted to introduce new academic and professional programs with the aim of new employment and new value additions in the production sectors. Mr. Lalith Weeratunga wants KDU to start such an ICT degree program to strengthen the ICT industry that can serve in the military forces as well as the governmental and nongovernmental sectors. He further said that such contribution to the telecommunication infrastructure with skills and knowledge, will help the economy in the post conflict scenario, directly and indirectly. Dr. Ajith Pasqual in selecting the education sector studied the problems and issues of ICT education in Sri Lanka. According to Dr. Pasqual, one time investment in ICT and just one off training alone will not be able to provide any contribution by ICT to economic growth and development. There is a need for continuous investment and training. The investment in networking facilities need to be continued. The training component, by using remote on line facility in ICT needs to be incorporate with multiple programs in future planning. Prof. Dileeka Dias brought to the notice of the audience that ICT infrastructure investment is a part of Social Overhead Capital. Doing a comparative analysis in relation to developed countries as well as developing countries, Prof. Dileeka Dias mentioned that ICT pursues economic development. She recommends the shift from mobile to internet with the use of other complementary innovations. According to Prof. Dileeka Dias, such a shift will enable the country to get benefits from ICT that would help the country especially in the post conflict scenario where the country is geared for acceleration of economic growth.*

*Prof. Ananda Jayawardena, with the focus on economic growth by 2015 with \$4000-5000 per capita income convinced the audience that Engineering sciences can play a big role in accomplishing the task of development. He emphasized on the introductory note of Hon. Champika Ranawaka on Nano technology, Bio technology and neuro technology and said that the engineering sciences can play a big role in economic development. In this regard, he mentioned that an increase in engineering graduates with the potential for innovative capabilities that linked with entrepreneurial abilities is important. Further, he recommends having a comprehensive National Innovative System with higher R&D investment. He said that the current R&D investment of less than 1% of GDP is very low even*

*when compared with the other South Asian countries. He also recommends the country to gear for Sri Lankan companies to come out as world recognized companies and be competitive in regional and global challenges. According to Prof. Jayawardena, if Sri Lanka can be competitive at regional level and at global level, Sri Lanka can increase export earnings and can reduce the import expenditure. This would help in winning the war against the challenges of economic development of Sri Lanka, as declared by the government of Sri Lanka. Prof. Jayawardena, giving special reference to construction engineering, praised the projects of Southern high way and Hambantota port that are in the process of leading the nation towards its vision of development. In the discussion, Mr. Mohan Peiris pointed out that there is a lack of competent professionals at higher levels where country needs to deal with issues at international level. Prof. Jayawardena taking the point, agreed that there are gaps to be bridged in the future for further improvement of the competencies of professionals. Answering a question on whether Sri Lanka should focus on application of existing knowledge or whether it should gear for new knowledge, Prof. Jayawardena mentioned that both need to go hand in hand and need to clear the path for development because both are mutually benefitted.*



*Lalith Weeratunge, Secretary to His Excellency the President, Mahinda Rajapaksa, making his Presentation (IMG\_1864)*

## **“Information Technology as a Tool for Modern Development**

*Mr Lalith Weerathunga Secretary to His Excellency the President Mahinda Rajapaksa*

Honorable Champika Ranawaka, the Minister for Power and Energy, Excellencies, Vice Chancellor of the General Sir John Kotelawala Defence University Major General Milinda Peiris, Deputy Vice Chancellor, Foreign delegates, Dignitaries, Dr. Rohan Gunarathe, Paper presenters, Officers of the Tri-Services and Staff of the KDU.

I am glad to be here once again. I was here last year as well at a very well prepared symposium, which discussed *post conflict development issues*. Today, I am in an engineering session and I am the only non – engineer who is talking about engineering aspects. So I will just try to see how we could relate to the topic at hand. Interestingly, we are talking about the role of ICT in post conflict development. Two years from end of the conflict, so many things are happening. Among which I believe the most important thing is the reconciliation approach of the government. Coming to terms with all the issues we have had, the baggage we have carried; and now we have come to a situation where we are trying to build one nation that many other speakers have elaborated on. Let me tell you, having suffered for 30 years I am grateful to our armed forces for making this country a place where we can move about freely. Including the honorable Minister, all of us can go to any place in this beautiful land and that is because of your hard work and your sacrifice.

I must tell you that we are on our way towards achieving a sustained target of 8% per annum in our economic growth and US dollar 5000 per capita income. I think those economic sources that spoke about it, would have elaborated on it. It took over 40 long years for us to get to the US dollar 1000 mark, but I think it took us just 05 years to get from 1000 dollars to 2000 dollars in terms of our country's per capita income. So, we are now just emerging and in a very unique position as a country that has been able to grapple with terrorism with our own resources and not with any imported man power, mercenaries or whatever you may call. We did this task with our own resources, with our own brains, with our plans and with our men. So having done that, it is my belief that the post conflict development process in Sri Lanka can be handled well by those who are in Sri Lanka. But we need the support of those who are abroad to perhaps inject new ideas, inject new thoughts and take Sri Lanka forward within the next 05 years or so. For the government during the period, say the last 3 decades, many places in the North and the East were inaccessible. So obviously, there is a huge disparity in development if you look at the areas of education, health etc. The ICT was certainly at the lowest level because most of the places in the North and East were not accessible. Therefore, with

respect to the investor, there was a great uncertainty and insecurity to set up plans to expand any existing businesses. The end of the war however, was to change all these and the bleak outlook that we have had is fortunately withering away and now we walk towards prosperity.

If you look at some other countries that are undergoing post - conflict development, Sri Lanka is unique in many ways. But the important thing to bear in mind, is that far too many activities need to be done simultaneously. For instance, we have to do the relief work and we have to ensure there is resettlement, reconstruction, and economical revival. Thereafter, we have to ensure that there is political conscientious building and there is investment coming into the country. We also have to build an inclusive society that is probably the most important thing in the current development phase. We have to ensure that there is social cohesion. I think the previous session talked about it. We have democratic elections, we have an election coming in a few weeks, but we do have to ensure that we have enhanced public service delivery. This is very important.

The government has no other place to go. The government has a monopoly in this whole issue of public services. People have to come to the government. Just say that you go to a shop and if you don't get your goods then you can go for another shop. But you cannot do that with the government. Government has a monopoly in many things and I am going to talk about some of these unique things that we have been doing and that we need to be doing in the future. For a country, which is facing post - conflict development, all what I mentioned from relief to reconstruction and social cohesion are all competing priorities. You can't place one priority over the other. You have to do all these simultaneously. That is a challenge. That is a huge challenge for a country which has limited resources. But my way of looking at it, we have first class human resources. I am going to talk about as to what Universities like the KDU could do in time to come.

We also need to ensure that information technology is used to serve this transformation. Information technology is a tool. But it has to be used to ensure that across the borders, services are delivered with equity and equality without any geographical discrimination. This is the beauty of ICT. The success of ICT, in post conflict transition has been well demonstrated in several countries including Cambodia. I myself had the opportunity to work during the time when the Cambodians were thrown out of Cambodia because of Cam Rouge fighting. There was so much of infighting, so much so that all these people came and landed on the borders of Thailand. The United Nations created what is called the UN border relief operation. I was taken in as one of those experts to work on education and technical training and I saw how these displaced persons had to grapple with day today life.

But incidentally, today if you look at what they are doing, Cambodia is also the first country in the world where the number of mobile phones exceeded the number of fixed line phones immediately after the conflict. Of course Sri Lanka has a fantastic history today. We have 18 million connections today for a 20 million population. It will not be long, may be in another 02 to 03 years time, there will be 22 million connections for a 20 million population, because some people carry more than one phone.

IT has several unique capabilities in accelerating development, as has been shown in Sri Lanka; it's a prime enabler of economic performance, increasing government revenue, improving access to information and public services, and enhancing private sector and civil society participation in development. Of course ensuring social cohesion and then using social media and its ability to bridge the generational gap often exists in countries affected by protracted conflicts. We are going through this today. We have adult population; we have young children, who are equally good at working with ICTs. We are just doing what we can do to ensure their equity. This is the most important thing that those in Colombo do not have an advantage of over those in Monaragala. That is the key concept of government's development policy.

During the 03 decades of the conflict, we have seen a structural shift in Sri Lanka's economy with the service sector share of the GDP growing dominantly and now reaching to 2/3 of the economy. So when you have a growing services sector, you can see the role of ICT coming into play. The government's development agenda, the "Mahinda Chinthana" (I am happy to say that we have also one of those architects here; honorable Partely Champika Ranawaka, who brought these concepts together so that we have a development plan for the country) firmly focuses on promoting Sri Lanka as a knowledge hub. I am not going to talk about the other four hubs but I am going to talk a little on how we should be working towards becoming a knowledge hub.

Well, it is strengthened by the realistic opportunities we have. If you look at the interesting figures of the ITPBO industry, we have some of the IT experts here from the University of Moratuwa. We could make it a one billion dollar industry without investing one billion dollars in it. This is the beauty of the software industry which is in the form of good human resources, good infrastructure, good broadband. So these are things that the government should be looking at. Well, we haven't had a traditional reputation for IT exports and BPOs. But sooner than later, we will have that reputation.

We right now earn about US dollars 350 million in ICT sector exports, but as I told you, by 2015 we hope to get to the magic mark of US dollars 01 Billion in ICT exports.

The rapid growth of the ICT sector in the county is also reflected in the national ICT work force. The survey done by the ICT agency recently shows that there is a huge enhancement in the numbers. Within a time span of merely 04 years, the IT work force had surged to 100% with the current numbers approximating 60,000. The share of female workers in the BPO sector is also on the increase, now accounting for 43% of the total BPO work force. I was approached by the HSBC BPO centre, just about 2weeks ago. According to them, they just cannot find people. They want 600 people to work in their BPO industry. They want people with 2 A/L passes but of course with the ability to use English not at a very highly articulate level but to be able to explain, to be able to understand a client's issue and then give a very coherent and correct response. They are finding it difficult, may be because according to what they told me, when they interview 20 young people they can just select 01. So there is a huge opportunity here, for Sri Lanka to get into the BPO sector.

I must quickly get on to what I should leave behind in terms of what the university should be doing. Our own performance in using IT in extensive e-governance reforms has resulted in sustained commitment by the World Bank to support the second phase of the e-Sri Lanka programme. That is very good news for us. In Sri Lanka, widely acclaimed projects are implemented by the government. The ICT agency is supported by the World Bank. The whole idea is to bring ICT to every village, citizen, and business and transform the way the government thinks and works. One of those projects is the 1919 the government information centre, which won one of the best e-government awards in the world. This is because we have been able to serve a population using 03 languages, 365 days of the year from 0800 to 0800. During the last 05 years the GIC, or the Government Information Centre had handled 07 million calls with an attrition rate of less than 5%.

I mean that is a great record for Sri Lanka in ICT. I would like to sum up, because time is limited and we are quite aware of the time constraint. But I would like to ask the KDU, a university, which has reputation and serving the armed forces, to look at how we could increase the number of IT graduates. We have the Moratuwa University here. If we put them together, it turns out something like 5000 per year. But we need a minimum of 10,000 IT graduates, at the level of graduate Engineer who should be able to conceptualize. These are not just BPO call centre workers; these are people who will conceptualize, design and then make ICT a very important crucial sector for Sri Lanka. I think in the roles that the KDU play, we have already seen the armed forces using ICT to maximum

effect. Now that peace is here and you have post conflict development processes going on, you could assume a role where you become an enabler, you become a resource creating centre and see that more and more IT graduates come out of your learning centers. I think that is the messages that I can convey today, and I must commend the KDU for bringing together all of us of different disciplines to talk about issues that confront us, issues that have to be carefully dealt with so that we look at the post conflict development phase with great confidence.



## **“Problems and Prospects of Information Technology with Special Reference to Sri Lanka”**

*Dr. Ajith Pasqual, Department of Telecommunication, University of Moratuwa*

Good evening ladies and gentleman the topic that is given to me is “Problems and Prospects of Information Communication Technology”. Let me concentrate on the problems of ICT with the focus on the e-problems specific to the education systems and let me justify why I actually selected the education systems, again specifically, the school education system. We all know that every year we have about 3000 thousand children basically getting in to grade 1 and in 10 years time, in 2021, 3 million students would have actually gone through the system and entered the society. So if you can actually make use of ICT to turn these school children into useful citizens, that will be a tremendous advantage or tremendous benefit to the country. The symposium theme being the challenge of post conflict Sri Lanka, I think we can actually address issues connected to ICT of these 3million children. So we must use ICT as an enabler, as Mr. Weeratunge pointed out. It is a tool for which many enabling technological support services must be fulfilled. First requirement is you have to have a computer. Then you have to have accessibility to the computer/to start using it and you must create the environment to use it, that is some kind of a basic training. Then one actually can start making use of computer hardware and software. Within the last five or six years the government has done a commendable job in these two aspects. So these two aspects actually need to be compatible with each other and we need to deal with the issues appropriately. Let’s try to focus on this particular aspect with a story that we are all familiar with.

Story is coming from an incident that has actually happened in a school and I am not going to narrate the story as such, but this actually happened in a school English class. The teacher asked the student to come in front of the class and narrate the story of the hare and tortoise. The student basically starts narrating the story in English and halfway through the teacher stops the student and says “what is the word that is used for tortoise” Is it a tortoise and how do you basically spell it? “Tortise” is that the way that you pronounce “Tortoise”. Yes that is what we have been used to. So then the teacher blames the student saying you are at this grade right now and after so many years, you pronounced it wrongly, it should be “tortoise” and not “tortise” Then the teacher asked the student to start the story once again. Start from the beginning and with the new pronunciation.

This simple story raises the following questions. “Who exactly is at fault?. Is it the teacher? or is it the college education or the entire education system in general?”. In the real situation, that is something wrong with the teaching learning environment. So what I am actually trying to point out

here is that we are on a march towards knowledge economy in a traditional society under teacher centered education but not under a student centred learning environment where students can exploit the learning environment. So what we can actually observe according to the story is that the teacher has faithfully learnt what she was told at a college of education. Therefore, probably, we need to have a system where we don't actually teach students but we allow them to explore beyond the things in a class room. The things probably, we were used to, when we were actually school children. We faithfully listened to what the teacher said and absorbed that. But now, in marching towards a knowledge society, this has to be changed. That is the point where I would like to start this presentation and where ICT appears. The school has computer laboratories and the school has internet connectivity. Probably many of you must have visited the WIKI dictionary site in the internet and if you go there, basically you can not only actually find all details about tortoise, but also how to pronounce the word as well. And so this is a very simple illustration. Now using ICT as a tool, although obviously not for development, you atleast know that you have learned English.

Mr. Weeratunge pointed out that we are planning to develop five knowledge hubs and has already started to work towards that goal. ICT is an enabler that can play a major role in making the initiatives for such knowledge hubs. In the case of using ICT as an enabler, we can identify its different levels. There are schools, universities, using ICT as an educational tool. Probably universities are better off. ICT industry can really benefit the government, the economy and the society. Basically the E-governance that we are referring to as ICT, enables us to serve citizens. The IT work force has increased from 15,000 to 50,000 in 2010. I would like to put this improvement in the context of the number of students who leave school education system in Asia. Probably, a very small fraction is actually joining the ICT workforce. How do we actually increase the number of school leavers joining the IT industry. As I already mentioned, the government has invested a huge amount of money to develop the ICT infrastructure in not only schools but also in the universities. The Government offices and these schools are actually connected to the internet. We have 9700 schools. The student distribution within the schools is actually very inequitable. Fifty percent of the student population is actually studying in 1000 schools. When you rank by the student population, 10% of the schools accounts for 50% of the student population. So what we can actually do is really address some of these schools and we can cover a larger margin. Even though the country is big and the schools are everywhere, we can really say that by covering 4600 schools they can cover 90% of the student population. If you are looking at the current statistics 90% is covered in terms of accessibility to ICT. Nearly 58% to 60% is covered in terms of basic accessibility to the network that is accessing the internet. What these statistics tell you is that we are now on the way to reaching a

target of 100%. The government investment has already proposed huge investment. The short IT replacement cycles in developing countries are actually very difficult to absorb. This is something that we have to really focus on. In the same manner, in terms of training, 110,000 teachers training has increased up to a 200,000 teacher cadre. So the question that needs to be asked here is “are we really using ICT for their education purposes?” “Is that the type of training that we need and is it sufficient to acquire all the basic skills in using our ICT”. So what are the alternatives of all such cases? Do we have the network accessibility? There are a lot of alternatives for the training, particularly online training. The crucial problems here are the poor utilization of ICT resources and use of ICT solutions. Training with the appropriate mind set change, with a focus on how teachers and students explore and self learn and not just a listen are important.

You need to absorb what you hear and go out and research into what you have heard and then, integrate them with ICT in order to create the needful so that, ICT is part of connectivity. I like to call internet connectivity as a facilitator. One reason is, you have the resources but yet, unless you are facilitated with proper ICT, use of resources may not be to the maximum.

ICT is a pyramid that leads to improvement. In this pyramid, there is a huge base at the bottom and at the middle we have the primary source for the IT BPO sector. Here the target should be to address things that are required in the particular discipline. Here it needs a lot of training to bring the students up to standard to absorb things in line with the IT enabler. The knowledge economy is all about the knowledge in trading, production consumption as an integral part of regional and global changes. In such a knowledge economy, internet has become a primary need.

Once you get the education, innovation and the development will be followed. So education is a road to investment. We all know this as billions have been spent to provide economic benefits to all the rural villages and what we need to do is invest in an information super highway or information highway from which the country is able to reach the benefits of money spent on hardware. For this information high way, the country needs Rs.200 million per year. Rs.120 million is already allocated for this year by the government. Remaining Rs.80 million, has to be found from somewhere else. This investment allows 65% of 2.2 million students to access internet. However we have to understand that it was a hard process and up to now the donor agencies have borne 2/3 of the cost.

Now let me go back to the hare and tortoise and see their applicability. Here, we are talking about the connectivity speed of megabits per second or kilobits per second which is a term that is gradually going out of the vocabulary in many countries. So we have to invest in one missing element if we are

to reach the benefit of investment. We have already made available the necessary conditions of ICT infrastructure. Let me conclude; it is a coincidence that Hon. Champika Ranawaka the Minister of Power & Energy is chairing the session. Just as the electricity is a prerequisite or basic utility in any society, in a knowledge economy and knowledge society, accessibility to the network and easy network access becomes a primary requisite of such a society. Let's all work towards that Goal.

Thank You.



*Dr. Ajith Pasqual making his presentation on “Problems and Prospects of Information Technology with Special Reference to Sri Lanka” at the Symposium (IMG\_1876)*

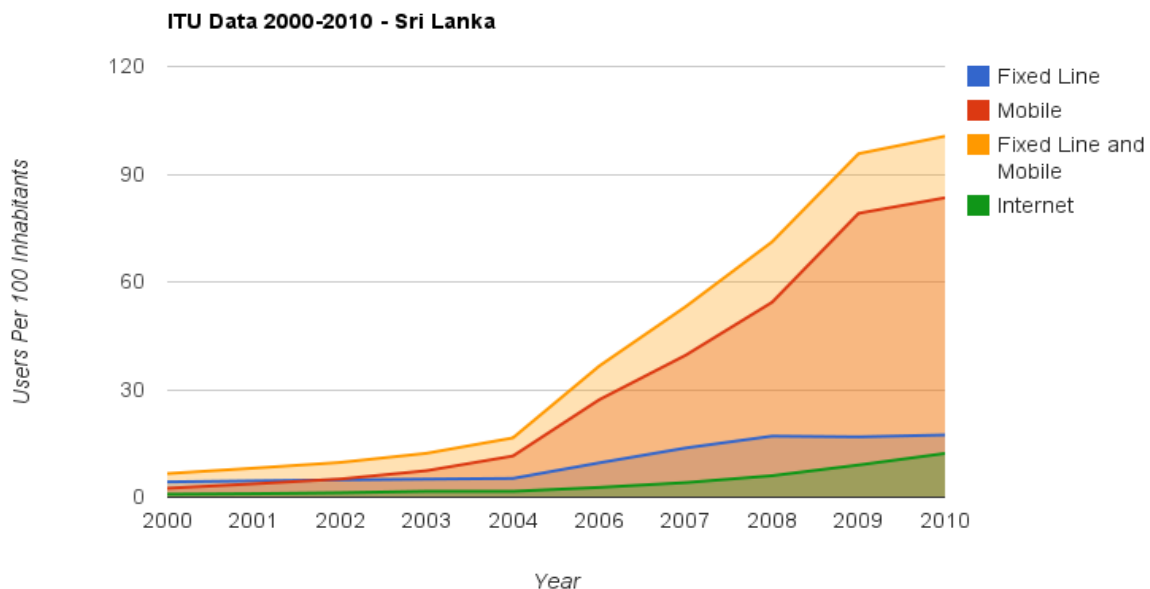
## Role of Telecommunication in Acceleration of Economic Growth in Sri Lanka

*Prof. Mrs. Dileeka Dias*

Good evening to you all. Hon.Minister and members of the distinguished panel, members of the audience, it is my humble privilege to be here today to make this short presentation on “How telecommunications can spur economic development in Sri Lanka”.

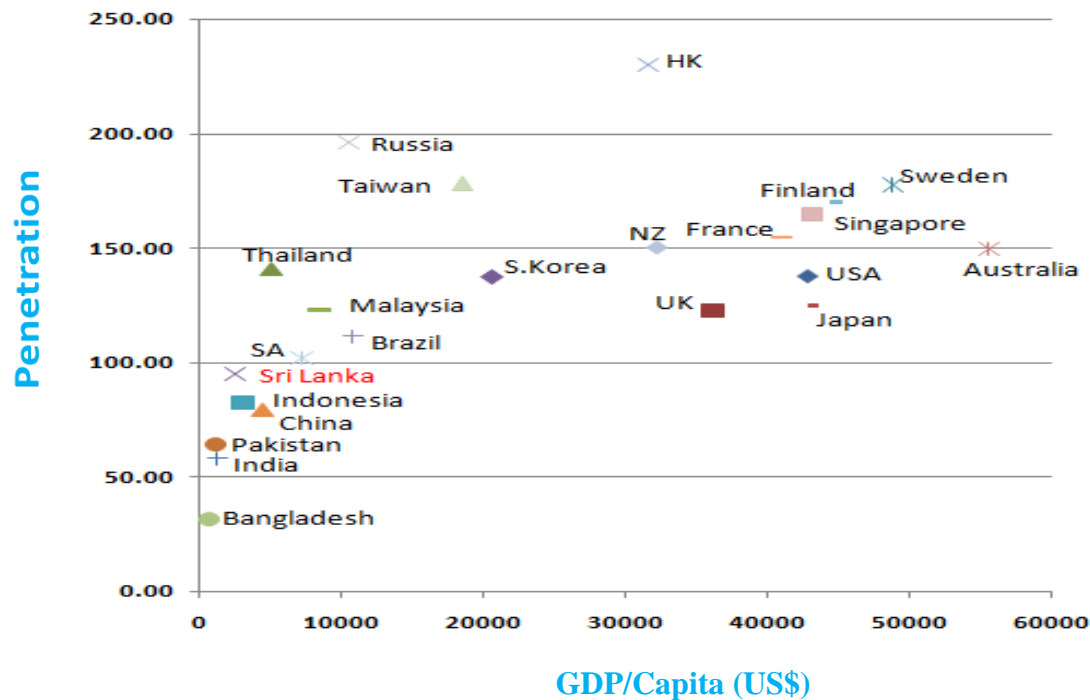
Let me start with two important miles stones. Just a couple of months ago, we reached a global milestone, where the number of telephone connections in the world exceeded the world population. The telephone penetration in the world has exceeded 100%. The mobile connections far exceed the fixed connections and this has been happening for many years all through this decade. Let me also talk to you about a local milestone. The tele - density in Sri Lanka, according to statistics, exceeded 100% in 2010. This is a little different to what Mr. Lalith Weeratunge said. You know different statistics come from different places. Anyway, we are very near to this 100% penetration and maybe even a little bit more depending on how you estimate these things. So, this is any way a very significant land mark for us. Then let’s look at the current state of affairs in our country.

### Current State of Affairs



think this graphs tell us lots of things. One thing is again the ratio fixed to mobile. You can see the growth of the fixed telephone and if I am to be straight forward about it, you can say that the fixed telephone is dead. There is no future for the fixed telephone and the future is with mobile. This doesn’t mean that all of our efforts in telecommunications should be on mobile or wireless. We need

a huge supporting infrastructure to support mobile. But anyway, the mobile will be the future as far as the consumer or the user is concerned. Another thing that we can see here is the internet penetration. Internet penetration is really poor and it is less than 15%. Then again where does Sri Lanka fit in the global picture?

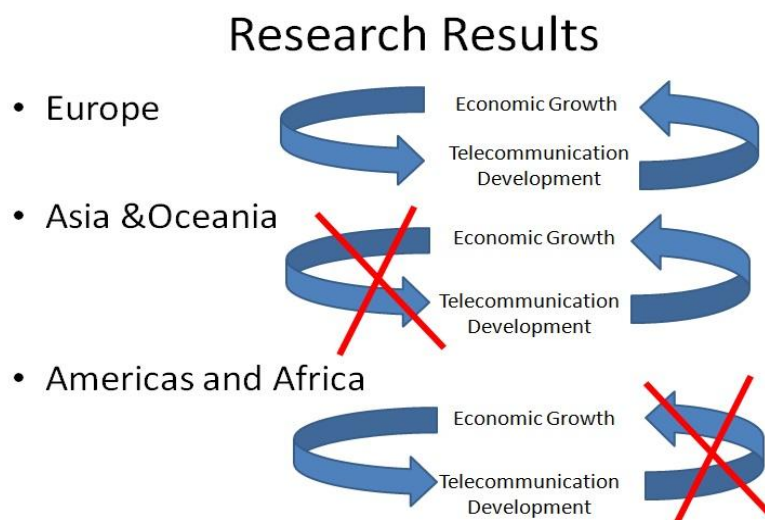


This shows the penetration Vs per capita GDP. The penetration here in Sri Lanka is just below 100% and Sri Lanka is at the top of the region. It is also obvious from this that there is a relationship between telecommunication development and economic growth. You can see a stronger correlation.



But what is this? What is the relationship exactly between telecommunications development and economic growth? Is it what causes the other? Or is it a two way relationship? Many people have studied this but it seems that there isn't much current information, which really quantifies this relationship regarding Sri Lanka. But research results that are available in various parts of the world show some interesting relationships from which we can learn and perhaps plan our future in terms of telecommunications.

Firstly, in European countries and the countries with high income, there is a two way relationship or a bi - directional relationship between telecommunications development and economic growth. That is telecommunication development spurs economic growth and the other way around. When we look at low and lower middle income countries, to which Sri Lanka belongs, it has been seen that economic growth spurs telecommunication development but not the other way around. This is a significant difference between these two environments. But when the impact of mobile development is evaluated separately, we see again the bi - directional relationship between economic growth and telecommunication development.



So what about the different geographical regions? When people look at the world as a whole, they have mostly found that there is no identifiable relationship between the two. But when people look at smaller regions of the world, there are clearly identified relationships. Again in Europe, you have that kind of a relationship. In Asia and Ausania also telecommunication development spurs economic growth. So, if you want to adopt these results in a straight forward manner, this is fine. We belong to this second category and telecommunication development does spur economic growth in here. On the

other hand, in America and in Africa, economic growth spurs telecommunication development but not the other way around.

Sri Lanka is somewhat unique, so I am not certain as to whether we can adopt the available data for Asia and Ausania in this case or whether we should look more closely. Anyhow, I think it is interesting for us to look into the reasons, as to why these relationships are so. Therefore, why is there a bi - directional relationship in Europe and in other high income countries? Of course one is high income; the other is that the fixed telephone penetration reached critical mass very early in the development. Critical mass is defined as 40% of the population having fixed telephones. Also these countries have skilled and educated work force. These are the reasons why this mutually supportive relationship has been established. If you look at Asia and Ausania, why this relationship is so? This is attributed to these facts: low or delayed fixed telephone penetration, like in Sri Lanka fixed telephone penetration was very slow; and good literacy and the skilled work force, we know as Mr. Weeraratunge said, we have a very literate work force and a literate population, and the mobile phone arrived as an alternative to the slow penetration of the fixed telephone. The result was that mobile phones spurred the economic growth.

In Central America, South America and Africa, mostly these are large geographic areas with vastly populated and under developed infrastructure, you can see all these other features like poor literacy etc; all such things resulted in telecommunication development not spurring economic growth but the other way around. There were probably no opportunities for people to use telecom effectively and cause economic growth. But when economic growth happens, people's affordability increases and therefore telecommunications development happens.

So other results show that most economic benefits are reaped at the point of achieving universal service. Universal Service is every person in the population having a telephone. So we are at the point of universal service and we can reach the maximum benefits of telecommunications.

We need to be really concerned about how we handle the situation right now. Then, educational skill level of the work force, business environment must be conducive to reap the benefits of telecommunications fully. This has been shown in studies in Africa where the skill and the education levels were very low and therefore telecommunication development was not very rapid.

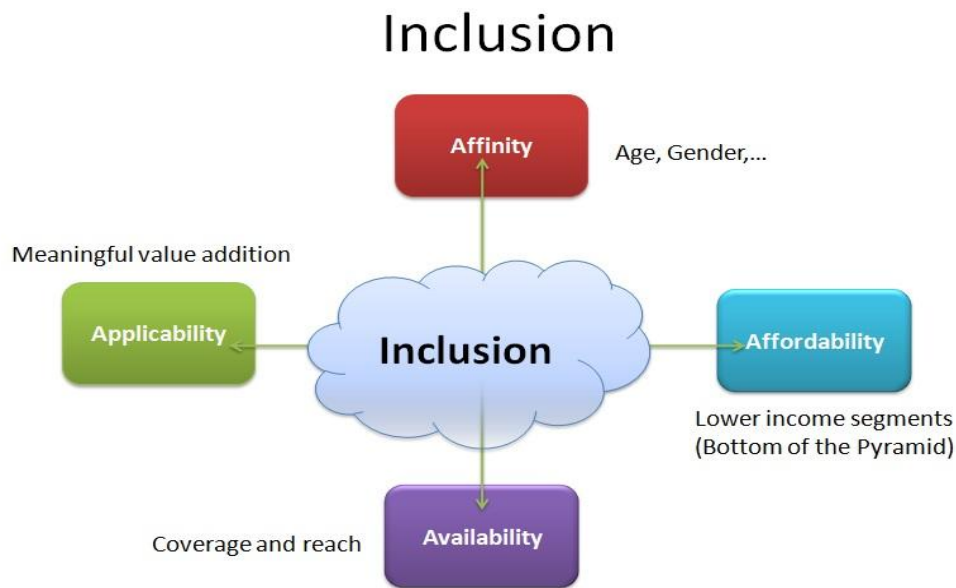


So in relation to all these, where are we? As we saw in the morning, Sri Lanka has a special characteristic. Sri Lanka never achieved critical mass in telephone penetration in the traditional sense. But we leapfrogged into nearly 100% penetration with mobile phones. So we have universal service. We have been a trail place in the region ever since the British installed the first telegraph office in Colombo; we have always been ahead of our immediate neighbors in telecommunications and it continues till today.

Yet, we need to look at the poor internet penetration which is another characteristic of the immediate neighborhood. I would like to point out that the concept of literacy has changed. The four “R”s, which characterize literacy today, *Reading, Riting, Rithmetic and Retrieval* are important in telecommunication. The retrieval of information has become an essential component of literacy today and we are very weak in this particular respect.

Then of course the war has affected the telecom development. This is a small country with unequal development, perhaps due to the war and may be also due to other reasons; this concept of having universal service is still valid. Research on this telecom and economy outdates fast. Much of the research that is available, may be done in 2008 or so, is no longer valid because the environment changes and it is so dynamic. We need to understand the real situation in this relationship, whether we can assume that is uniform across the country or whether it is different in different parts of the country. So my feeling is that we need to have a closer look at the provincial level.

Anyway, what we want is to make use of the telecom sector to accelerate economic growth. In this regard, we can identify 03 factors; one is *inclusion*, more people and more services. The importance of inclusion was presented earlier too. Then *more coverage, more capacity*, which means more investment and the third one is grab new opportunities that are opening up, which I call *innovation*. So we have three eyes, which would help accelerate economic growth together with telecommunication. Let’s briefly look at some of these things. Let me quote Dr. Hans Wijesuriya of Dialog; he said “*inclusion is a fundamental tenet of economic development and wireless is inherently inclusive*”, because wireless reaches everybody. It is not wired technology where you have to draw wire to each person. Wireless is in the air so it is inherently inclusive.



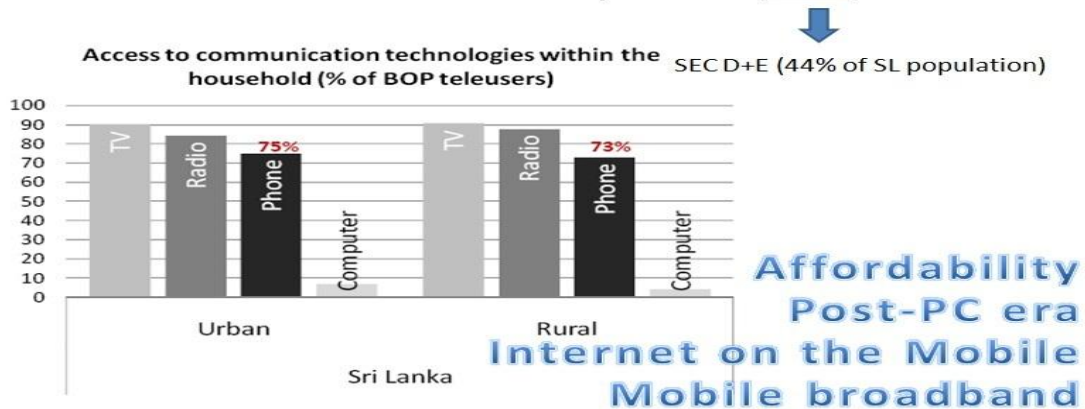
Source: "Wireless and the Economy", Dr. Hans Wijayasuriya, IESL, February 2008

What is this inclusive concept? In terms of Telecommunications, it makes products available and affordable to as many as possible. That is the inclusive concept in telecommunications. As oppose to exclusive consumer orientation, which is to make products available to those who can afford, this inclusive consumer orientation includes inclusive development of telecommunications that would spur economic development.

Telecommunication products inclusion has four characteristics. They are; *age, affinity, affordability and availability*. Affinity means it has to appeal to some part of the community. Affordability is that it has to be affordable to low income people. This is called the bottom of the pyramid, similar to what Dr.Pasqual articulated previously. Here, we have a bottom of the pyramid and it has to be affordable to this segment of people and then the coverage and the reach, availability or accessibility has to be there. Applicability means meaningful value addition. So if these four characteristics are satisfied that particular product will be inclusive. In fact all technology is inclusive by definition, because technology develops looking at these four characteristics.

## Inclusion

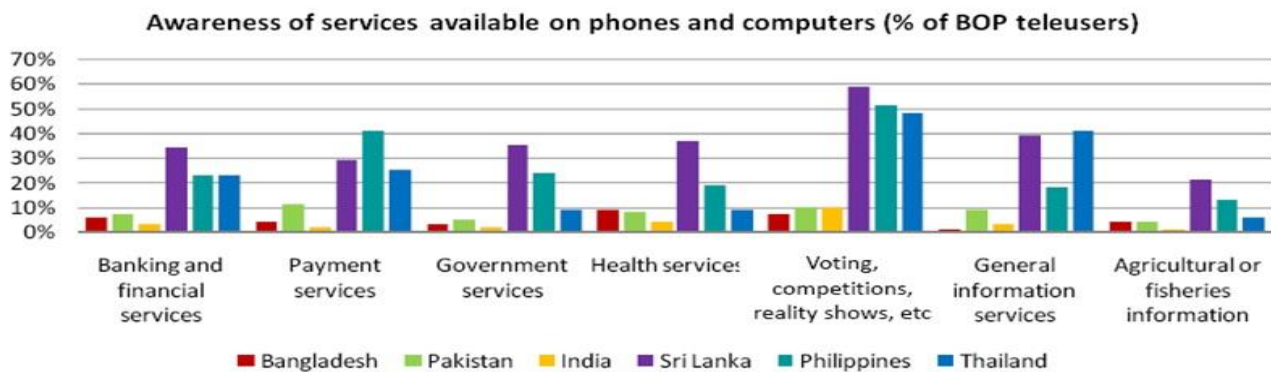
- Reach the Bottom of the Pyramid (BoP)



Source: LIRNEasia

So this particular result shows that the bottom of the pyramid in Sri Lanka, which is 44% of the population, has access to telecommunications and you can see that 75% of this group has access to a mobile phone. Whereas computer is really low, so this gives us some indication about the state's affordability. Phone is affordable to a lot more people than the computer and also we are now in the post PC era.

# Inclusion



Sri Lankans are tech-savvy  
A big opportunity to innovate  
Lack of content

Learn from the African continent

Source: LIRNEasia

The device, which is attractive today in various ways, is the mobile device and this again brings us to internet on the mobile. We have low penetration so let's have internet on the mobile. That brings us to the requirement for effective mobile broadband. Also Sri Lankan population is very tech - savvy.

They are able to adopt new technologies, new services very easily. As this study shows the purple bars are for Sri Lanka and you can see that Sri Lankans are ahead in their awareness of services that are available on phones and computers. So we can make use of this fact. It is a big opportunity to innovate and the reason that we have not triggered this kind of applications is perhaps the lack of content. A very good example to learn from is the African Continent, where people have really got into this business of providing all kinds of innovative services on telecommunications.

So what are the opportunities for innovation? We have mobile devices lowering costs and increasing capabilities. The bottom of the pyramid, as I said before, increases productivity and the earning capacity of this bottom of the pyramid is a big opportunity for Sri Lanka.

Then opening up of northern and eastern regions of Sri Lanka, as we discuss earlier, also provides a new unexplored market with competition. Then another opportunity is the expected booming in the tourism sector. This can be made use of to provide lots of new expansion in the telecom sector. Also with emerging energy costs; less travel more work could be another opportunity therefore telecommunication development. So coverage, capacity, accessibility and innovation content those are the key factors of making use of all these opportunities.

So let me conclude, Telecommunications and economic growth is really a combination of factors, such as infrastructure, education, training, business opportunities and regulation. So, what does infrastructure give us? Coverage capacity, accessibility and business opportunities give us the ability to innovate and to generate content. Effective regulation gives competition and growth in the industry. The education and training of the work force give us the opportunities to exploit the true potential of telecommunications. So, it is a combination of all these factors that would result in a very productive relationship between telecommunications and economic growth. Therefore I recommend the shift from the \* PC and the fixed telephone\* to the mobile with the use of other complementary innovations.

Thank you very much.



*Prof. Dileeka Dias receiving her souvenir from Hon Champika Ranawaka, Minister of Power and Energy (IMG\_1906)*

## Role of Engineering and Technical Sciences in the Acceleration of Economic Growth in Sri Lanka

*Professor Ananda K.W. Jayawardane, Senior Professor in Civil Engineering, University of Moratuwa  
NDB Bank Endowed Professor in Entrepreneurship President, Institution of Engineers, Sri Lanka*



*Prof. Ananda Jayawardena making his Presentation at the Symposium (IMG\_1894)*

### 1. Introduction

His Excellency the President of Sri Lanka in his Mahinda Chinthana: Vision for the Future declares that “the people of our country are now awaiting the victory in the ‘economic war’ in a manner similar to our victory in the war against terrorism. Over the next six years, I will dedicate myself to increase our per capita income to well above US\$4,000, thereby placing our country in the ranks of middle income nations”.

This is an ambitious target to achieve from current GDP per capita of US\$ 2,400 to US\$ 4,000 by end 2015. In order to achieve this rapid economic growth, from engineering point of view, it is necessary for us to concentrate on high tech value added exports. Currently, our hi-tech exports are only 1.5% of all exports and it has to increase to about 10% by 2015 to have this economic target (MOT&R,



2010). Sri Lanka is currently having a very good economic growth rate of 8.2% according to the statistics. The simple formula for creation of wealth for our country is to export more and earn from exports and reduce import expenditure through import substitution. We need to create a conducive environment to widely use that opportunity and this is where engineering sciences can play a dominant roll. Clearly, strategic application of engineering sciences and principles in effective way will lead to (a) high value additions to our products and services, (b) creation of knowledge intensive products, (c) successfully face national and international competitiveness, and (d) become more innovative nation. This can be effectively harnessed by promoting entrepreneurship and creating innovation and entrepreneurial culture in our institutions. With this background, the paper addresses the role of engineering and technical sciences in accelerating economic development under seven sub headings – 1. Opportunities in the engineering sciences, 2. Producing world class graduates, 3. The need for Innovation, 4. The need for Entrepreneurship, 5. The need for a National Innovation System, 6. The challenges, and 7. The way forward.

### Figure 7 Opportunities in engineering sciences

Rapid economic development can be facilitated through effective harnessing of engineering sciences in many disciplines. I will take a couple of engineering disciplines just to explain the concepts.

**Chemical and Process Engineering:** Chemical and Process Engineering applications convert raw materials to products, treat domestic and industrial waste to produce energy, useful raw material or useful products among many other opportunities (see Fig. ).1

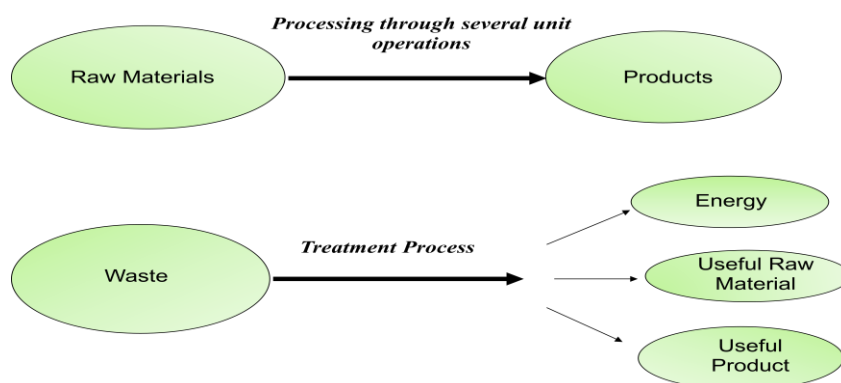


Figure 1 – Chemical and Process Engineering Applications

(Source: Department of Chemical and Process Engineering, University of Moratuwa)

Applications cover petro chemical industry, food and beverage manufacturing, sugar industry, confectioneries processing, polymer industry, personal products and many more like paints,

pharmaceutical, cigarettes, paper, solid waste treatment, cement manufacturing, waste water treatment and future applications in the area of nanotechnology. Session chair indicated at the beginning that we are in the era of biotechnology, nanotechnology, neuro-technology, information technology. There are lots of developments and opportunities in all these areas.

**Civil Engineering:** The traditional civil engineering discipline has several sub disciplines like structural and solid mechanics contributing to putting up of buildings of even one kilometer high, various other mega structures, waste treatment and environment, transportation systems, geo-technical and soil mechanics where we do things underground, hydraulics and water management, and construction management. In the 20<sup>th</sup> century the construction industry was proud to have had visionary engineers like Dr. ANS Kulasinghe who contributed immensely in the areas of pre-stressed concrete, shell structures, cost effective technologies, component assembly producing iconic structures such as Kalutara Bodhiya and Planetarium among many others. Today, in the 21<sup>st</sup> century we are already enjoying and in fact getting involved in many infrastructure projects such as Kinniya Bridge, Norochola power plant, Upper Kotmale hydraulic power project, Southern express way, Magampura sea port, the Sangupiddii bridge connecting people, Mattala Air Port and the Colombo Port expansion project. Civil engineers therefore make the difference and they build the quality of life of people as identified by the American Society Civil Engineers.

**Materials Science and Engineering:** It deals with the metals, the ceramics, the polymers (see Fig. 2). Technology advances are in the areas of smart materials in electro-ceramics and high performance composites (capacitors, Piezoelectric Sound Components, Thermistors and Sensors) and bio materials, nanostructures. Bio engineering applications include human organs transplant and things like Material for sensors, Intelligent wound dressings, Silicon chip implants, Personal health monitors, Miniature power sources, Artificial tissues and organs, New materials allowing direct cell growth and Drug-release membranes. Furthermore, many developments are taking place in the materials used in aircraft manufacturing to make the body light weight using high strength alloys facilitating higher load carrying capacity making the developments unimaginable.



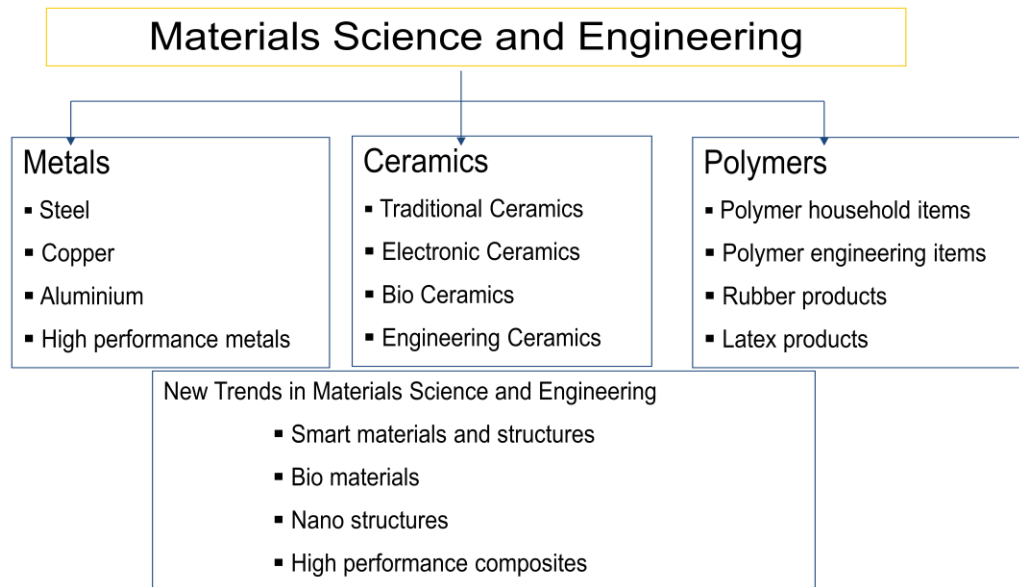


Figure 2 – Developments in the Materials Science and Engineering

(Source: Department of Materials Science and Engineering, University of Moratuwa)

**Electronic and Telecommunication Engineering:** Electronics and Telecommunication is a rapidly growing industry with a market more than a trillion dollars world-wide and with lots of high value addition – raw material > 45%; components > 25%; and final products > 10% (Jayasinghe, 2009). Five major sectors have been identified as strategic sectors – electronic component industry, consumer electronics, computer and office equipment industry, telecommunication industry and industrial electronic industry. There has been only 1% growth in this sector in Sri Lanka during the past ten years and there is a great opportunity to exploit with strategic moves. Business prospects are moving towards Asia and this is where the engineering sciences can be used to create wealth for our country. Further developments are taking place in areas of medical electronics, personal robotics, smarter mobile devices, and consumer electronics. In future there may be smart homes where lights will come on and the kettle will go on when you come in to the house, a home which will call you if you are late to see where you.

**Electrical Engineering:** Electrical engineers manage, operate, maintain, plan, expand and upgrade national electrical supply system for quality, reliable and best affordable delivery of electrical energy among other practices. Several power stations are now being constructed by our local electrical engineers. They play a big role in industrial sector in motion control, automation, lighting, equipment and personal safety, standby power generation, internal power distribution etc.

Focal areas of electrical engineering will include electrical power generation, high voltage power transmission, low voltage power distribution, electrical constructions, building services, industrial automation, electrical machines, power electronics and control drives, electric transportation, artificial lighting, renewable energy, energy sector planning and management and electrical product developments.

### **Figure 7 Producing World Class Graduates**

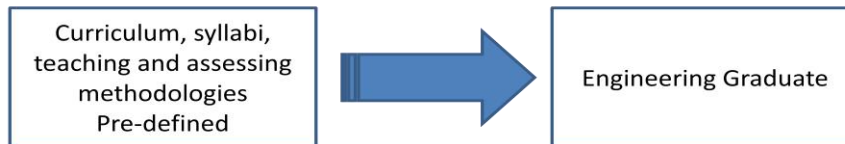
Although we produce highly marketable graduates from Moratuwa University with unemployment three months after graduation at 374nal time low – less than 1% and with a high demand for graduates from the industry, we still feel that there is opportunity to enhance their knowledge, skills and competencies. A similar situation applies to other universities too. Earlier approach was input based education where the curriculum and syllabuses are developed first, teaching and assessment methodologies are conventional and whoever comes out is a good quality graduate. But now it is totally a reverse approach. We need to first define what kind of a graduate we want to produce with graduate attributes and then work backward and design our curriculum, syllabuses, teaching and assessment methodologies (see Fig. 3).

To start with we need to first identify all the attributes of a graduate in order to make sure that he is the product that we want. There are typical attributes used by accreditation bodies. For example, accrediting bodies of professional engineering degrees want engineers not just having subject knowledge and comprehension but also capabilities to analyze, apply, evaluate, review and synthesize – a holistic engineer in order to effectively contribute for economic development. A typical set of attributes used by the Institution of Engineers, Sri Lanka (IESL, 2011) which is in line with international requirements, is as follows.

- Engineering Knowledge
- Problem Analysis
- Design/ development of solutions
- Investigation
- Modern Tool Usage
- The Engineer and Society
- Environment and Sustainability
- Ethics
- Individual and Team work

- Communication
- Project Management and Finance
- Lifelong learning

### Earlier: Input based



### Now: Outcome based

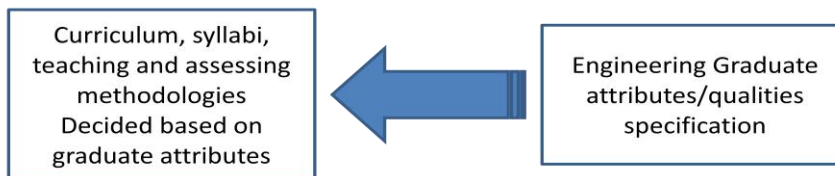


Figure 3 – Approaches in Input based education and Outcome based education

## 4.Need for Innovation

Sri Lanka needs to be an innovative nation and promote innovation which is the instrument for high value addition, identification of gaps and exploit opportunities. It has potential for both product innovations and process innovations, incremental and break through innovations which can be further divided into many other innovation types. Innovating is the only way for sustainable economic growth or sustainable competitive advantage for our nation because we want to our products and services to compete with many other countries to generate wealth for Sri Lanka. Technology acquisition either through self development using Research and Development, and technology transfer are essential in the process. Professor Navaz Sarif, a US based Bangladesh originated professor said “technology is a game for the rich, a dream for the poor, and key for the wise” because strategic technologies such as bio technology, nano technology are always very expensive and out of reach for many developing nations.

## 5.Engineer Entrepreneurs

Engineers have great potential for entrepreneurship. When engineers become entrepreneurs they have great potential to be highly successful, can develop highly value added products and services, products and services can be hi-tech and innovative, have the ability to compete with competitors and have great potential to export. At Moratuwa University graduates are encouraged to be job creators

than job seekers and to become entrepreneurs. Several strategies are used for this purpose including facilitation of formation of student companies while they are studying at the University, provision of minor specialization in entrepreneurship with several new subjects introduced for entrepreneurship without sacrificing the core specialization, provision of incubator facility in the departments to facilitate staff and student innovations and commercialization, conducting research on entrepreneurship.

The University has also linked up with the MIT of the US to have information technology incubation entrepreneurship and try to provide with incubation facilities within the University so that they can develop their products in house and come out with products be commercialized. There is a great potential for this to be successful as the requirement for venture capital is minimum.

## 6. Need for National Innovation System (NIS)

Existence of a world class National Innovation System is an extremely important aspect for rapid economic development. This is because it aligns the objectives and goals of all the key stakeholders avoiding confusion, contradiction and encouraging understanding and facilitation. For this to take shape, there should be strong linkages between all parties (see Fig. 4)

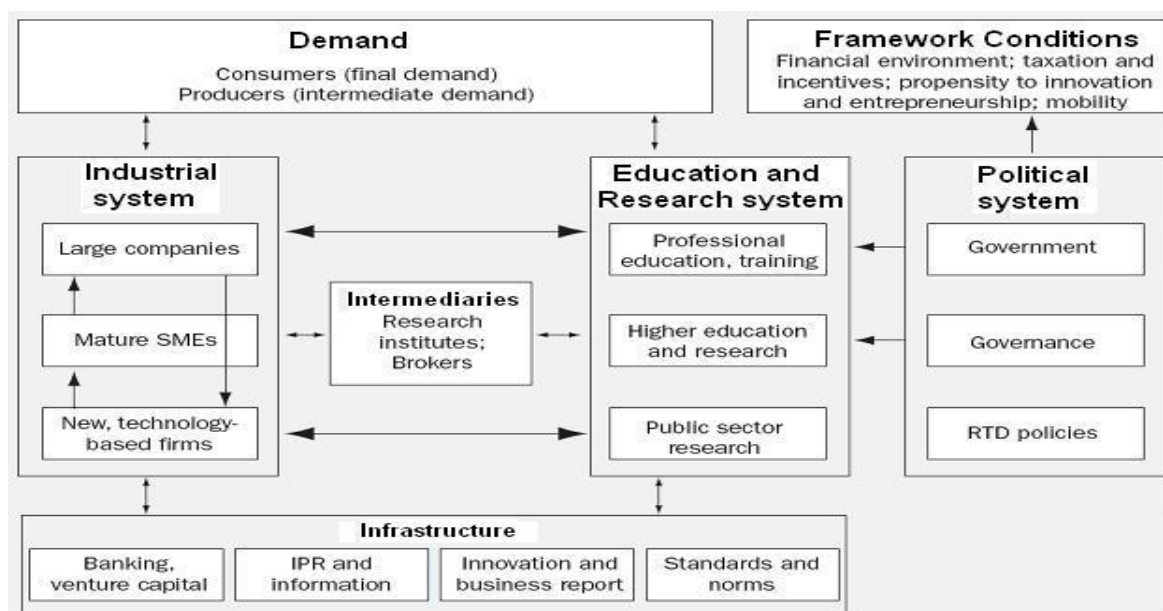


Figure 4 – Innovation System Model (Source: Arnold et. Al., 2003)

Fig. 4 shows that there is the industrial system where large companies, mature SMEs and new technology based firms operate. Then there is the educational and research system which needs to collaborate with the industrial system. Then there is the political frame work which should be conducive and supportive for innovations with necessary infra structure. The connections and strengths of the linkages between these systems can be modeled as shown in Fig. 5.

When a country does not facilitate strong partnership, it is similar to phase I of Triple Helix model where the state is a big circle, industry and academia working separately. Phase II clearly has three partners but the connections and collaborative activities are not very strong, but in a developed national innovation system state, industry and academia everybody is working together with strong networking. When all the three systems are aligned partners move ahead resulting in rapid economic development because all the players are aligned in one direction. There is significant emphasis now in Sri Lanka on facilitating a world class national innovations system (MOT&R, 2010).

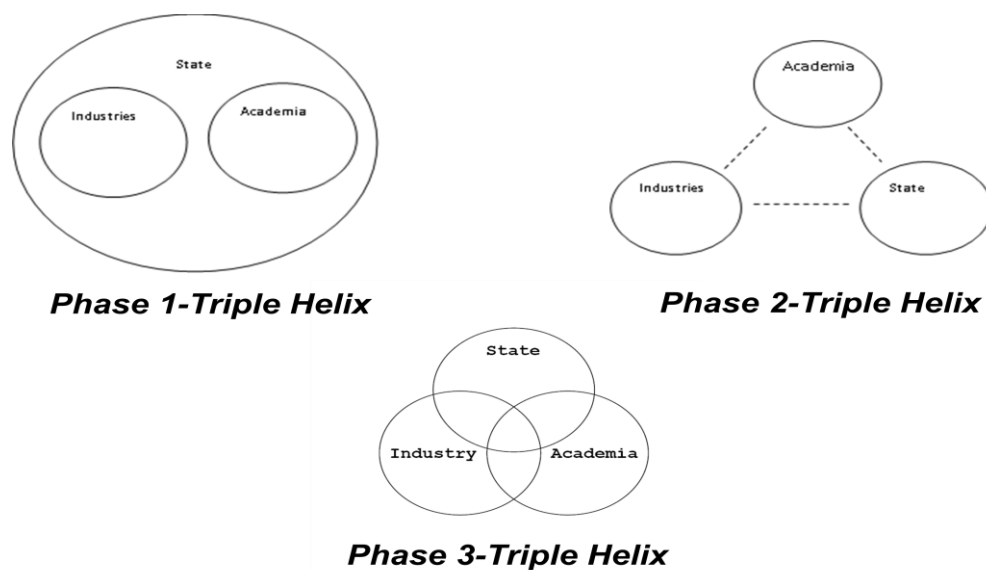


Figure 5 – Triple Helix III (Source: Etzkowitz and Leydesdorff, 2000)

Many initiatives have already been taken as different elements of NIS. These include, (a) implementation of several donor funded projects to improve quality and relevance of educational programs and improving research culture in the universities and R&D institutions, (b) establishment of several hi-tech institutions including the Sri Lanka Institute of Nanotechnology (SLINTEC) and Nanotechnology Company (NANCO), (c) establishment of several promoting mechanisms such as National Enterprise Development Authority (NEDA), Small and Medium Enterprise Developers

(SMED), (d) several initiatives at the Universities to promote innovation and entrepreneurship, for example, MIT Accelerating Information Technology Incubation and NDB Bank endowed chair in entrepreneurship at the University of Moratuwa, and (e) Cabinet approved National Science and Technology Policy, and Science, Technology and Innovation Strategy for Sri Lanka 2011-2015 and many others. Despite these developments there are many opportunities to improve.

## **6.Challenges and Way Forward**

*Challenge 1:* Transformation of engineering education from input based to outcome based education to have all necessary attributes and to make the graduates innovative and entrepreneurial.

*Challenge 2:* Lack of funding for R & D – R&D investment should be commensurate with the other requirements but at the moment it is 0.13% to the GDP, lowest in the region (MOT&R, 2010). This has to be increased at least to 1%. Emphasis should also be given to SME sector and jointly explore funding opportunities. With this kind of low R & D expenditure, it is difficult to attract good brains to come out with research, development, innovation and entrepreneurship successes.

*Challenge 3:* Large technological gap and lack of absorptive capacity – This exists specifically in the SME sector where there are innovative ideas, the will to exploit but difficult to succeed due to lack of theoretical understanding.

*Challenge 4:* Absence of at least a few large companies in many sectors – In addition to creating SMEs and addressing their issues, it is necessary to create at least one or two very large companies in strategic sectors so that they can break the barriers of the boundaries of Sri Lanka and compete internationally. There are no such companies in all the sectors, may be one or two in some sectors. This is one of the strategies adopted in Korea, where the Korean government initially supported everybody, let the inefficient ventures die and continued to support the bigger players more so that companies like Samsung became globally very competitive and world leaders in their own areas of business.

*Challenge 5:* Still lack of direction by the government – The government is trying hard lots of things but still there exists some policy shortcomings, strategic direction for thrust industries, lack of support for thrust industries/players, insufficient funding support especially for R&D institutions, lack of outreach and lack of incentives for public institutions.

*Challenge 6:* The need for a well developed National Innovation System – The importance of NIS needs to be re-emphasized and the stakeholders are becoming increasingly aware of the need. Government is in the progress of identifying the strategies to have a world class system in the national technological and innovational systems that was submitted to the Cabinet by the former minister of Technology and Research Prof. Tissa Witharana. The universities are addressing this issue and it is expected that all the players, especially the National Science Foundation should take a leading role in pioneering its implementation.

*Challenge 7:* Lack of exploitation of Intellectual Property – There is a need to provide increased awareness on intellectual property rights as Sri Lanka is actually poor in this aspect. There are difficulties in obtaining patents and there have been situations where technologies developed by Sri Lankans were stolen and exploited by other nations due to these shortcomings.

*Challenge 8:* Lack of emphasis on Technology Transfer – Many mega projects are carried out in Sri Lanka with donor assistance with new technologies to learn and transfer to domestic players. However, there is lack of focus on technology transfer during negotiations leading to repeated consultancies for expertise for similar projects. India is very clever in that, Bangladesh is the opposite. We need to make sure that technology transfer is an agenda item during negotiation. Sri Lanka being a country with good human capacity and intelligence there should not be any difficulty in our absorptive capacities.

## **7.Way Forward**

In summary, the following actions are recommended as strategic moves towards accelerating economic development in Sri Lanka by effectively using engineering and technological sciences.

- Embracing outcome based education from input based education
- Visionary S&T Policy – Already in place
- Well developed S,T &I Strategy – In place but needs projects
- More R&D funding opportunities/mechanisms
- More effective/co-ordinated Need-Seed matching where industry needs are matched with expertise in the universities
- More effective incentives for R&D Institutions/researchers

- Mechanisms for more effective innovation & entrepreneurship
- More effective IPR policies, their awareness, assistance to obtain IPR
- Compelling technology transfer and technology development legal mechanisms
- Significant change of attitudes of people

All these actions will lead to a world class National Innovation System which in turn facilitates rapid economic development.

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**ENGINEERING**  
**TECHNICAL SESSION 1**

Chaired by Prof SSL Hettiarachchi  
Prof. of Civil Engineering, University of Moratuwa

### **Summary**

*After the introduction by Prof. SSL Hettiarachchi, the paper presentations started. In this session a paper on “Synthesis and Characterization of Hydroxyapatite to be used as a Bio-Material (Dr. SU Adikary et al)” confirms that Hydroxyapatite can be used as a Bio-material. However, in the discussion the authors of the paper agreed that they wanted to do further studies on the use of local materials and to study their compatibility with the local conditions.*

*Another paper discussed about “The use of bio diesel as an alternative energy for vehicles, particularly for vehicles under the military forces in Sri Lanka”. Lt Col C. J. S. Weerakoon proposed to apply this method initially to the armed forces and then to other sectors. Answering a question on the cost, the author said that at the experimental level it has cost Rs.60 per liter, but he also stated that it can be reduced up to Rs.30-40 at commercial level production.*

*A paper on “Precision Investment Casting of Aluminium Machine Parts Using Specially Designed Ceramic Mould” (PPSS Pussepitiya and Dr. SU Adikary) discussed about the fabrication technique of ceramic moulds, and the capability to manufacture ceramic moulds with good characteristics such as permeability, mechanical strength, thermal conductivity, thermal expansion, and surface roughness using slurries of ceramic powders. A research into the effect of Gypsum on the strength of Cement, found that the Gypsum influences not only the setting but also other cement properties such as grind-ability, sensitivity to storage, volume stability and strength. Finally the paper confirms that strength is increased and then decreased with the increment of gypsum.*



*Prof. Samanth Hettiarachchi, University of Moratuwa conducting an Engineering Technical session (IMG\_1995)*

## Synthesis and Characterization of Hydroxyapatite to be used as a Bio-Material

*S. U. Adikary, J. M. N. Jayaweera, and G. A. Sewvand, Department of Materials Science and Engineering, University of Moratuwa, Sri Lanka.*

### 1. Introduction

Ceramics are a versatile group of materials that are abundant in type. Some ceramics that have been tested in vivo do not cause increased activity in the immune system when dissolved in body fluid or in contact with tissues. Such ceramics, mainly oxides, are termed bio-ceramics. Bio-ceramics have the advantage of being compatible with the human body environment. As reported by Erdem and Ahin (2006), these bio-ceramics include calcium phosphates, Bio-glasss, A-W glass-ceramic and other bioactive glasses and glass-ceramics with hydroxyapatite being the prominent family member, Bio-ceramics are generally used to repair or replace skeletal hard tissues.

Naruporn M (2008) states that Hydroxyapatite [HA] is a bioactive, biocompatible calcium phosphate based ceramic material that possesses a structural and chemical composition similar to the mineral component of human bone tissue. There are several methods of preparing HA crystals reported in the literature, including wet chemical precipitation by Naruporn M, (2008), solid-state reaction and hydrothermal methods by Chun-Wei Chenn et al (2004) etc. According to Guzm'an V'azquez, et al (2005), wet-chemical precipitation route is the most prominent route owing to its ease in experiment operations, low working temperature, yield of hydroxyapatite and low cost equipment requirement C.

Therefore in the present study, wet chemical precipitation technique was used with analytical grade  $\text{Ca(OH)}_2$  powder and  $\text{H}_3\text{PO}_4$  acid as starting materials. A.Binnazhazar yoruc and Yeliz koca, (2009) and some other authors concluded that the shape, size and specific surface area of the HA particles obtained by this method are very sensitive to the dropping rate, reaction temperature, pH value, stirring speed, method of stirring, reflux temperature, ageing time, etc. The purpose of this study is to produce high quality and purified hydroxyapatite for artificial bone application.

### Methodology

Analytical grade Calcium hydroxide ( $\text{Ca(OH)}_2$ ) was dispersed in water to make calcium hydroxide suspension. Then analytical grade Phosphoric acid ( $\text{H}_3\text{PO}_4$ ) solution was added drop wise to Calcium hydroxide suspension while stirred by magnetic stirring and ultrasonic stirring. During the adding

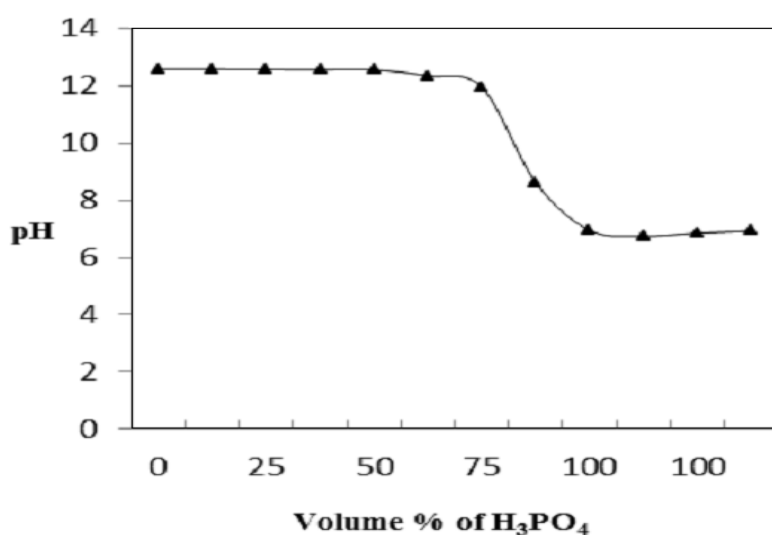
process, the pH of the calcium hydroxide suspension was measured by a pH meter. After completion, the mixture was reflux at 70 °C by stirring for another 1 hour. Then suspension was aged at room temperature for 72 hours. After that precipitate was filtered and washed with distilled water for three times. Finally precipitate was dried at 70 °C for 3 hours. The phase compositions of prepared powders were analyzed by X-ray (XRD, Brucker D8 Focus) diffractometer using  $\text{CuK}\alpha$ , ( $\lambda=1.5406$  Å) as a radiation source with Ni filter over the  $2\theta$  range of 20 - 55° at 25° C.

The molecular bond structure of the synthesized powder were determined by using Fourier transform infrared spectroscopy (Bruker Alpha-T) was used in the wave number region of 4000 – 400  $\text{cm}^{-1}$  and KBr pellets (1-mg sampler 100-mg KBr) to obtain the characteristic peaks of HA powders.

Differential thermal analysis was used to determine thermal behavior of the synthesized powder by heating dried HA powders from room temperature to 1000°C at a heating rate of 10°C/min in alumina crucibles.

The weight change of the HA powder during heating was obtained by TGA in the heating range of room temperature to 1000°C with a heating rate of 10°C/min under normal atmosphere.

## 1. Results and discussion

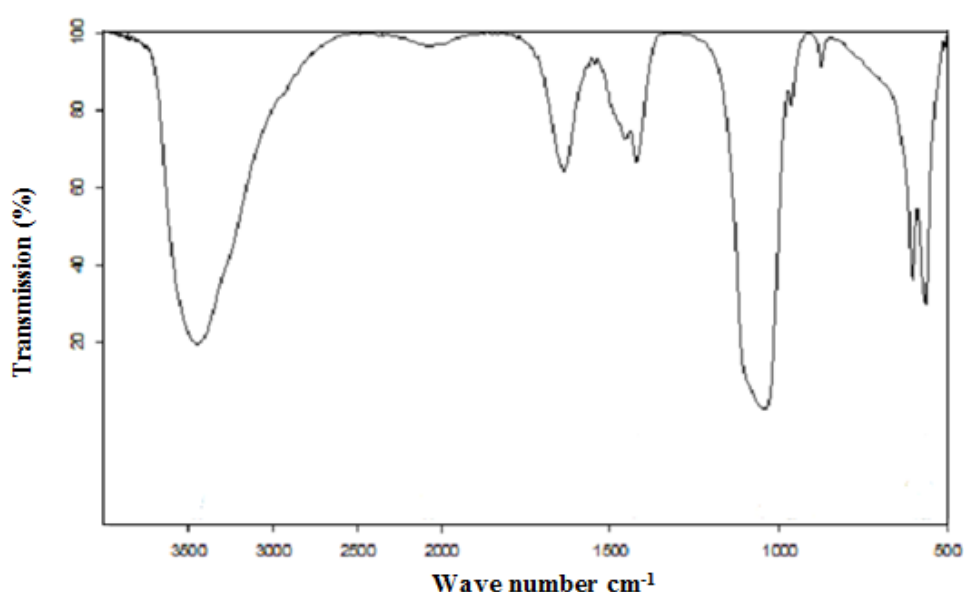
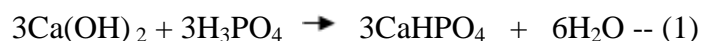


**Figure 3.1.** pH variation of analytical grade 0.11M  $\text{Ca}(\text{OH})_2$  suspension during the addition analytical grade 0.49M  $\text{H}_3\text{PO}_4$  acid solution at room temperature

Figure 3.1 shows the pH variation of analytical grade  $\text{Ca}(\text{OH})_2$  suspension during addition of  $\text{H}_3\text{PO}_4$  solution. The pH of the analytical grade  $\text{Ca}(\text{OH})_2$  suspension was almost at a constant value during the addition of 60% of  $\text{H}_3\text{PO}_4$  acid solution. With further addition of  $\text{H}_3\text{PO}_4$  solution, the pH of  $\text{Ca}(\text{OH})_2$  suspension was decreased drastically. Finally, pH of the suspension reached 6.8-6.4 range. Erdem and Ahin (2006) concluded that once the  $\text{H}_3\text{PO}_4$  solution is completely added, pH of the suspension indicates close relation between the stoichiometry, acidity and solubility. Finally, the suspension pH reached 6.8-6.4 range indicating the Ca/P ratio is close to 1.67

As reported by Yosuke Tanaka et al (2003), during the reaction, continuous dissolution of  $\text{Ca}(\text{OH})_2$  powder supplies  $\text{OH}^-$  ions to keep the pH value high during the formation of hydroxyapatite particles from the super saturated  $\text{Ca}^{2+}$  ions and  $\text{PO}_4^{3-}$  ions. Further formation of apatite particles consumes the  $\text{Ca}^{2+}$  and  $\text{OH}^-$  ions remaining in the suspension and hence gradually decreases the concentration of  $\text{OH}^-$  ions in the reaction range from 50 to 100% of  $\text{Ca}(\text{OH})_2$  powder.

As reported by A.Binnazhazar yoruc and Yeliz koca (2009), during the reaction stage, possible reactions are given in Eqs (1), (2) and (3). The reactions given in Eq. (2) and Eq. (3) are dominant in proper activation technique.



**Figure 3.2.** FTIR spectrum pattern of the synthesized HA powders

Figure 3.2 illustrates the FTIR spectrum of HA powders synthesized by reflux temperature at 70 °C. Sahebali Manafi and Seyyed (2008) concluded that a narrow band located at 963  $\text{cm}^{-1}$  represents the  $\nu_1$  mode of  $\text{PO}_4^{3-}$  ions in apatite. The main signal of phosphate appears in the triply degenerate  $\nu_3$  domain (1000-1100  $\text{cm}^{-1}$ ). The adsorption band at 3500  $\text{cm}^{-1}$  confirmed the presence of OH groups. The bond groups for  $\text{HPO}_4^{2-}$  groups do not appeared in this FTIR spectrum. From the FTIR spectrums of the samples, it can be concluded that the reflux temperature has positively affected during the synthesized of HA powder.

As per a study by Hossein Eslami et al (2008), Sahebali Manafi and Seyyed Hossein Badiiee (2008), Fourier transform infrared (FTIR) analysis revealed the presence of carbonate on the surface of the HA. The  $\nu_2$  peak of  $\text{CO}_3^{2-}$  is located at 875  $\text{cm}^{-1}$ ; this absorption results from out-of plane stretching. The  $\nu_3$  mode, near 1400  $\text{cm}^{-1}$ , is the strongest IR peak for carbonate. This peak is actually composed of two bands (1421  $\text{cm}^{-1}$ , in Figure 3). 1600  $\text{cm}^{-1}$  bond group is indicated by absorption band of carbonate. It was concluded that the shape of the  $\nu_3$  signal and the absence of the C-O absorption bands at 700  $\text{cm}^{-1}$  indicate that no calcite was associated with the HA. Carbonate ions can substitute for either  $\text{OH}^-$  or  $\text{PO}_4^{3-}$  ions in the apatite structure (type A  $\text{CO}_3^{2-}$  or type B  $\text{CO}_3^{2-}$ ).

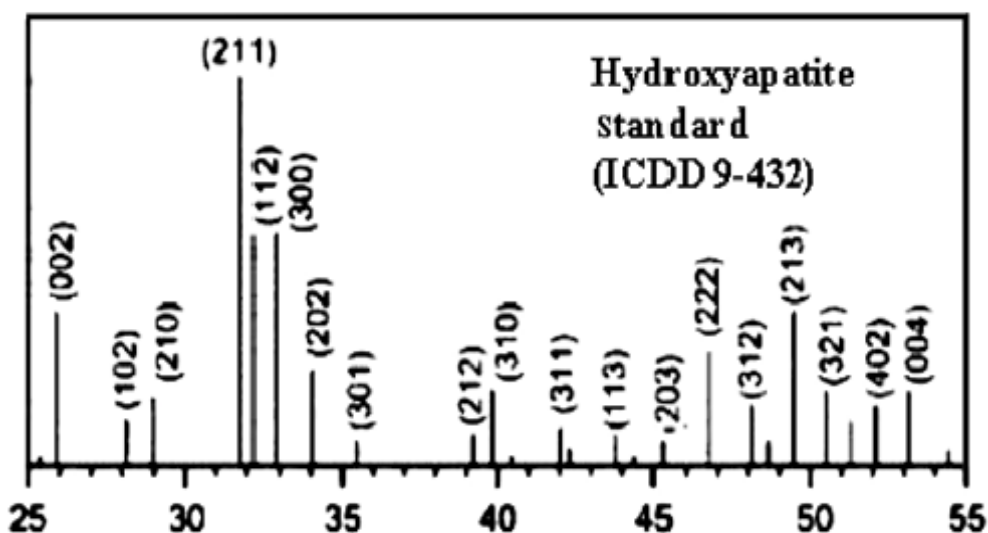
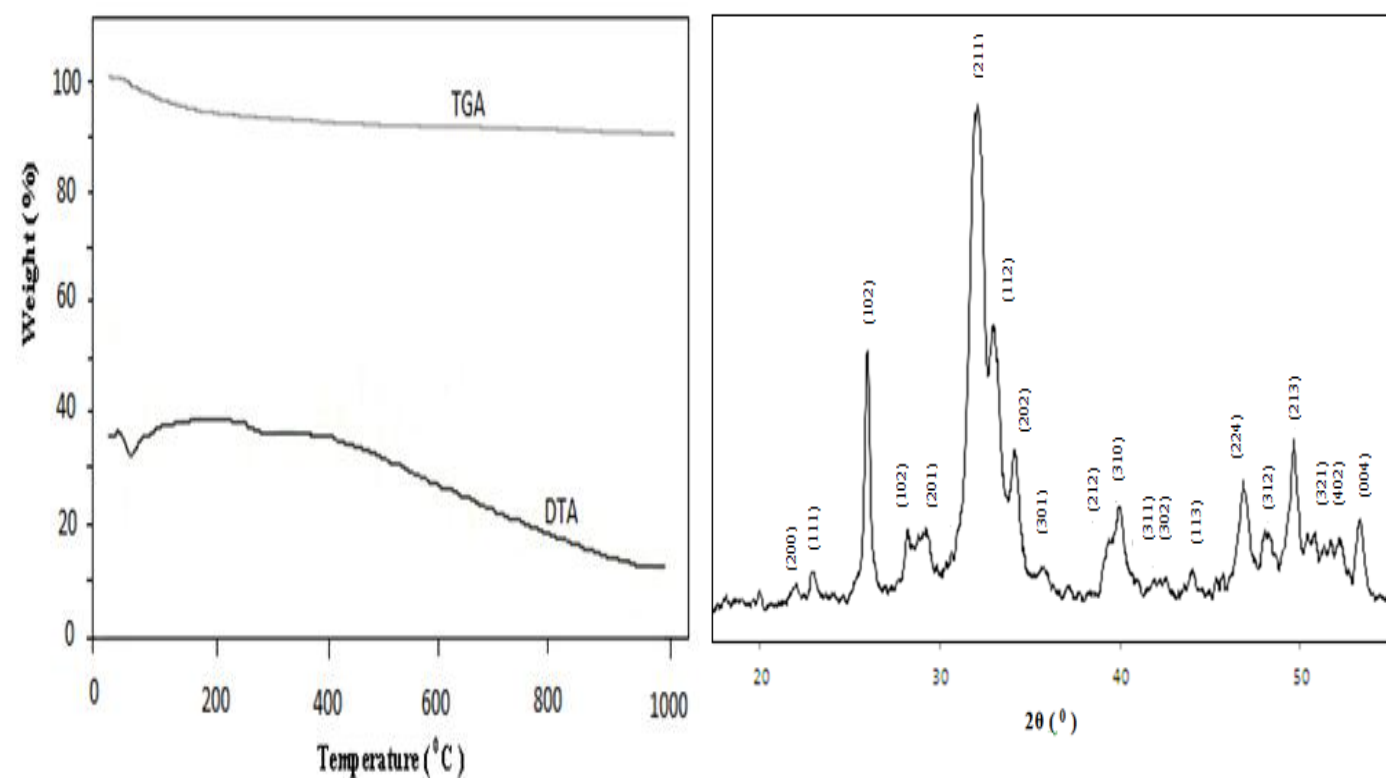


Figure 3.3. Standard

XRD pattern of the HA powders from reference [M. Sadat-Shojai (2009)]

A Standard XRD graph by M. Sadat-Shojai (2009) and the XRD patterns of the precipitated powder are shown in Figure 3.3 and 3.4 respectively. According to A.Binnazhazar yoruc and Yeliz koca (2009), XRD patterns of the precipitated powder clearly indicate that the precipitated particles are well crystalline and have a definite crystal structure. The XRD spectrum of powder precipitated sample has only HA phase as shown Figure 3.4 and this sample did not contain any impurities such as  $\text{CaHPO}_4$ . The XRD patterns in Figure 3.4 confirm all the characteristics peaks of the hydroxyapatite as compare to reference curve given in Figure 3.3



simultaneous thermal analysis curves for the

hydroxyapatite powder are illustrated in Figure 3.4. The first endothermic region range from 70 °C to 161 °C with a peak at about 130 °C, which corresponds to the dehydration of the precipitating complex and the loss of physically adsorbed water molecules of the HA powder. The weight loss in this region is 6%. With increasing temperature from 161 °C to 1000 °C no peak has been observed, except a weight loss of 4% is observed at the TGA curve in the temperature range which is assumed to be the result of gradual dehydroxylation of HA powder. S. Ramesha et al (2007) concluded that this behavior can be explained by the reaction given in equation (4).



## Conclusion

The HA powders can be synthesized from aqueous suspensions containing  $\text{H}_3\text{PO}_4$  and  $\text{Ca}(\text{OH})_2$  with an aid of double step stirring (magnetic +ultrasonic stirring) techniques under atmospheric pressure and reflux at  $70^\circ\text{C}$ . XRD analysis and FTIR spectrums of the samples showed that high purity and crystalline hydroxyapatite can be synthesized by wet chemical precipitation method. Proper pH variation of the  $\text{Ca}(\text{OH})_2$  suspension was obtained during the synthesis HA. It confirmed that the synthesized powder is stoichiometric hydroxyapatite ( $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ ).

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## **Use of Bio-Deisel in Sri Lanka Army**

*Lt Col Chandana Weerakoon, Central Bank of Sri Lanka*

### **Introduction**

Bio diesel is a very common concept all over the world though Sri Lanka is at a primitive stage as far as the knowledge and application of bio diesel concept is concerned. Alternative energy is the only scapegoat to the present energy crisis. Therefore, it is important to study about the fruitfulness of bio diesel and apply it to the society and the country. Sri Lanka is blessed with adequate raw materials that can be used as bio diesel. They are Kaneru, Domba, Mee, Rubber seeds etc. Also, people have knowledge of the industry of these raw materials with indigenous experience. Bio diesel has three times more efficiency of fossil fuel diesel when considering the chemical and economical factors. Therefore, it can pause a better impact on the financial sector of the country. The most important factor is the domestic manufacturing of bio diesel and this kind of micro economic industry which gives the highest productivity to the country. Already, bio diesel system is tested in the country. This had been developed by the Coconut Research Institute and they have demonstrated driving a vehicle using converted coconut oil bio diesel. The main problem in Sri Lanka is that innovations are not integrated with the commercial sector. Therefore the product innovations are dying inside laboratories or take much time to reach the market. Therefore, bio diesel concept needs more integration with the commercial sector, government and the society in order to improve the economic states of the country.

There are a few macro level agencies in the country under the government rule to implement the bio diesel programme. Few of them are Sri Lanka Transport Board, Sri Lanka Army, Navy and Air Force and the Ministry of Transport. Among them, the highest number of diesel vehicle fleets is owned by Sri Lanka Army amounting to 13930 both heavy and light vehicles. Those consume 1.6 Mn liters per month as an average. Apart from that Army will have more other benefits by launching this programme. The most important thing is reaching the general public which develops communication and the popular support that is necessary to develop the Civil Military Corporation and the image of the Army. This system has to be backwardly integrated with different levels of suppliers. Since the Army is having many supplying outlets, sales outlets and purchasing outlets all around the country, it will be able to acquire the necessary supplies to produce bio diesel. Also Army has the ability to purchase macro level devices to produce the bio diesel fuel. Since the equipment has the range from domestic to industrial level, Army will have many choices for production as far as the production geography is concerned. Also, this is an economic booster to upgrade the poor segment of people,

specially, in the North and the East. Apart from that, it can enhance the economic power by utilizing wasted and abandoned raw materials in the country. Finally, it can reduce purchasing of minimum 40% of total fuel requirement to the Army while increasing the efficiency of vehicles in three times and giving support to reduce the trade deficiency gap in the country. Finally, Army can be act as a role model of saving energy by using indigenous products in the country.



**Bio diesel powered tractor in Sri Lanka**

### **Historical background:**

Transesterification of a vegetable oil was conducted as early as 1853 by scientists E. Duffy and J. Patrick, many years before the first diesel engine became functional. Rudolf Diesel's prime model, a single 10 ft (3 m) iron cylinder with a flywheel at its base, ran on its own power for the first time in Germany on August 10, 1893. In remembrance of this event, August 10 has been declared "International Bio diesel Day". Research into the use of transesterified sunflower oil, and refining it to diesel fuel standards, was initiated in South Africa in 1979. By 1983 the process for producing fuel-quality, engine-tested Bio diesel was completed and published internationally. An Austrian company erected the first bio diesel pilot plant in November 1987, and the first industrial-scale plant in April 1989.

Throughout the 1990s, plants were opened in many European countries, including the Czech Republic, Germany and Sweden. France launched local production of bio diesel fuel (referred to as *diester*), which is mixed into regular diesel fuel at a level of 5%, and into the diesel fuel used by Public transportation at a level of 30%. Renault, Peugeot and other manufacturers have certified truck engines for use with up to that level of partial bio diesel; experiments with 50% bio diesel are underway. In 1998 the Austrian Bio Fuels Institute had identified 21 countries with commercial bio diesel projects. In September 2005 Minnesota became the first U.S. state to mandate that all diesel fuel sold in the state contains part bio diesel, requiring a content of at least 2% bio diesel.

## Production

Scientific explanation of Bio diesel:

Chemically, transesterified bio diesel comprises a mix of mono-alkyl esters of long chain fatty acids. The most common form uses methanol to produce methyl esters as it is the cheapest alcohol available, though ethanol can be used to produce an ethyl ester bio diesel and higher alcohols such as isopropanol and butanol have also been used. Using alcohols of higher molecular weights improves the cold flow properties of the resulting ester, at the cost of a less efficient transesterification reaction. After this processing, unlike straight vegetable oil, bio diesel has combustion properties very similar to those of petroleum diesel, and can replace it in most current uses.



**Domestic Bio  
diesel plant**



Bio diesel feedstock

Seeds are used as a source of bio diesel.

A variety of oils can be used to produce bio diesel. These include:

Waste vegetable oil (WVO);

Animal fats including tallow, lard, yellow grease, chicken fat, and the by-products of the production of Omega-3 fatty acids from fish oil.

New Zealand has successfully developed a system for using sewage waste as a substrate for algae and then producing bio-diesel.

Thermal depolymerization is an important new process that reduces almost any hydrocarbon based feedstock, including non oil based feedstocks, into light crude oil.

Bio diesel feedstock plants utilize photosynthesis to convert solar energy into chemical energy. The stored chemical energy is released when it is burned, therefore plants can offer a sustainable oil source for bio diesel production. Most of the carbon dioxide emitted when burning bio diesel is simply recycling that which was absorbed during plant growth, so the net production of greenhouse gases is small. The highest yield feedstock for bio diesel is algae, which can produce 250 times the amount of oil per acre as soybeans.

Yields of common crops

Crop	Litres oil/ha	Gal/Acre
Corn (Maize)	172	18
Cashew Nut	176	19
Cotton	325	35
Soybean	446	48
Coffee	459	49
Pumpkin Seed	534	57
Coriander	536	57
Mustard Seed	572	61
Sesame	696	74

Rice	828	88
Sunflowers	952	102
Cocoa	1026	110
Peanuts	1059	113
Olives (Veralu)	1212	129
Avocado	2638	282
Coconut	2689	287
Oil Palm	5950	635
Algae	95,000	10,000

Typical oil extraction from 100 kg. of oil seeds

Crop	Oil/100kg.
Copra	62 kg
Cotton Seed	13 kg
Groundnut Kernel	42 kg
Mustard	35 kg
Palm Kernel	36 kg
Sesame	50 kg
Soybean	14 kg
Sunflower	32 kg

Following seeds are in abundance in Sri Lanka;

Endaru

Kitul

Palmyra,

Mango

Tamarind	Mee
Avocado	Margosa
Kaneru	Domba
Jack seeds	Rubber
Rambutan	

Bio diesel can be extracted basically from any seed that has a kernel. But there are high fat seeds like Domba and Mee of which Sri Lankan people possess the knowledge.

#### Efficiency of Bio diesel and economic arguments

A farm land consumes 82ltr/Hect (8.75Gal/Acre) to produce a crop.

An average crop produces oil 1029-1356 ltr / Hect (110 – 145 gal/Acre).

Ratio of input to output is 1:12.5-16.5.

Basic energy yield ratio of Bio diesel to Fossil diesel is 1:3.2 (Considering overall effects).

A gallon of Bio diesel produces 2.25 gal of ethanol.

Bio diesel is becoming of interest to companies interested in commercial scale production as well as more usual home brew bio diesel users and the use of straight vegetable oil or waste vegetable oil in diesel engines. Homemade bio diesel processors are many and varied. The success of bio diesel home brewing, and micro-economy-of-scale operations, continue to shatter the conventional business myth that large economy-of-scale operations are the most efficient and profitable. It is becoming increasingly apparent that small-scale, localized, low-impact energy keeps more resources and revenue within communities, reduces damage to the environment, and requires less waste management.

**Macro level Bio Diesel Plant**



## Conclusion

In Sri Lanka, people have the know-how of the system. Scientists have tested and demonstrated. Therefore, the requirement of making the conversion device is the most important factor. This equipment is available in the world market in various capacities from micro industries to huge macro industries with better economy of scale. At the moment, the most productive industry in the country is micro level industry or self employment industry. Therefore, it can be started with a micro level and subsequently developed to macro level with the investor who is in the fuel industry. But considering the present economic status of the country the micro economic industries are the best because, it eliminates the middle men process and gives highest productivity and service to the customer and society as far as rural areas are concerned. The person who possesses the conversion mechanism can supply the seeds for the production and market the product to the customer in the same village since rural areas are based on agricultural economy. There will be a great market from tractor owners and hand tractor owners and other people who need the products. When it comes to macro level it needs better integration of backward process and the customer with the blessings of the government in order to achieve a better productivity.

Army as the largest macro level industry as far as transportation and the fleet is concerned, will be able to reap many benefits in terms of economy and military as I have discussed previously. The most important is reaching the target audience as far as the civil military corporation is concerned. Apart from that containing the target audience to a continued vocation with economically enhanced power is extremely important. Since the army is more innovative and ready to face challenges, it is important to present the image as a role model to other macro level organisations to start this important industry and enhance the economy.

In 2005, the US imposed a law in Minnesota State to add 2% bio diesel to the fossil fuel consumption like wise with the present state of seeds available in the country; Sri Lanka too can reduce about 20% fossil fuel imports and secure a greater income to the country. Bio diesel concept is one of the areas which should be known by the people in the country. The Ministry of Energy should launch an awareness programmes to educate people of the country as far as bio diesel energy is concerned. The country also can observe that, there are various institutes which conduct researches on alternative energy but nothing is getting commercialized due to less integration with the government sector and the commercial sector of the country. Therefore, eradication of that negative status will give better results too, for the implementation of the bio diesel concept in Sri Lanka.



## **Precision Investment Casting of Aluminium Machine Parts Using Specially Designed Ceramic Mould**

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### **Introduction**

Investment casting process is a well established manufacturing process with greater product design freedom from very simple to highly complex parts with tight dimensional tolerances and excellent surface finish compared to other casting processes. Therefore expensive machining, wastage of material could be reduced or eliminated while providing more design economy and flexibility than other casting process.

The investment casting is widely used for producing complex geometries of ferrous and non ferrous materials [1]. Many researches have been performed on this subject during past four to five decades. The ancient method of investment ("lost wax") casting of metal components has been transformed into a near net shape forming technique offering the designer at the forefront of metal casting, economy and flexibility [2].

McGuire [3] had developed a method for forming investment casting shell and obtained the US patent for it. In his study slurry of colloidal silica, zircon flour and fused silica had been used to build the mould around wax pattern, wherein the slurry was included particles of varying size. The surface quality of the casting is determined by particle size and composition of the slurry in mould making [4].

This research reports the systematic investigation carried out to build the ceramic shell around the polycarbonate pattern with fine particle size zirconium silicate, alumina, refined kaolin and grog. Use of colloidal silica and fused silica were avoided and refined kaolin and alumina were used instead. Today, the investment casting with ceramic mould is recognized and used worldwide as a technique for producing close tolerance metal parts at highly competitive costs.

The Ceramic moulds are used to cast pieces or tools with fine details, very smooth surfaces, high dimensional accuracy and good metallurgical integrity, in a diversity of metallic materials. The surfaces of this type of ceramic moulds have refractory properties which allow them to withstand the high temperatures of casting, as is the case of ferrous alloys. Furthermore, the excellent thermal

stability of these ceramic moulds is very important. The ceramic moulds are produced by mixing in variable proportions, depending on the type of ceramics employed, strength desired and other properties [5].

To our knowledge for the first time in Sri Lanka, modeling and pattern making of complex engine parts using by rapid prototyping technique and subsequent mould making for investment casting using ceramic materials were performed. Since investment casting uses expendable patterns and ceramic shells, it is excellent for complex and detailed part designs. The process manufactures intricate parts that are difficult to machine, form or forge [6].

Castings are used in areas like transportation, aerospace, defense, mining, construction, fluid power and domestic household. Some cast components include engine blocks, suspension parts for automobiles & fluid flow components like valves, pumps, pipes, and fittings. There is a need to improve the fuel efficiency and make the vehicle lighter in weight. Aluminium is a non ferrous metal which is lighter than steel and has density one third of that of steel. Aluminium has a lower density of  $2.7 \text{ g/cm}^3$  compared to  $7.8 \text{ g/cm}^3$  of steel. Aluminum and aluminum alloys are lightweight with good corrosion resistance, ductility and strength. Aluminium castings are more expensive than ferrous based castings. The greater use of them can decrease vehicle weight, improve its performance and reduce fuel costs. Pure aluminium possesses relatively poor casting features and for this reason, castings are prepared from aluminium alloys [7].

## **Methodology**

### **1.1.Design of pattern**

Initial models of the engine components were designed using Pro-engineer modeling software and actual polycarbonate model was done by rapid prototyping machine. The gating system was selected as the metal pouring from the top of the mould for aluminium casting. The gating system was made of the same modeling materials as that used for the mould cavity.

### **Development of ceramic slurry**

The composition of the ceramic mould for investment casting was determined with 65% of zirconium silicate, 25% of quartz, 10% of refined kaolin and sodium silicate. The particle sizes of the refractory materials are about 325 mesh which is shown in Table 01. Carboxymethyl Cellulose (CMC) was used as binder of the ceramic slurry and the specific density of the slurry was about 2.40. The viscosity of the slurry was maintained about 305

units (Torsion viscometer with probe size 11x16). The slurry was mixed properly with the help of stirrer and maintained its optimum quality and consistency by regular monitoring.

**Table 01: composition of the ceramic mould**

<b>Material</b>	<b>Composition</b>
Zirconium silicate	65%, 325 mesh
Refined kaolin	10%
Quartz	25%, 325 mesh
Grog	1~2 kg, 150µm & 250µm
Polyvinyl acetate (PVA)	10 g
Carboxymethyl Cellulose (CMC)	20~30 g
Sodium silicate	20g

### **Development of ceramic mould**

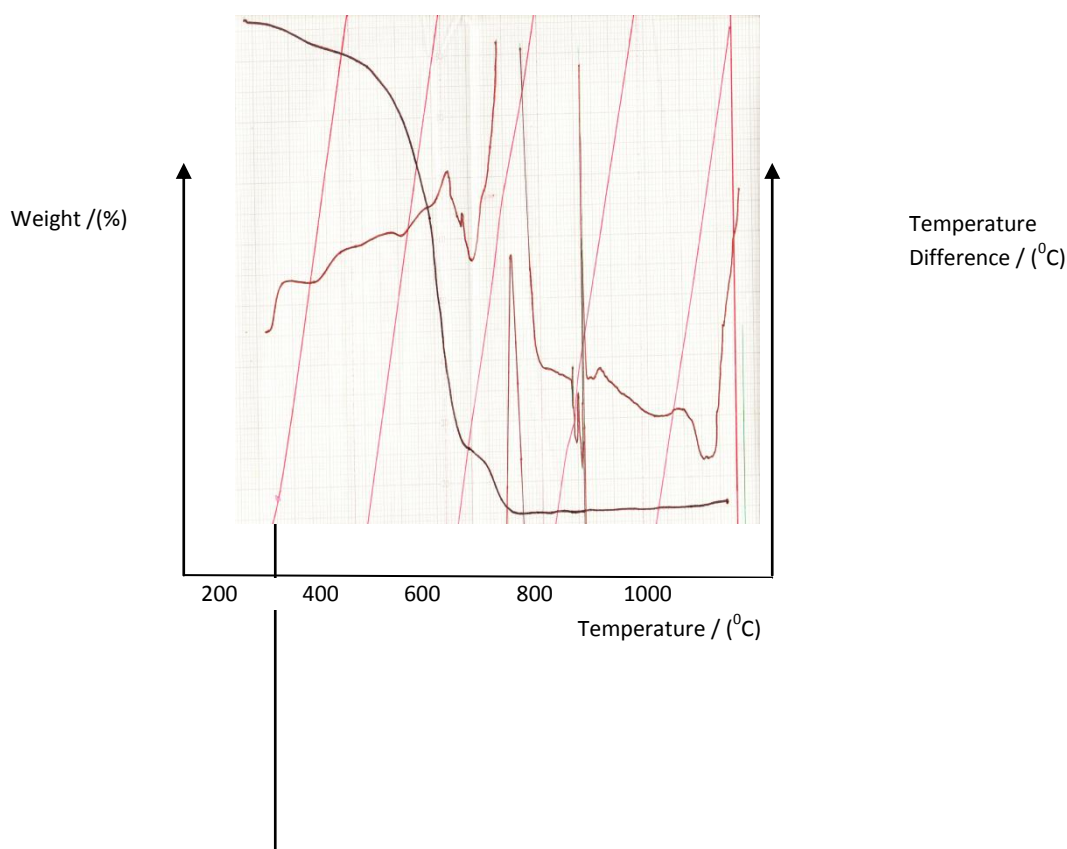
A two-step process was used including dipping the pattern into the slurry, then spraying binders and refractory powders on it. The first coat of the mould was developed by dipping the pattern into the ceramic slurry. It was a fine, dense and uniform layer avoiding the entrapment of air bubbles. The pattern was lifted and held above to remove excess fluid from the pattern. Once the first layer was fully dried, the pattern was dipped again in the same slurry to ensure a uniform layer on the pattern. It was allowed to air dry and the on top of the inner most surface PVA (Polyvinyl acetate) was applied. A fine grog layer of 150µm was deposited by spraying.

The mould was dried again and the second layer was built by dipping in the same slurry to increase the shell thickness. The mould was allowed to dry 10- 20 minutes after each dipping. Then PVA was applied and the particle size of 250µm grog layer was deposited. The process of dipping the investment in the slurry, air drying, applying PVA and grog layer was repeated to build the shell mould.

This ceramic slip and the grog were applied alternatively until 6-7 mm wall thickness was achieved. The sealing coat was applied to the mould without adding a further grog layer on it. The sealing coat was applied to bind any residual refractory material to the surface, preventing loose particles falling away from the finished investment mould. The smooth surface of a sealed mould made easier to handle. The process of shell building was time consuming as each coat of slurry need to be air dried prior to application of subsequent layers. The air drying period of the ceramic investment was reduced using the electric fans, but higher drying rate could cause the shell to crack.

### Firing of the ceramic mould

The mould was allowed to dry for 07-10 days to remove the moisture and fired in an electric furnace to melt out the pattern maintaining  $1090^{\circ}\text{C}$  for 2 hours. The mould was allowed to sinter to obtain required hardness for 1 hour. During the firing of the mould, the substrate was melted or burned away leaving the shell. The thermal behavior of polycarbonate polymer was analyzed using Different Thermal Analysis (DTA) and Thermo Gravimetric analysis (TGA) curves as shown in the Figure 01.

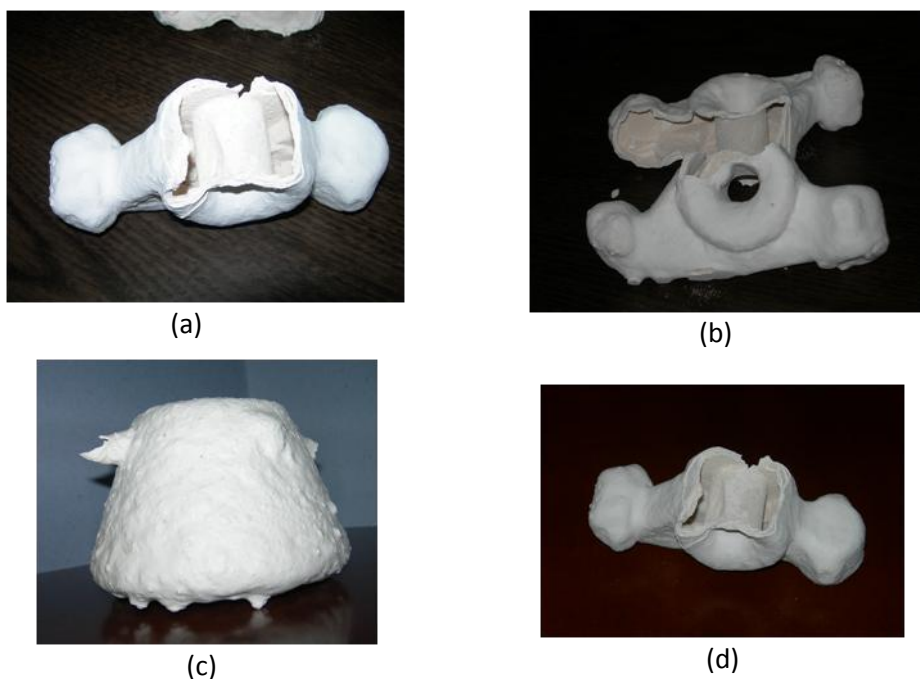


**Figure 01: Different Thermal Analysis (DTA) and Thermo Gravimetric Analysis (TGA) curve of polycarbonate pattern during burnout process**

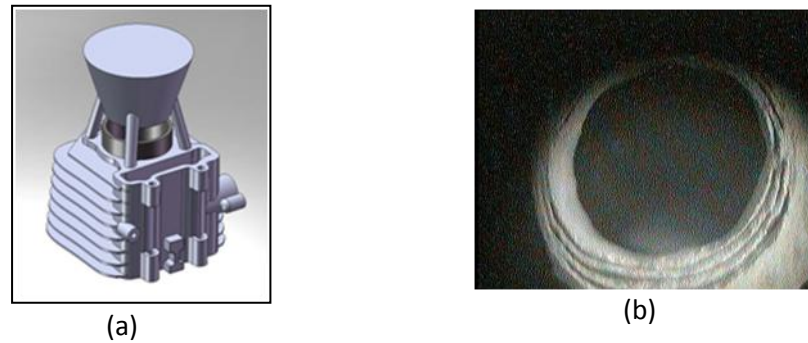
### Results and Discussion

The use of carefully developed ceramic compositions with precisely controlled mould making procedure is required to make a mould of complicated shape which requires high degree of precision and smooth surface finish. In order to get an excellent surface finish, materials of high density and fine particle sizes are necessary. The slurry consists of fine refractory materials which are capable of depositing a uniformly dense coating over the pattern. Zirconium silicates and alumina in fine forms are ideal materials to be used for the above purpose. A fine deposit is essential to the formation of finer details of face coat. Fine grog makes a good backup layer as it gives the strength and the thickness to the mould. The composition used for the ceramic mould is shown in the Table 01.

The composition of 65% of zirconium silicate and 35% of refined kaolin provide thicker and dense ceramic slurry which made faster shell building. The ceramic moulds tend to crack during drying if the slurry contains more refined kaolin. The pattern material is amorphous polymer which has sudden increase of volume at glass-transition temperature ( $T_g = 58^{\circ}\text{C}$ ). Therefore the ceramic mould should have strength to withstand at that pressure.



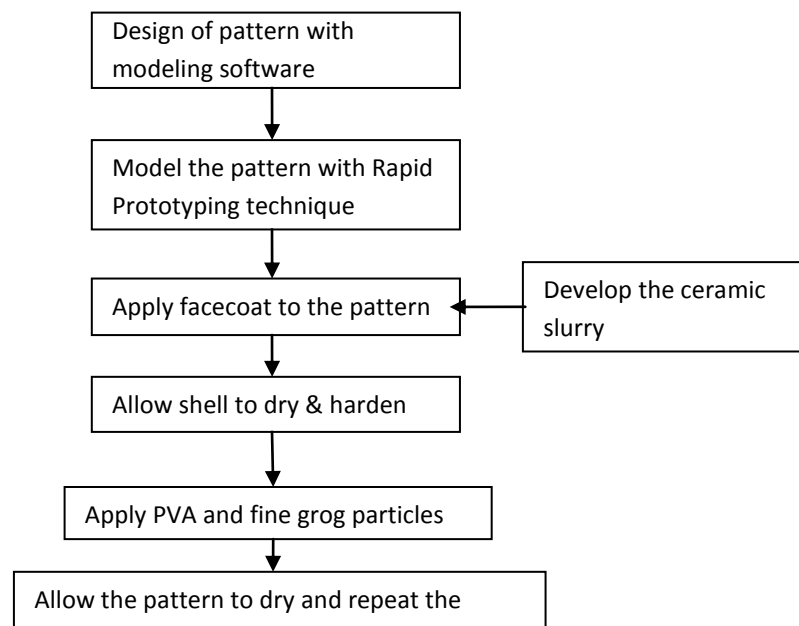
**Figure 02: The developed ceramic moulds of different engine parts**



**Figure 03: (a) 3D pattern of fabricated mould, (b) Microscopic view of different layers in the ceramic mould**

The investment must be able to withstand temperature fluctuations with minimal or no adverse effects. The investment mould is exposed to temperatures of between  $550^{\circ}\text{C}$ - $1200^{\circ}\text{C}$  during pattern burnout, firing and metal pouring. Ceramic shell investments in particular are exposed to very rapid fluctuations of temperature. The investment mould must be strong enough to withstand internal and external forces. It must expand as it heats up during the kiln burnout.

The secondary layers of the mould are built up with an increasingly coarse and less costly refractory body as the coarse particles of the backup layers are not in direct contact with the polycarbonate pattern and no effect on the surface quality of the metal cast. In forming less dense wall than the first layers, it allows casting gases to more easily permeate the investment wall. The process flow diagram of fabricated mould is given in the Figure 04.



**Figure 04: Process flow diagram for fabricated of ceramic mould**

## Conclusion

The use of carefully developed ceramic compositions with precisely controlled mould making procedure is required to make a mould of complicated shape which requires a high degree of precision and smooth surface finish. In order to get excellent surface finish, materials of high density and fine particle sizes are necessary. The slurry consists of fine refractory materials which are capable of depositing a uniformly dense coating over the pattern.

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## Effect of Gypsum on Compressive Strength of Cement

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### Introduction

The effect of gypsum on the compressive strength of cement is not determined regularly by the industry to ascertain quality of cements delivered to the market. Therefore the objective of the research is to determine the optimum gypsum percentage which gives maximum standard strength (28 days) while other physical parameters (initial setting time, fineness & soundness) and chemical compositions remain in compliance with Sri Lanka Standards SLS 107: 2008 (Specification for Ordinary Portland Cement) & SLS 1253:2003 (Specification for Portland Limestone Cement). Thereby the industry can ensure the quality of cements before delivering to the industries of construction and cement based products by knowing its optimum gypsum percentage [1, 3].

### Methods

#### Tests

Compressive strength was determined as per Sri Lanka standard SLS ISO 679: 2008 while initial setting time, fineness and soundness were determined as per Sri Lanka standard SLS 107: 2008: Part 2. X-ray fluorescence (XRF) test method was used to determine chemical compositions of unhydrated cement where as X-ray powder diffraction (XRD) method was used to identify phases of unhydrated and hydrated cements [2,4, 5].

#### Sampling

First, the weight ratio of ordinary Portland cement (OPC) clinker to gypsum was set to 90:10 by using a cement mixing machine with a control unit. Then the gypsum percentage was varied from 10 to 0 (clinker from 90 to 100) within a period of one hour and at the same time 21 cement samples (cement grade 42.5 N) were drawn continuously from the production line at every 3 minutes time intervals. On each occasion 5 kg of cement sample was collected. Next X-ray fluorescence (XRF) testing was carried out to find the gypsum percentage (as SO<sub>3</sub>%) as well as the other chemical compounds of each sample. After that 13 samples were selected out of 21 previously drawn samples considering its SO<sub>3</sub>%. Those were labeled as ‘OPC 01’ to ‘OPC 13’ as shown in the Table 01 and sealed in polythene bags until tests were started. The above procedure was repeated for Portland limestone cement (PLC) as well (see Table 02).



## Results & Discussion

### 1. Chemical and physical test results of OPC & PLC

Table 01: Chemical compositions, compositional parameters and physical test results of ordinary Portland cement

Sample No.	OPC 01	OPC 02	OPC 03	OPC 04	OPC 05	OPC 06	OPC 07	OPC 08	OPC 09	OPC 10	OPC 11	OPC 12	OPC 13
SO <sub>3</sub> %	0.64	0.82	1.07	1.14	1.28	1.51	1.69	1.90	2.02	2.09	2.47	2.59	2.77
SiO <sub>2</sub> %	21.20	21.40	21.40	21.20	21.00	20.90	21.20	21.30	21.20	29.50	20.70	20.80	21.20
Al <sub>2</sub> O <sub>3</sub> %	4.90	5.00	5.10	5.00	4.80	5.00	5.00	4.90	5.00	5.00	4.90	5.00	4.70
Fe <sub>2</sub> O <sub>3</sub> %	3.00	3.00	3.10	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.90
CaO %	65.20	65.60	65.80	64.80	64.50	64.60	64.90	64.70	65.00	64.50	64.10	64.30	62.60
MgO %	0.87	0.87	0.85	0.86	0.84	0.82	0.80	0.82	0.79	0.77	0.76	0.75	0.71
K <sub>2</sub> O %	0.31	0.33	0.35	0.33	0.32	0.36	0.34	0.31	0.35	0.30	0.33	0.35	0.30
Na <sub>2</sub> O%	1.06	1.00	0.99	1.04	1.02	1.09	1.08	0.77	0.85	1.05	1.04	1.01	0.89
Cl <sup>-</sup> %	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.02	0.01	0.01	0.00	0.00	0.02
CS- 2D	21.5	21.2	25.3	27.6	30.9	35.1	35.0	29.2	28.1	28.1	29.0	29.4	27.4
CS- 7D	36.5	37.6	42.4	43.6	48.1	52.5	50.0	45.2	44.5	43.1	39.7	41.8	40.8
CS-28D	50.4	54.3	55.9	57.8	58.0	63.0	64.3	59.3	54.5	56.6	57.3	57.6	52.6
S	0.6	0.6	0.7	0.5	0.7	0.6	0.7	0.7	0.6	0.7	0.7	0.6	0.7
F	386	351	397	386	414	403	401	412	409	402	407	419	419
IST	125	120	125	120	125	125	125	120	125	125	120	120	125

Table 02: Chemical compositions, compositional parameters and physical test results of Portland limestone cement.

Sample No.	PL C 01	PLC 02	PLC 03	PLC 04	PL C 05	PL C 06	PLC 07	PLC 08	PLC 09	PLC 10	PL C 11	PLC 12	PLC 13
SO <sub>3</sub> %	0.3	0.5	0.7	1.1	1.2	1.3	2.1	2.5	3.0	3.5	3.6	3.8	4.0
SiO <sub>2</sub> %	15.	15.	15.	15.	15.	15.	15.	14.	14.	14.	14.	15.	14.
Al <sub>2</sub> O <sub>3</sub> %	3.6	3.6	3.7	3.6	3.8	3.6	3.6	3.3	3.3	3.6	3.2	3.6	3.3
Fe <sub>2</sub> O <sub>3</sub> %	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.1	2.0
CaO %	71.	69.	70.	69.	69.	69.	69.	68.	68.	68.	66.	66.	66.
MgO %	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1
K <sub>2</sub> O %	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Na <sub>2</sub> O%	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cl <sup>-</sup> %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CS- 2D	24.	18.	23.	25.	26.	25.	27.	25.	22.	20.	15.	18.	17.
CS- 7D	33.	29.	35.	37.	37.	37.	36.	35.	34.	30.	28.	29.	28.

<b>CS- 28d</b>	42.	40.	47.	48.	47.	50.	48.	48.	45.	41.	38.	40.	39.
<b>S</b>	0.7	0.7	0.8	0.6	0.6	0.8	0.7	0.6	0.7	0.6	0.6	0.5	0.7
<b>F</b>	364	332	327	333	336	381	346	342	369	367	365	353	333
<b>IST</b>	125	125	125	125	125	125	120	125	125	120	125	125	120

Where; CS-Compressive Strength (MPa)

D-Days

S-Soundness (mm)

F-Fineness

(m<sup>2</sup>/kg)

IST- Initial Setting Time (min)

### 1.1 Variation of compressive strength for different sulphur content (SO<sub>3</sub>) of OPC & PLC

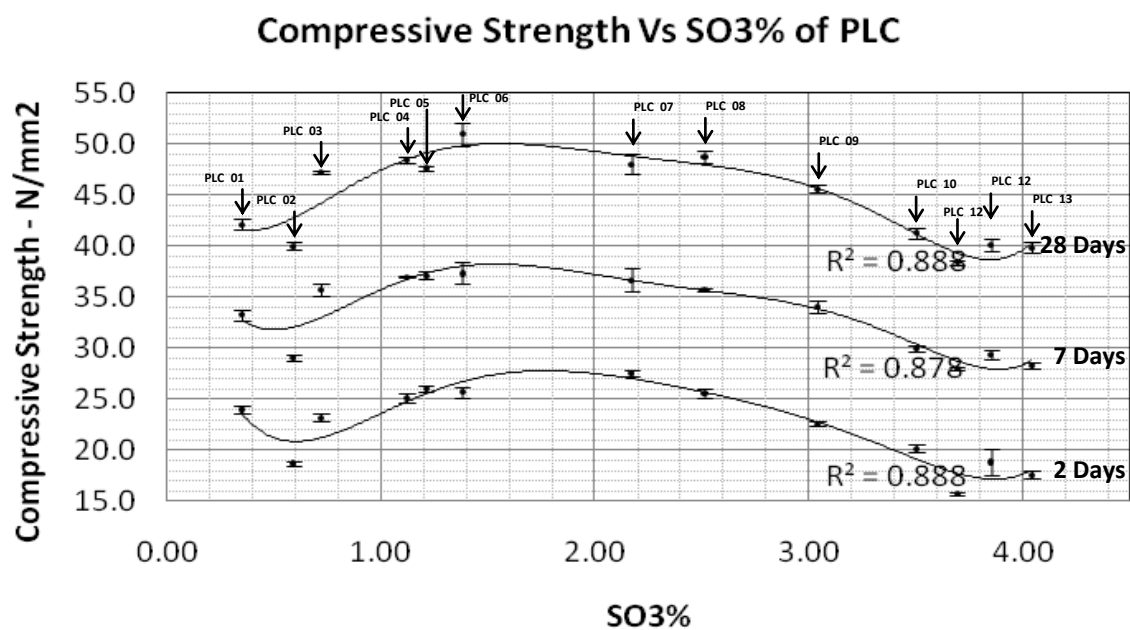
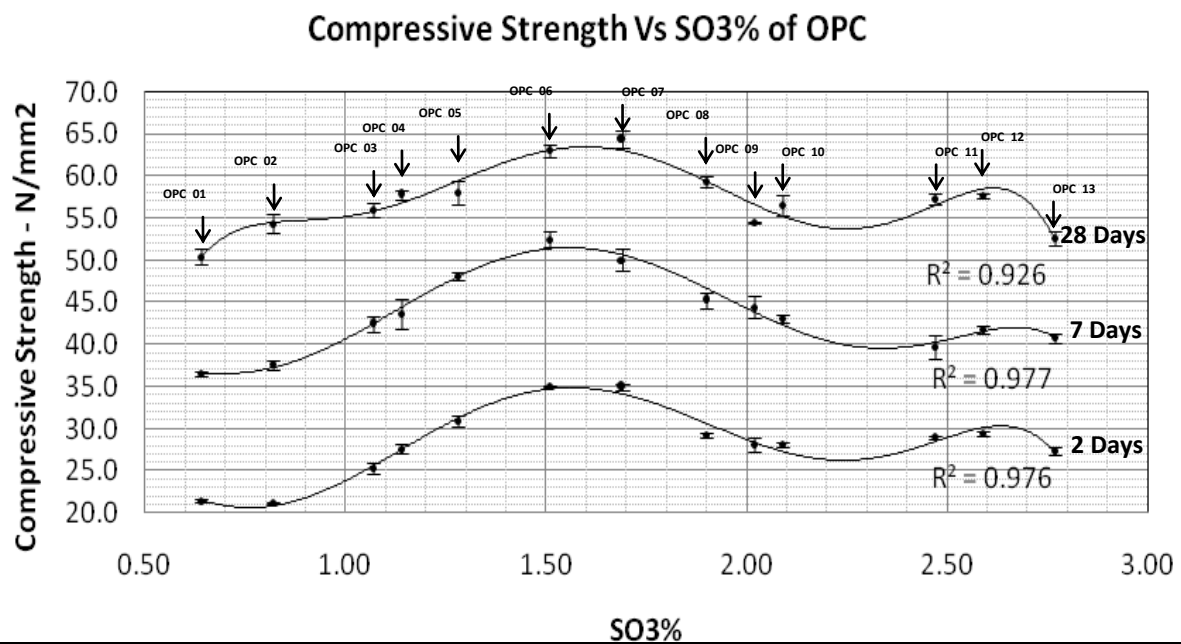


Figure 02: Compressive Strength Vs SO<sub>3</sub>% of Portland limestone cement

Variation of the compressive strength with the increment of gypsum of the prepared samples of ordinary Portland cement (OPC 01 to OPC 13) and Portland limestone cement (PLC 01 to PLC 13) are depicted in Figure 01 and Figure 02 respectively. Each figure consists of three graphs labelled as '2 Days', '7 Days' and '28 Days'. '2 Days' graph indicates the results of compressive strength of cement mortar prisms after water curing for 02 days. Similarly '7 Days' and '28 Days' graphs indicate the results of compressive strength of the samples after water curing for 07 days and 28 days respectively.

When comparing Figure 01 with Figure 02, it shows that OPC has comparatively higher compressive strength values than the PLC. This is due to higher formation of alite ( $3\text{CaO}.\text{SiO}_2$ ) and belite ( $2\text{CaO}.\text{SiO}_2$ ) phases in OPC than in PLC [6].

The addition of gypsum increases the compressive strength of cement up to a certain limit. The sample number 07 (see Figure: 01) and the sample number 06 (see Figure: 02) give the maximum standard (28 days) strength of 64.3 MPa (SO<sub>3</sub>% is 1.69) and 50.9 MPa (SO<sub>3</sub>% is 1.38) respectively.

It is observed that (see Figure 01) low compressive strength values have been obtained when SO<sub>3</sub>% is less than 1.69. This is mainly due to insufficient sulfate content which results a flash set. This is caused by the formation of aluminate hydrate ( $3\text{CaO}.\text{Al}_2\text{O}_3 + 6\text{H}_2\text{O} \rightarrow 3\text{CaO}.\text{Al}_2\text{O}_3.6\text{H}_2\text{O}$ ). Aluminate hydrate partly prevents the onset of alite hydration ( $2(3\text{CaO}.\text{SiO}_2) + 6\text{H}_2\text{O} \rightarrow 3\text{CaO}.2\text{SiO}_2.3\text{H}_2\text{O} + 3\text{Ca}(\text{OH})_2$ ) and resulting low strength of cement [6].

When SO<sub>3</sub>% is exceeding 1.69 (see Figure 01) compressive strength values are decreasing. It causes considerable swelling which can lead to expansion due to formation of unstable hydrated phases and it prevents cement hardening process. As a result low strength of cement can be observed [8,9].

## .2 XRD analysis of hydrated (28 days curing) samples of ordinary Portland cement

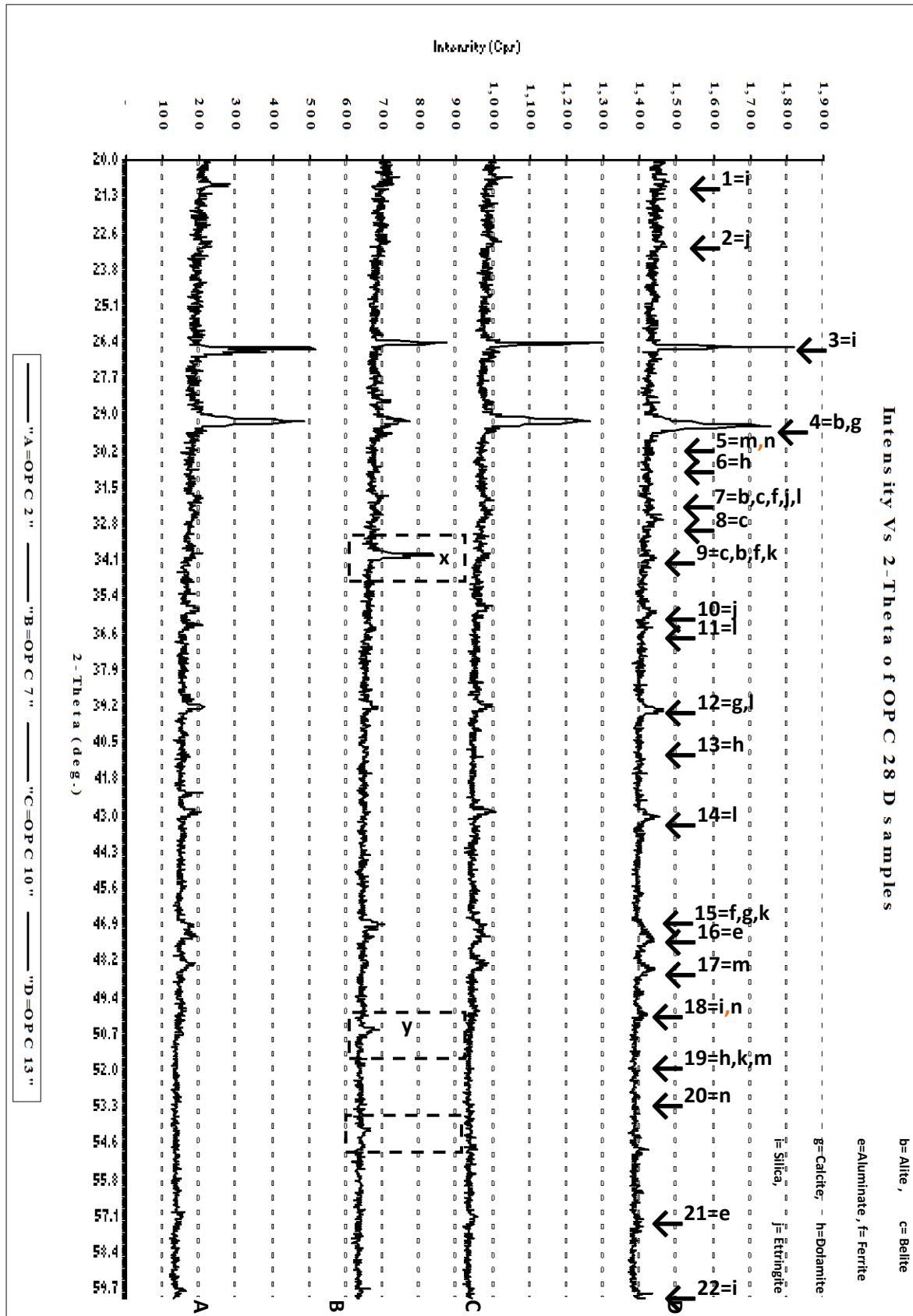


Figure 03: XRD analysis of hydrated samples (28 days curing) of ordinary Portland cement

### 1.3 XRD analysis of and hydrated (28 days curing) samples of Portland limestone cement

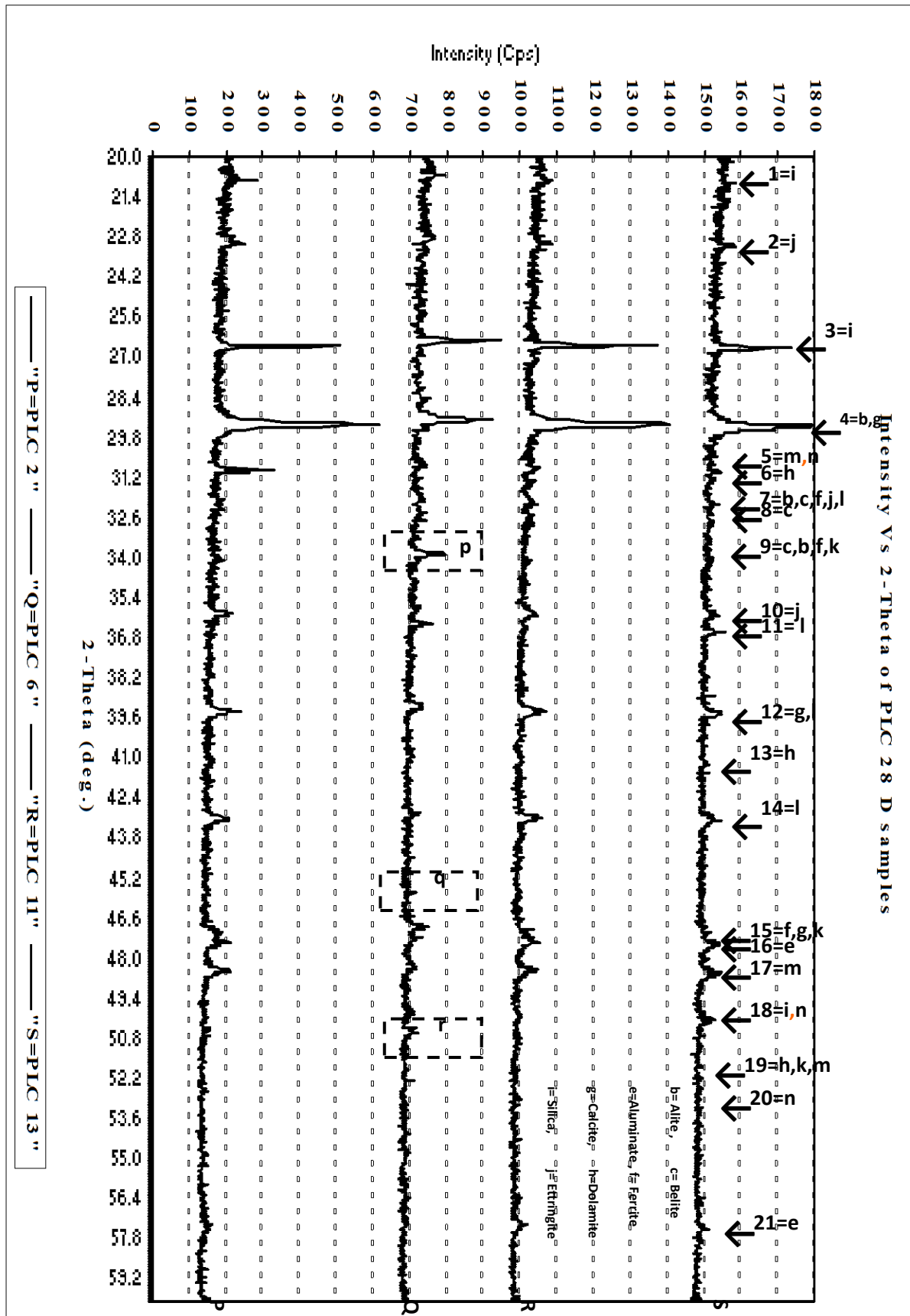


Figure 04: XRD analysis of hydrated samples (28 days curing) of Portland limestone cement

These low intensities of phases 'g', 'l' and 'm' and the new phase may cause the high compressive strength value in OPC 07 (see Figure 01).

XRD analysis for the hydrated (28 days curing) powder samples of Portland limestone cement is depicted in Figure 04. It contains four graphs labelled as 'P', 'Q', 'R' and 'S' for comparison. Graphs 'P', 'Q', 'R' and 'S' are pertaining to the cement powder samples from 'PLC 02', 'PLC 06', 'PLC 11' and 'PLC 13' respectively.

When comparing graph P, Q, R and S in Figure 04, the phases 'g' (peak 4,12 and 15), 'l' (peak 11,12 and 14) and 'm' (peak 5,17 and 19) of graph Q have low intensities than the other three graphs. Further more a new phase (peaks  $p = d=2.64$ ,  $2\theta=33.9^\circ$ ,  $q = d=1.97$ ,  $2\theta=45.9^\circ$ ,  $r = d=1.80$ ,  $2\theta=50.6^\circ$ ) can be observed only in graph Q. The phase corresponds to these three peaks could not be identified using the standards d-values [9]. The investigations in this regard are remained for further studies. These low intensities of phases 'g', 'l' and 'm' and the new phase may cause the high compressive strength value in PLC 06 (see Figure 02).

## CONCLUSION

Gypsum is a vital compound for cement manufacturing although the adding percentage is around 5%. For particular cement, there is an optimum sulphate content (both the clinker sulphate and added gypsum) which gives maximum standard strength as well as workable time for cement work.

The optimum sulphate content is affected by many factors, including aluminate content, aluminate crystal size, aluminate reactivity, and solubility of the different sources of sulphate, sulphate particle sizes, milling temperatures and whether admixtures are used.

With regard to the results obtained from this project shown with lower gypsum content ( $SO_3\%$  is up to 1.7 for OPC and 1.6 for PLC) adequate strength is not achieved. This does not mean that adding more gypsum (i.e.  $SO_3\%$  is above 1.7 for OPC and 1.6 for PLC) results in good strength. It will also reduce the strength. Therefore optimum gypsum content ( $SO_3\%$  is 1.7 for OPC and 1.6 for PLC) has to be maintained to get the desired cement properties.

It is mandatory to perform gypsum optimization trial if any one of the following cement parameters change.

- (a) Type of gypsum

- (b) Composition of cement
- (c) Reactivity of clinker

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**ENGINEERING AND OTHER TECHNICAL SCIENCES**

**TECHNICAL SESSION II**

Chaired by Mr. MA Nimalsiri

Director General Civil Aviation Authority, Sri Lanka



### **Summary**

*Presenting a paper on “Bell Helicopters” which is based on an ongoing project Sq Ldr DLA Manage recommends the Vacuum Bag Processing method to fabricate an engine deck by utilizing tools and equipment available to the SLAF. In this study all fabrication techniques were studied with their advantages and disadvantages along with load analysis. The session chair commended the research effort and said that it will be cost saving.*

*A paper on “Network Based Distributed Intelligent Intrusion Detecting System” (Mr. RK. Ahmadh Rifai Kariapper) identified that the majority of the intruders are teenagers and therefore suggested to give priority to security. The study proposed Network-Based Distributed IDS which has the capability to learn and detect new types of attacks because of the novel architecture of the proposed intelligent IDS and the system structure.*

*The paper on “Scaling Experiments on Flight and Performance of Unmanned Air Vehicles and their Sensors” (UAV) provided an important step in setting up guidelines for experimental scaling of flight tests of UAVs and performance evaluations of their sensors. The results rendered for the vehicles and their sensors with regard to performance characteristic,s were comparatively similar and computer simulations closely approximated analytical values. The author recommended further analysis by employing more complex and realistic flight environments for the further validation of results.*

## **Network Based Distributed Intelligent Intrusion Detecting System**

*BRK. Ahmadh Rifai Kariappe, r Sabaragamuwa University of Sri Lanka*

### **1. Introduction**

With the rapid growth of the technology in all computing fields, the security for those Computer and Network Systems containing the valuable data has received the biggest priority. In depth defense will need to include firewalls, installed to prevent unauthorized access, antiviral software installed to detect viruses, and intrusion detection systems placed to prevent outsiders from breaking into the system or to prevent misuse of the system by an insider.

An intrusion into an information system tries to compromise the security of the system. An intrusion into the information system stems either from inside the network or outside the network and can steal classified information or create havoc in the system and halt as well as deny the access to legitimate user activities, incurring huge economic losses. An Intrusion Detection System (IDS) aims at detecting intrusive activities, and gives warnings to the System Security Administrator.

Existing IDSs can be categorized into mainly three types based on application strategy: host-based IDS often referred to as HIDS, network-based IDS and router-based IDS also abbreviated as NIDS. Host-based IDSs are usually deployed on individual host-machines to monitor activities on the host machines. Network-based IDSs are installed in some strategic computers in the network to monitor data packets sent between host machines. Network-based IDSs can detect violations of network security policy Router-based IDSs are installed on routers to monitor data packets passing through routers, thus trying to prevent intrusive data packets from entering the network inside the router. Router-based IDSs are similar to network-based IDSs.

The IDS can also be categorized based on the detection technique strategy: signature-based detection, anomaly detection, and specification-based detection. In signature-based intrusion detection, the data is matched against known attack characteristics, thus limiting the technique largely to known attacks, even excluding variants of known attacks. In anomaly detection, profiles of normal behavior of systems, usually established through automated training, are compared with the actual activity of the system to flag any significant deviation. Anomaly detection can detect unknown attacks, but often at the price of a high false alarm rate. The security mechanisms and detection technique used in the traditional IDSs demonstrated severe weaknesses such as robustness, scalability, intelligence and less

human interaction. The new findings also reveal that there is variant breed of IDSs emerging in the industry, combining the signature-based detection and misuse detection techniques; these are also so called Hybrid Intrusion Detection Systems.

The Network Based Distributed Intelligence Intrusion Detecting System will overcome most of the drawbacks over present systems. It is necessary to provide good IDS since securitywise, the intrusion detecting system faces an enormous number of threads. Accuracy of detection is a powerful criterion of the proposed system. In brief the architecture and the selection of detection algorithm are playing a major role to make the IDS efficient. [1][2][3][4][5][6]

## **2. System Requirements**

The system requirement is playing a vital role here. The requirement is classified into two groups; Functional and Non-Functional requirements. If we take the past records, there are a number of different proposals that have been made. Each proposal varied from another in characteristics such as architecture, techniques used, processing methods and even deployment strategies. Nevertheless the researchers have always focused on one primary goal that is the Intrusion Detection.

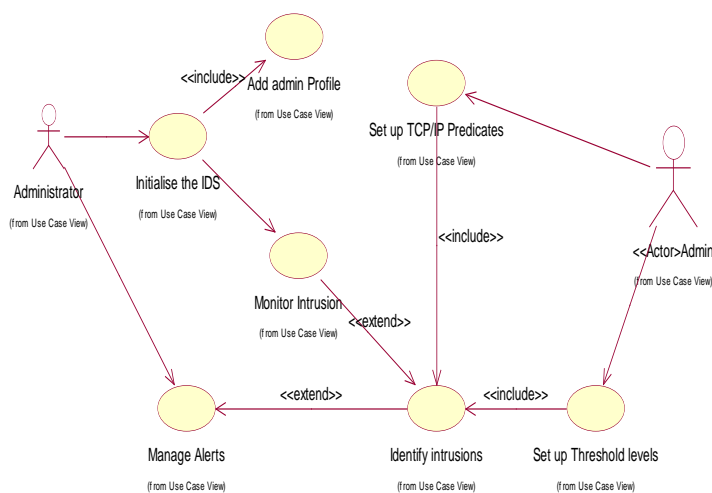
For an Intrusion Detection System to be considered as a quality system, it is very mandatory that the intrusion systems should address and present a certain amount of common quality characteristics. It is pretty difficult to accommodate the entire functionalities and characteristics in one system due to the different sets of constraints.

The system is constructed with functional requirements like creating admin profile; the profiles should be uniquely local to each node; thus only authorised “Admins” will perform operations on authorised nodes, this will eliminate unnecessarily generalising and globalising the admin profiles, managing vulnerability predicates and threshold like; threshold levels explain the severity of the intrusions and the setting up of thresholds will also reduce the unnecessarily produced false alarm; communicate with data sensors, intrusion detection; primarily focuses on the novel intrusions taking place on TCP/IP based networks, invoke alerts and non functional requirements such as accuracy, performance, scalability, security, false positive rate, fault tolerance, resilience, reliability and completeness.

## **3. The Architecture**

The intrusion detection systems face an enormous number of threats from internal and external entities, these systems are not only responsible for the security of the Networks and other systems but also responsible for their own security. The architecture of the Intrusion systems is one main focus area in improving the security.

An intrusion detection system should be efficient enough to tackle the ever changing nature of the attacks. The efficiency of an intrusion detection system is highly depended on the architecture, non functional characteristics and quality characteristics of the system.

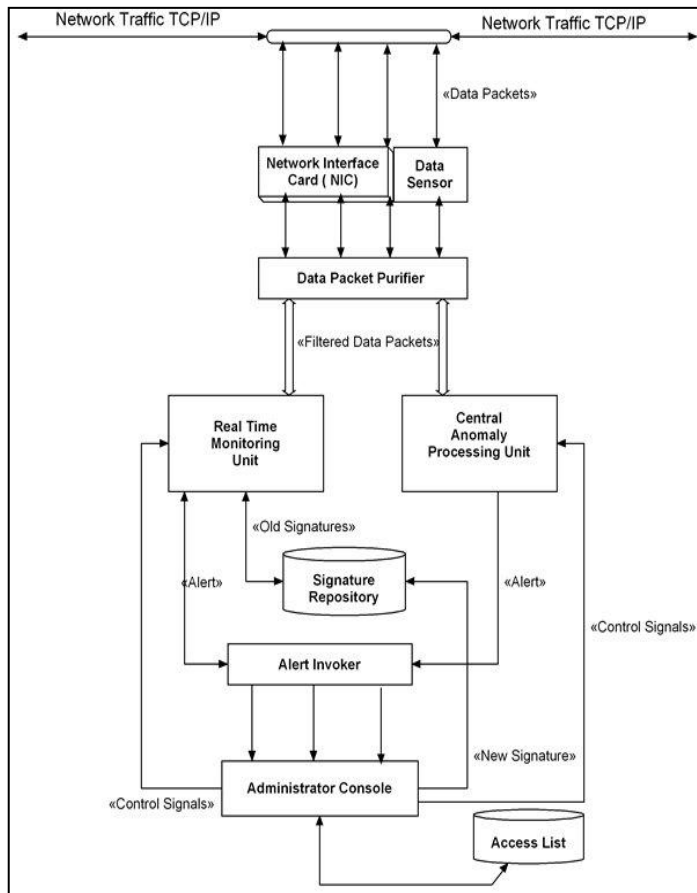


The proposed system is aimed at enhancing the accuracy of detection, detecting unknown attacks and known attacks, reduction of false alarms and resource consumption, and the novel architecture introduces the self-learning capability to the proposed system.

There are namely two types of detection techniques namely; misuse detection and anomaly detection. The misuse detection is also called Signature based detection; this approach to

intrusion detection is based on somehow defining what malicious behavior is in the form of Signatures, and then monitoring for it. This approach is very good at detecting attacks which are known but will miss new attack methods, even if they are just minor variations on old attacks. On the other hand, In contrast to misuse detection, anomaly detection works by building a model to represent normal system usage and then monitoring for anything that does not fit this model. This approach is good at detecting novel attacks that a system using misuse detection would miss.

The novel architecture for the proposed system takes advantage of the drawbacks of the existing architectures. The architecture enables distribution of both the learning process as well as the network monitoring process. Mainly, there are two separate components in this architecture. This component is deployed at each of the nodes in the network that needs protection.

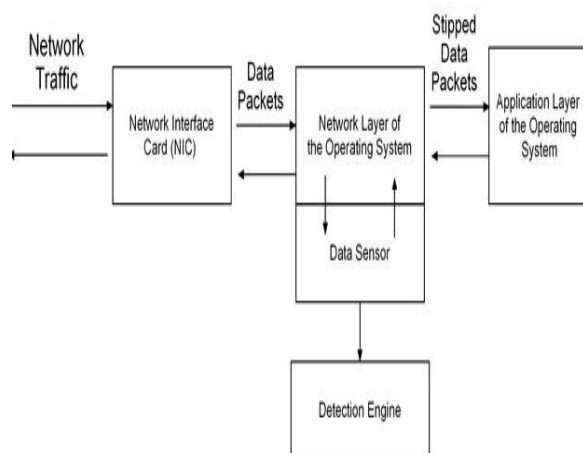


Intelligent Intrusion Detection System as a whole System

The architecture describes two processing units namely Real Time Monitoring Unit (RTMU) and Central Anomaly Processing Unit (CAPU).

Each of the processing units receives the data or packet of data sniffed by the sensor from the network and then processes in its own way. The architecture proposes two separate and parallel processing Units; one performing the learning and other the monitoring. If both the processors operate simultaneously, the RTMU can benefit from the feedback of the CAPU and can constantly improve its learning by

redefining the new models or Signatures.



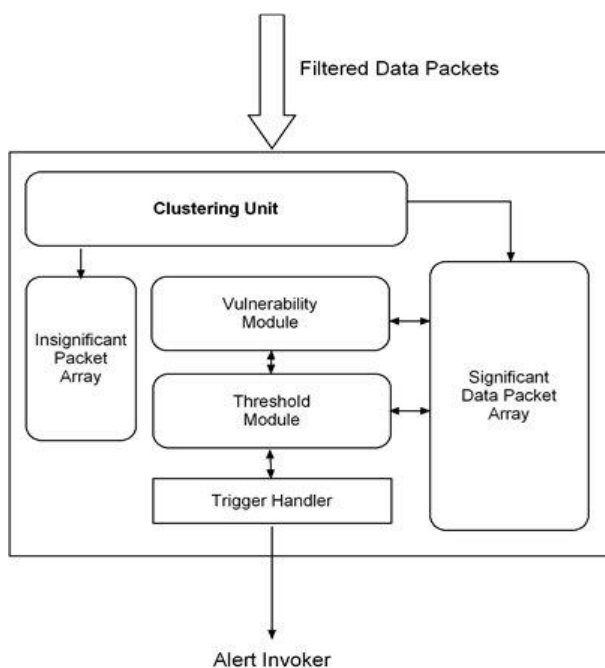
**The Data capturing phases and the communication between the different layers of the Operating System.**

The sniffed network traffic is initially passed through a filter called 'Data Purifier'; this operation is performed in order to remove insignificant data packets such as acknowledgement packets. This will greatly influence the quality of data passed to the processing units, thereby refraining from wasting time on processing insignificant data packets. When the filtered data packets are forwarded to the

CAPU, the insignificant data packets are dropped off by the detection engine; the significant packets are grouped and placed on a window of arrays.

Some researchers tend to group the data packets as connection oriented packets and the data packets, each of which is further grouped to perform detection processing, which involves an extra burden on processing power and additional resource consumption

The threshold level module is mainly focused on reducing the false alarms, when the vulnerability model is applied on the clustered data packets, it tends to give us various readings for different groups of data packets depending on the matching totality of the vulnerability predicates, nevertheless its necessary we should priorities the vulnerability levels. The application of threshold levels greatly helps us understand the genuine vulnerability



The internal components of the Central Anomaly Processing Unit

#### 4. The System Design

The intercommunication design between data sensor and processing unit; the architecture specifies a queuing communication model, thus allowing the network sensor to place the packets in the queue and get ready for the next packet, while at the same time the processing Units consume the packets placed in the queue. The intercommunication design between data sensor and central anomaly processing unit; this is referred to as piping technology and the implementation of pipe is carried out

with the help of the Piping technology of PERL language [7][9]. In implementation, the PERL (PRACTICAL EXTRACTION AND REPORTING LANGUAGE) has been used to implement the prototype version of the proposed system. The proposed prototype system has well benefited from the String manipulation capabilities of PERL. The “Tk” extension module provides the path to implement contemporary Graphical User Interfaces for the front end of the systems [8][9].

The results of the evaluation showed that the system accurately detected any abnormal activity and generated alerts notifying the administrator. The network intrusion detection systems that are often considered by researchers demand special deployment configurations in the network. Since most of the network intrusion detection systems that have been proposed are based on centralized architecture, this inherently creates a single point of failure. We can detect attacks, either previously known or novel strategy attacks, since any attack will result in an abnormal activity. This is the philosophy behind anomaly based intrusion detection systems. Also, the denial of service attack was accurately detected by the system and notifications sent to the administrator, which is a big achievement for the project and many current systems lack this detection capability. The System configurations suffer from data quality problems and demand changes in the network structure. The system that is proposed in this research can work seamlessly without modifying any part of the physical network. The proposed system is of the ability to collect data from any type of network for intrusion detection.

The proposed system is good at detecting attacks. Unlike the other system the proposed system does not implement a database to store data; instead it uses simple file system. This system provides real-time intrusion detection and alerting facility. The prototype of the proposed system is implemented with very less significant performance issues.

For example, Windows XP systems have a default configuration which allows them to give higher priority to the user's programs as compared to certain system programs. The proposed system makes use of data clustering to identify anomalies. The system was more focused on novel attacks rather than on known attacks. However the system also has provisions for the known attacks.

## 5. Conclusion

Since most of the network intrusion prevention systems that have been proposed are based on signature analysis, this inherently creates a single point of failure. The system is proposed to the project network and no spanning ports or tap ports are required. The proposed system is good at

detecting. The system can be easily deployed on an already configured and installed wireless network too.

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**ENGINEERING AND OTHER TECHNICAL SCIENCES**  
**TECHNICAL SESSION III**

Chaired by Prof UGA Puswewala  
Dean of the Faculty of Engineering

### **Summary**

*Under the environmental engineering session, a paper on “Statistical Control of Process Parameters of Machining Operations for Enhanced Quality Process Economy” (G. D. S. Desinghe<sup>1</sup> and N. K. B. M. P. Nanayakkara) studied optimum machine operation condition. The results of the study revealed that for both end milling and turning operations, the most significant factor for the surface roughness is the feed rate followed by the spindle speed.*

*A study on “Noise Reduction in an Enclosed Space by Destructive Interference” (Lt Col Lt Col R. M. Monaragala) was done in order to analyze the effectiveness of Active Noise Control (ANC) for frequencies below 500 Hz, in an enclosed space. In order to ascertain physical implementation of the concept, a PC based experimental model has been developed. The ANC algorithm has been implemented in the system using Lab view, Java and Digital Signal Processing (DSP) techniques.*

*A paper on “Developing a sensor that is compatible with the existing specific conditions in solar ponds”(U S Rahubadde & PAA. Perera) proposed a mathematical model that captures specific conditions of solar ponds and the salinity issue.*

*A study on “Potential Use of Biogas as an Alternative Bio Energy Source: A Case Study at Kotelawala Defence University” (Pathmamali Jayasuriya) concluded that the KDU bio gas project with the aim of replacing some selected use of LP gas, is successful when compared to other bio gas projects in other environments. The researchers recommended strengthening the ongoing biogas project at KDU.*

## **Statistical Control of Process Parameters Of Machining Operations For Enhanced Quality And Process Economy**

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### **Introduction**

Due to the widespread use of highly automated machine tools in industry, manufacturers require to increase productivity and improve product quality. Computer Numerically Controlled (CNC) machine tools have been extensively used during the recent decades, with least interaction with operators, providing greater improvements in productivity and quality of the machined parts. There are several machining processes in industries such as milling, turning, boring, drilling etc. The CNC milling is one of the most significant metal removal methods to generate flat surfaces, slots with multipoint cutting tools and therefore, this process is widely used in the manufacturing industries including aerospace, mould manufacturing, automotive sectors (Lou et al., 1999). Turning is another important machining operation used for removing unwanted material for the purpose of generating an external surface of a rotating cylindrical workpiece by the action of single point cutting tool (ASM Hand Book, 2004).

The quality of machined components is evaluated by the specifications of the product such as length, width, diameter, surface finish and reflective properties. In milling and turning operations' dimensional accuracy, tool wear and quality of surface finish are the most significant factors for the manufacturers. Surface quality plays an important role on the performance of milled and turned surfaces especially in improving fatigue strength, corrosion resistance and creep life. Machining with a desired surface roughness is rather difficult than producing physical dimensions because relatively more factors affect the surface roughness. Some of these can be controlled and some cannot. Controllable process parameters include feed rate, spindle speed and depth of cut. Factors such as deterioration in tool geometry, vibration of the workpiece and machine tool, workpiece and tool material variability, tool wear and chip load can hardly be controlled (Lou et al., 1999 and Kirby, 2010).

Determining the optimum levels of machining parameters; spindle speed, feed rate, depth of cut and tool diameter will result in enhanced product quality that is very important. It is also important that this prediction technique should be accurate, reliable, low cost and non destructive (Lou et al., 1999). Therefore, a model building for surface finish in CNC end milling and turning operations are

significant for future developments in the machining and manufacturing sector. Multiple regression analysis method which is a statistical based method is suggested to predict the surface roughness and develop a model for surface roughness.

In order to analyze the machining process, it is mandatory to understand the impact of each of these variables as well as the interaction among them (Pavel *et al*, 2002). However, it is not a straight forward task to determine the effect of each and every variable on the output and also it is a time consuming and costly exercise. Therefore, only most significant variables are considered in the analysis and these variables include cutting speed, feed rate and depth of cut while other factors such as tool geometry, setup conditions and associated effects like chatter, tool wear and workpiece materials were remained constant.

It has proven that Taguchi Method is a quite successful tool in experimental analysis because Taguchi parameter design is a powerful and efficient method for optimizing quality and performance output of manufacturing processes (Zhang *et al*, 2007). Also, Taguchi design conducts the orthogonal experimental combinations and it is more effective than a factorial design. In addition, the statistical tool, MINITAB is popular software that is used for the analysis of design of experiments.

## Methodology

An experiment was carried out on OKUMA CNC machining center with High Speed Steel (HSS) two and using four flute end milling tools. The lubricant was always kept ON and cutting direction was set in X direction of the CNC machine: this will enhance the tool life and effects due to tool wear and also ease the roughness measurements to take along the same direction. It is still also possible to carry out an experiment with the lubricant OFF. However, it is obvious that the effect of tool wear becomes significant in this case. The acceptable ranges of spindle speed, feed rate, depth of cut and tool diameter were selected to mill a mild steel workpiece and different levels for each parameter i.e. 500, 750, 900 and 1000 revolution per minute for spindle speed ( $X_1$ ), 50, 75 and 100 millimeter per minute for feed rate ( $X_2$ ), 0.25, 0.5 and 0.75 millimeter for depth of cut ( $X_3$ ) and 16 millimeter diameter for two flute tool and 750, 900 and 1000 revolutions per minute for spindle speeds ( $X_1$ ), 30, 50 and 75 millimeter per minute as feed rates ( $X_2$ ), 0.4, 0.7 and 1.0 millimeters for depth of cut ( $X_3$ ) and 9, 12 and 16 millimeter diameter for four flute tool ( $Z_1$  and  $Z_2$  are dummy variables) in milling operation. All cutting combinations were selected in number of experiments while keeping other parameters constant.

Turning operations were carried out in M300 turning centre with single point HSS cutting tool. In turning operation; the spindle speed ( $X_1$ ) was tested at 540, 370 and 260 revolutions per minute, feed rate ( $X_2$ ) was at 0.03, 0.06 and 0.09 mm per revolution and the depth of cut ( $X_3$ ) were 0.5, 0.7 and 0.9 mm. Same as in the milling operation the turning operation was carried out while other affected parameters remained constant and the optimal cutting combinations were obtained with Orthogonal Array ( $L_9$ ) of Taguchi design method. Note that each of the above parameters was chosen within the recommended ranges of M300 lathe machine which suits for the work and the tool materials used. During the experimental process a 65 mm sampling length of a 24 mm diameter mild steel rod was turned with different cutting conditions while supplying a consistent flow of coolant throughout the operation. According to the combinations of the cutting parameters 9 observations were recorded during experiment and process was continued for number of replicates.

In both milling and turning operations, the surface roughness was measured using the parameter of Arithmetic Mean Roughness Value ( $R_a$ ) which is accurate enough compared to other parameters such as, root mean square ( $R_q$ ), Maximum peak to valley roughness height ( $R_y$ ). The measurements were collected using a profilometer with 1 micron accuracy. In this study the controllable parameters were chosen as independent variables and the surface roughness as the dependent variable or the resulting output. The proposed regression model containing all the main effects and interaction term ( $\alpha_i$ ) are given below.

For Milling (without changing tool diameter);

$$Y_i = \alpha_i + X_{1i} + X_{2i} + X_{3i} + X_{1i}X_{2i} + X_{1i}X_{3i} + X_{2i}X_{3i} + X_{1i}X_{2i}X_{3i} + \epsilon_i \quad (1)$$

For Milling (with different tool diameters);

$$Y_i = \alpha_i + X_{1i} + X_{2i} + X_{3i} + Z_{1i} + Z_{2i} + X_{1i}X_{2i} + X_{1i}X_{3i} + X_{2i}X_{3i} + X_{1i}Z_1 + X_{1i}Z_2 + X_{2i}Z_1 + X_{2i}Z_2 + X_{3i}Z_1 + X_{3i}Z_2 + X_{1i}X_{2i}X_{3i} + X_{1i}X_{2i}Z_1 + X_{1i}X_{2i}Z_2 + X_{1i}X_{3i}Z_1 + X_{1i}X_{3i}Z_2 + X_{2i}X_{3i}Z_1 + X_{2i}X_{3i}Z_2 + X_{1i}X_{2i}X_{3i}Z_1 + X_{1i}X_{2i}X_{3i}Z_2 + \epsilon_i \quad (2)$$

For Turning;

$$Y_i = \alpha_i + X_{1i} + X_{2i} + X_{3i} + X_{1i}X_{2i} + X_{1i}X_{3i} + X_{2i}X_{3i} + X_{1i}X_{2i}X_{3i} + \epsilon_i \quad (3)$$

$\epsilon_i$  is the random error which is assumed to be normally distributed with mean zero and constant variance, and it is uncorrelated;  $i = 0, 1, 2, 3 \dots n$ .

The development of a surface roughness prediction model for milling and turning on a mild steel surface were carried out using Multiple Linear Regression Analysis. The Statistical Analysis Software (SAS) and MINITAB 13 were used to develop a model for milling and turning operations respectively. Forward selection method was used to select the best subset of independent variables from the above models. The variation inflation factor was used to check the multicollinearity in the model.  $R^2$  was used to measure the adequacy of the multiple regression models. To test the significance of the regression model the F-test was used. In addition the T- Test was used to evaluate the significance of each parameter in the predicted model. The Durbin - Watson Test was used for detection of the serial correlation, and the Whist General Test was used to test the constant variance and the Anderson-Darling Test was used to test normality of the residuals.

The statistical software MINITAB 13 was used as the aid tool for statistical analysis and the analysis was continued with a specific setup to determine the critical values of feed rate, cutting speed and depth of cut for optimize the surface finish while optimizing the tool life and the cost associated with the turning operation.

## Results and Discussion

### For Milling (Without changing tool diameter);

48 mild steel specimens were milled and surface roughness measurements were collected. 28 data points were selected randomly as training data, set to build the prediction model and remaining 20 data points were used as testing data set to check the validity of the derived model. The variables were selected using stepwise selection method at a significance level 0.05. The variance inflation factor was less than 10. Therefore, there was no multicollinearity.  $R^2$  was found as 0.9855 and this shows that 98% of the variation is explained by the model. The mean square error of the fitted model was 0.0029. The F-test was used to test the significance of the fitted regression model. Since P-value of the test is  $< 0.001$ , the model is significant at a significance level  $\alpha = 0.05$ . Also the estimates of the parameters were significant at a significance level  $\alpha = 0.05$  (P-value  $< 0.001$ ). Thus, the fitted multiple regression model for predicting the surface roughness is;

$$\hat{Y} = 0.85819 + 0.00000314 \times X_1 \times X_3 + 0.00256 \times X_1 \times X_2 - 0.00001352 \times X_1 \times X_2 \times X_3 \times Z_1 \quad (4)$$

It was also proved that the assumption made before experiment; from the normally distributed Box Plot (Figure 1) is as below;

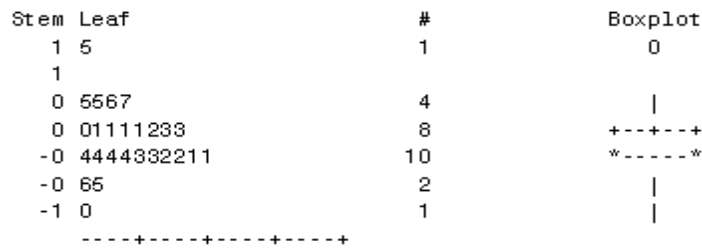


Figure 1: Box plot

All the assumptions were satisfied by the derived models. The observed surface roughness and predicted surface roughness values for the training data set and testing data set are shown in Figure 2.

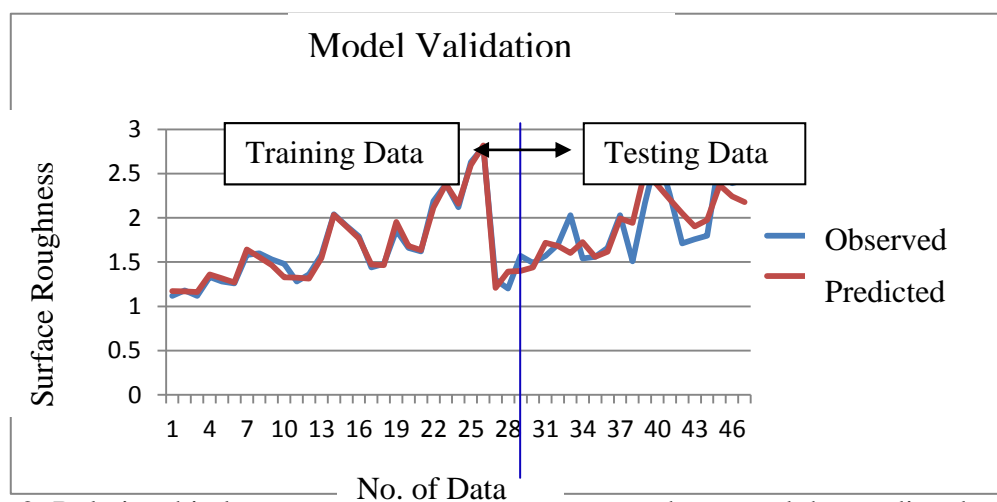


Figure 2: Relationship between the observed surface roughness and the predicted surface roughness

#### For Milling (With different tool diameters);

80 mild steel specimens were milled and surface roughness values were measured. Out of these, 60 data points were selected randomly as training data to build the prediction model and remaining 20 data points were used for the validation of the fitted model. The variables were selected using forward selection method at a significance level 0.05 and the variance inflation factor was less than 4. Therefore, there is no multicollinearity.  $R^2$  was 0.8422 and therefore, 84% of the variation is explained by the model. The mean square error of the fitted model was 0.1578. The F-test was used to test for the significance of the fitted regression model. Since P-value of the test was  $< 0.001$ , the model is significant at a significance level  $\alpha = 0.05$ . The estimates of the parameters showed a significance level  $\alpha = 0.05$  (P-value  $< 0.0011$ ). Thus, the fitted multiple regression model for predict the surface roughness is;

$$\hat{Y} = 0.62 - 0.00994 \times X_2 - 0.00213 \times X_1 \times Z_1 + 1.34 \times X_3 \times Z_2 + 0.0000166 \times X_1 \times X_2 \times X_3 \times Z_1 \quad (5)$$

The hypothesis  $H_0: \rho=0$  (Errors are uncorrelated) was tested to check whether there is serial correlation. The Upper Durbin Watson value ( $d_u$ ) from the Table was 1.73 and the calculated Durbin Watson value ( $d$ ) was 1.870. Since  $d > d_u$ ,  $H_0$  is not rejected at a significance level  $\alpha = 0.05$ .

Therefore, the random errors are uncorrelated. P-value of the Anderson-Darling test used to test for the Normality of the residuals was 0.25, which shows that the residuals are normally distributed at a significance level  $\alpha = 0.05$ . The Whites' general test was used to test the constant variance of the residuals. Since the P-value was 0.1362, the hypothesis is not rejected and the variance is constant at a significance level  $\alpha = 0.05$ .

All the assumptions are satisfied through the models. The observed surface roughness and predicted surface roughness values for the training data set and testing data set are shown in Figure 3.

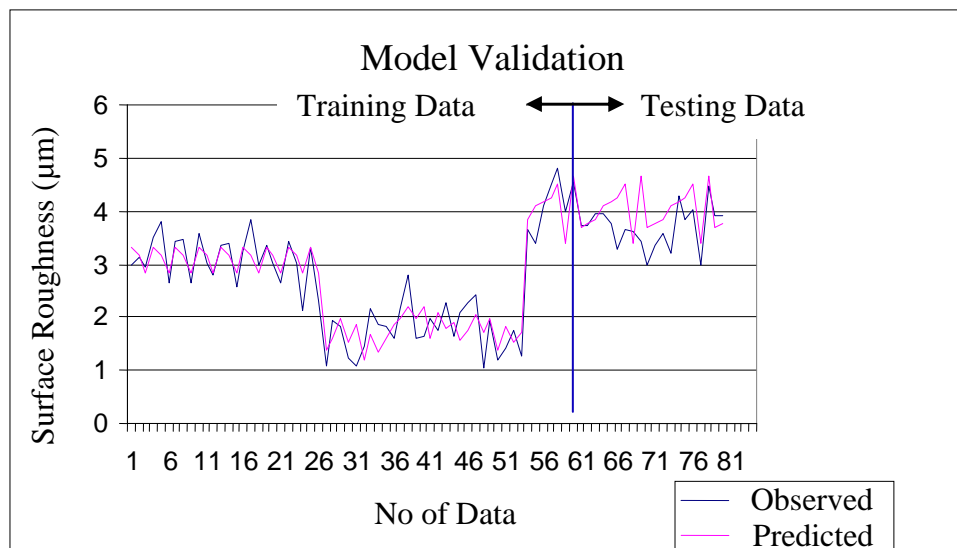


Figure 3: Relationship between the observed surface roughness and the predicted surface roughness

For Turning;

$$\hat{Y} = 5.46 - 0.00962 \times X_1 + 38.9 \times X_2 + 2.77 \times X_3 \quad (6)$$

To achieve 95% accuracy of the model it is required to have the probability; P-value less than 0.05. From the analysis of variance (ANOVA) table, it was found that the probability,  $p$  of this model was 0.042. Therefore, it is clear that the model is well within the significant level of 0.05. Besides the control factor “depth of cut” the P-values of all other individual coefficients of control factors were less than significance level of 0.05 and this means that all the coefficient values of these factors are



significant at significance level of 0.05. The variance inflation factor was 1 (less than 4). Therefore, there is no multicollinearity. It was also found that the value of the model adequacy ( $R^2$ ) is equal to 78% at the significance level of 0.05. According to the above results the model is appropriate to predict the surface roughness of manual turning operations with an accuracy of 78% at the significance level of 0.05.

In this experiment, the signal to noise ratio (S/N) ratio was calculated with “the smaller the better” concept. All the relevant calculations were carried in MINITAB 13. Calculated S/N ratios for different cutting combination are summarized in Table 1.

**Table 1: Experimental results for surface roughness represented with S/N ratio**

Spindle Speed	Feed rate (mm/rev)	Depth of Cut	Surface Roughness	S/N Ratio	Standard Deviation	Mean
540	0.03	0.5	3.18	-10.89	0.43841	3.490
540	0.06	0.7	4.62	-10.94	1.94454	3.245
540	0.09	0.9	5.65	-12.20	3.18198	3.400
370	0.03	0.7	4.66	-13.99	0.47376	4.995
370	0.06	0.9	7.51	-15.03	3.40118	5.105
370	0.09	0.5	5.21	-11.81	2.41123	3.505
260	0.03	0.9	5.66	-16.59	1.44250	6.680
260	0.06	0.5	7.11	-15.15	2.29103	5.490
260	0.09	0.7	9.64	-16.92	5.14067	6.005

In the computation of the best cutting combination, it is required to determine the maximum S/N ratio; at the maximum S/N ratio the optimal cutting conditions can be achieved for the range of values on which the experiment was carried out. In this experiment, the tabulated S/N ratios suggest that the 1<sup>st</sup> cutting regime (S/N ratio = -10.89) corresponds to produce the surface which has the lowest surface roughness. Significance of the machining parameters could be determined by examining the above results obtained from Taguchi analysis, considering the smaller the better S/N ratio, means of response, standard deviation of response the feed rate showed the higher influence to the surface roughness rather than spindle speed and depth of cut.

## CONCLUSION

In this study, a new model was established to predict the surface finish in CNC milling operation using spindle speed, feed rate, depth of cut and three different tool diameters. Verification experiments have proved the ability to predict the surface roughness with the accuracy of almost

98.5% for 16 mm two flute end milling tool and 84% accuracy for four flute different diameter tools. Feed rate was the most significant machining parameter used to predict the surface roughness as validated in multiple regression model. In this research the effects of vibration, friction, tool wear and tool chatter, are negligible compared to the parameters such as spindle speed, feed rate, depth of cut and tool diameter.

The results obtained for turning operation using Taguchi analysis clearly indicate that the feed rate plays a very important role for producing lower surface roughness and the spindle speed is the most insignificant factor on surface roughness. Furthermore, following cutting regime (when S/N Ratio = -10.89) is the setting expected to produce the surface which has lower surface roughness.

Spindle speed = 540 rpm, Feed rate = 0.03 mm/rev, Depth of cut = 0.5 mm

According to the results, the developed model using regression analysis was successful and it can predict the surface roughness values ( $R_a$ ) with 78% accuracy for mild steel at the 0.05 significance level.

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## A Mathematical Model for Designing a Sensor for Salinity Measurements in Solar Ponds

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### Introduction

In recent years, there has been an increase in the effort to promote renewable energy in developing countries. Solar pond (SP) is one such technology. Salinity gradient solar ponds (SGSPs) are essentially low cost solar collectors with

integrated storage, and hence are potential and cheaper

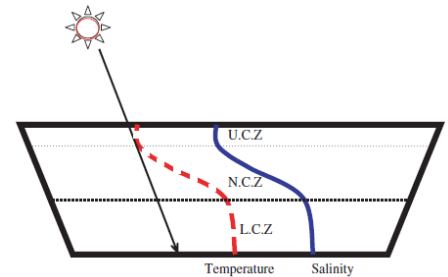


Fig. 1

alternatives to flat collector systems in suitable locations. Solar Pond is one of the heat generators because of the intermittent nature of solar radiation as an energy source. Excess solar energy during periods of small demand can be stored in order to meet demands when solar energy availability is insufficient. The solar pond is some kind of a solar energy storing device. The solar radiation in solar pond is stored as thermal energy. In short, solar pond has three different layers,

1. Top Layer (Upper Convective Zone -UCZ)
2. Middle Layer (Non Convective Zone -NCZ)
3. Bottom Layer (Lower Convective Zone -LCZ)

UCZ has low salinity and has clear fresh water that acts as solar collector (receiver) which is relatively the shallowest in depth and is generally close to ambient temperature. NCZ has increasing salinity from UCZ to LCZ with a gradient which serves as the non-convective zone which is much thicker and occupies more than half the depth of the pond. Salt concentration and temperature increase with depth. LCZ consists of the densest salt concentration, serving as the heat storage zone. Almost as thick as the middle NCZ, salt concentration and temperatures are nearly constant in this zone. The salinity profile and a rough cross section of a solar pond is given in figure 1. The dashed line and solid line show how salinity and temperature increase respectively with the depth of pond in figure 1. In order to collect and store the solar energy to the solar pond, the salinity level variation is an important parameter which has to be maintained. Therefore a device needs to be designed to measure salinity inside the pond. In this research work, attention was forward on a salinity sensor which can be immersed in a pond for a long period of time (may be more than one year).

There are more techniques to measure the salinity of a solution. Among them, the following three methods are important.

1. Optical Method
2. Conductive Method
3. Capacitive Method

The first two methods are popular and there are a lot of salinity measuring instruments which are designed by using those two methods. In order to design a measuring instrument, capacitive method is rarely used because the researches which were carried out for third method is insufficient but capacitor sensor can be used as non-contact sensor with the solution. Since metallic electrodes are non-contact, they are prevented from corrosion when it is immersed in solution. In our research work, we try to improve the capacitive method to measure salinity of solution as a new investigation. The salinity of solution cannot be measured directly by using measuring devices which are available in market because all the devices are calibrated with a specific temperature since the responses which are produced by Optical, Conductive, and Capacitive sensors are changed with the temperature for a given salinity value. In a solar pond, both salinity and temperature are varied simultaneously with its height. Therefore, a new sensor is needed to be pre-calibrated with temperature while it is calibrating with salinity. The sensor which is calibrated with temperature and salinity is suitable to get instant measurement of salinity in a solar pond. In order to move the sensor inside the solar pond, vertical electronically controlled mechanical system or manual method can be used.

## Experimental Procedure

### Preparation of Conductive Sensor

Two bread boards with dimensions 20 mm x 40 mm x 3 mm were selected and  $0.05 \text{ cm}^2$  was covered by a layer of paint. Then two plates were immersed in CuO solution for 15 minutes to etch the exposed area of Cu layer on bread board. After using acetone, the layer of insulating paint was removed. The top view of composed sample electrodes is shown in figure 2 (a) and (b). Parallel wire was soldered to the end points of copper electrodes and these two electrodes were connected using araldite with 5 mm space.

### Preparation of Sample solutions

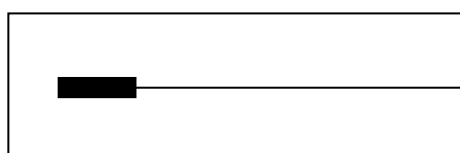


Fig. 2 (a) Left side  
of electrode

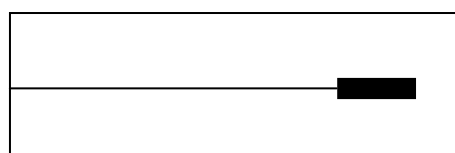


Fig. 2 (b) Right side  
of electrode

Five sample solutions were prepared with its concentration varying from 20 g/kg to 40 g/kg. In order to prepare 20 g/kg solution, 20grams of pure sodium chloride was measured and distill water was added until it reaches 200 grams of solution (The electronic balance can be utilized to measure maximum mass of 250 grams; therefore, we utilized that balance to measure 200 grams in each step). Another 200 grams of distilled water was measured five times and added to the previous solution. Similarly 25 g/kg, 30 g/kg, 35 g/kg, and 40 g/kg sample solutions were prepared.

### Methodology for conducting measurements

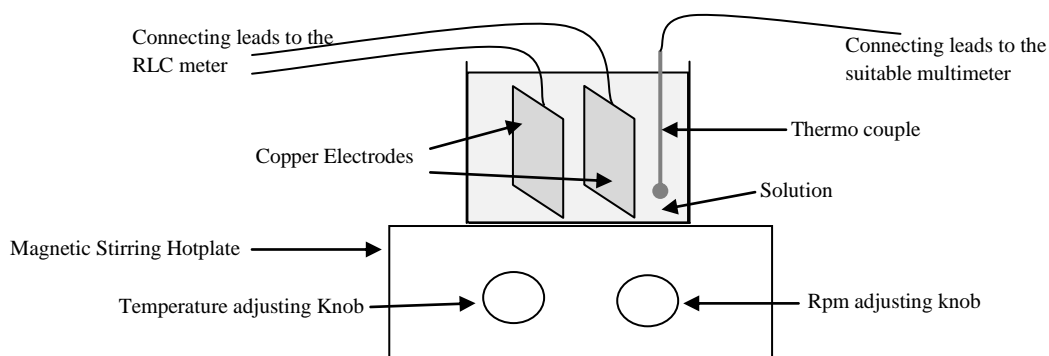


Fig. 3 Arrangement of apparatus for the calibration of sensor.

As the charge carriers in metals are electrons, the charge carriers of electrolytic solution are ions. In order to measure the resistance of ohmic resistor, a digital multimeter can be used. Multimeters measuring mechanism is there to provide a constant DC voltage and measure current passing through it, and to divide that constant voltage by measured current. This method cannot be applied in order to measure resistance of electrolytic solution because of polarization of ions inside the solution. Due to polarization of ions, mobility decreases with time and it can be observed that the resistance value of multimeter increases with time. Therefore, proper AC RLC method is used to measure resistance of solution to avoid polarization. Since two electrodes are immersed in aqua solution, the resistance is  $R = \frac{\rho \cdot l}{A}$ . Therefore, the electrical conductivity is  $C = \frac{lR \cdot A}{1000}$ . Since A is  $0.05 \text{ cm}^2$  and  $l$  is 5 mm,

$$C = \frac{1000}{R} \text{ ----- (1)}$$

20 g/kg solution was poured into Pyrex beaker and conducting sensor was inserted into solution. Starting from 25 °C of temperature, corresponding resistance was measured at every 10 °C until 75 °C. In order to measure temperature, calibrated thermocouple was used and in order to measure resistance, RLC meter was used at 1kHz operating frequency and 0.2Vpp operating voltage. Similarly, this procedure was followed for 25 g/kg, 30 g/kg, 35 g/kg, 40 g/kg solutions. Using

equation 1, resistance values were converted into conductivity values and it is observed that the conductivity for each solution linearly varied with temperature and gradient value for each concentration was measured by least square method. The conductivity versus temperature curves were plotted in figure 4 to figure 8.

## Results and Discussion

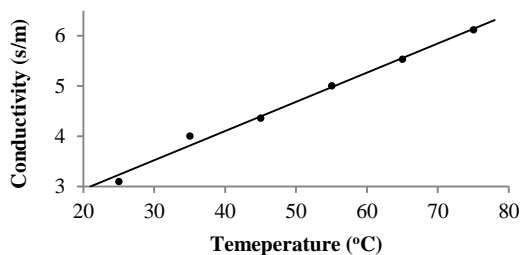


Fig. 4 The graph of Conductivity versus Temperature for 20 g/kg

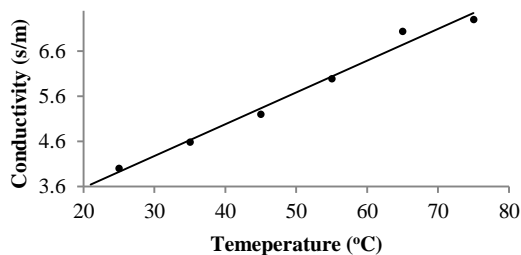


Fig. 5 The graph of Conductivity versus Temperature for 25 g/kg

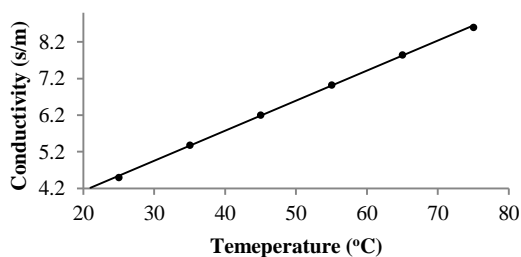


Fig. 6 The graph of Conductivity versus Temperature for 30 g/kg

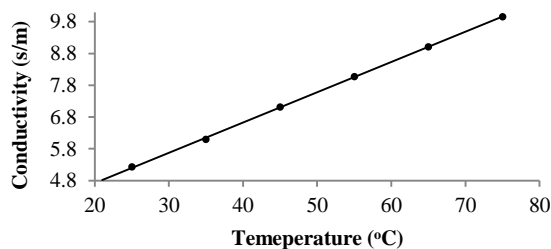


Fig. 7 The graph of Conductivity versus Temperature for 35 g/kg

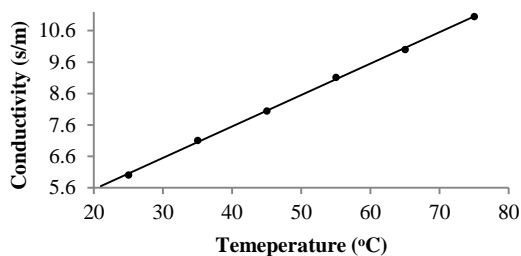


Fig. 8 The graph of Conductivity versus Temperature for 40 g/kg

For linear graph shown in figure 1, 2, 3, 4, 5, equations can be derived respectively as given in equation 2, 3, 4, 5, 6.

$$C(20, t) = \left(\frac{\partial C}{\partial t}\right)_{20} \cdot t + C(20, 0) \text{ ----- (2)}$$

$$C(25, t) = \left(\frac{\partial C}{\partial t}\right)_{25} \cdot t + C(25, 0) \text{ ----- (3)}$$

$$C(30, t) = \left(\frac{\partial C}{\partial t}\right)_{30} \cdot t + C(30, 0) \text{ ----- (4)}$$

$$C(35, t) = \left(\frac{\partial C}{\partial t}\right)_{35} \cdot t + C(35, 0) \text{ ----- (5)}$$

$$C(40, t) = \left(\frac{\partial C}{\partial t}\right)_{40} \cdot t + C(40, 0) \text{ ----- (6)}$$

whereas,  $\left(\frac{\partial C}{\partial t}\right)$  is the partial derivative of conductivity with respect to temperature for a given solution. Here it is considered as the gradient of linear graph. For all above equations, respective gradient and intercept can be obtained using least square method in statistics. For equation (2),  $\left(\frac{\partial C}{\partial t}\right)_{20} = 5.81 \times 10^{-2}$  and  $C(20, 0) = 1.7807$ . For equation (3),  $\left(\frac{\partial C}{\partial t}\right)_{25} = 7.05 \times 10^{-2}$  and  $C(25, 0) = 2.1607$ . For equation (4),  $\left(\frac{\partial C}{\partial t}\right)_{30} = 8.21 \times 10^{-2}$  and  $C(30, 0) = 2.4876$ . For equation (5),  $\left(\frac{\partial C}{\partial t}\right)_{35} = 9.52 \times 10^{-2}$  and  $C(35, 0) = 2.8202$ . For equation (6),  $\left(\frac{\partial C}{\partial t}\right)_{40} = 10.01 \times 10^{-2}$  and  $C(40, 0) = 3.5471$ .

It is observed that the gradient and intercept values are varied as functions of salinity of solution. It is shown in figure 9 and figure 10.

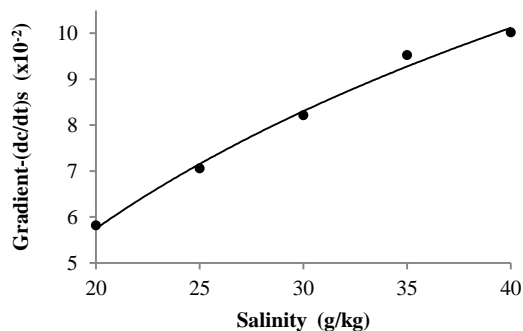


Fig. 9 The graph of Gradient

$\left(\frac{\partial C}{\partial t}\right)_s$  versus Salinity.

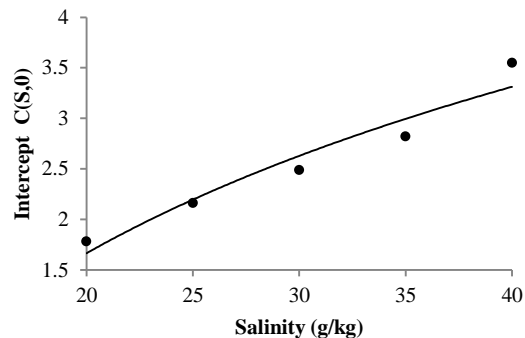


Fig. 10 The graph of Intercept

$C(S, 0)$  versus Salinity.

Each gradient value shows a relationship with salinity as given in equation 7 :

$$\left(\frac{\partial C}{\partial t}\right)_s = A_1 \cdot \ln(S) + B_1 \text{ ----- (7)}$$

here  $A_1$  and  $B_1$  values are obtained using least

square method in statistics and those values are  $A_1 = 6.3061 \times 10^{-2}$  and  $B_1 = -13.1440 \times 10^{-2}$ . Similarly for the intercept, the relationship is given in equation 8.

$$C(S, 0) = A_2 \cdot \ln(S) + B_2 \text{ ----- (8)}$$

here  $A_2 = 2.3766$  and  $B_2 = -5.4546$ .



The equations given in 2 to 6 can be derived from varying salinity as given in equation 9

$$C(S, t) = \left( \frac{\partial C}{\partial t} \right)_S \cdot t + C(S, 0) \text{----- (9)} \quad \text{by substituting equation 8 and 7.}$$

$$C(S, t) = \ln[S^{A_1 t + A_2} \cdot e^{B_1 t + B_2}] \text{----- (10)} \quad \text{and eliminating } S \text{ form equation 10.}$$

$$S(C, t) = e^{\left( \frac{C - B_1 t - B_2}{A_1 t + A_2} \right)} \text{----- (11)} \quad \text{equation 11 shows how salinity varies with the different concentration of solutions and temperature simultaneously. The corresponding 3 dimensional plot and density plot are given in figure 11 and figure 12.}$$

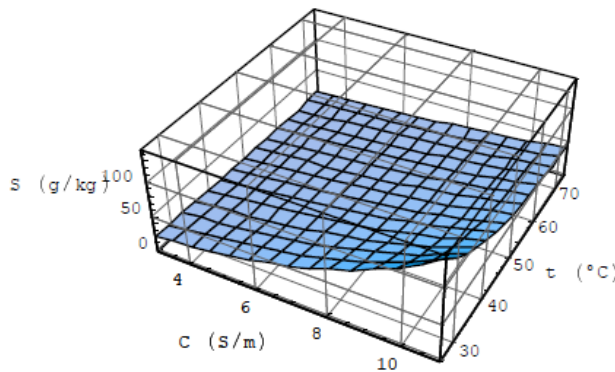


Fig. 11 3D plot of the response of calibrated sensor.

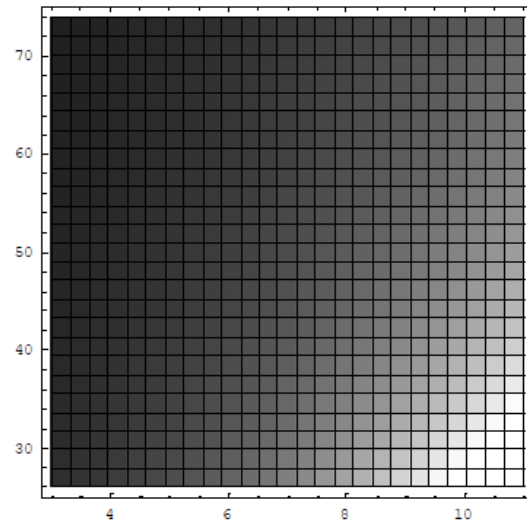


Fig. 12 The density plot of salinity as a function of temperature

This mathematical model given in equation 11, gives salinity values as a function of concentration and salinity. That relation is exponential. Therefore, one argument that may arise is salinity reading is not linearly varied with temperature and concentration. However, that curvature can be avoided and considered as linear for small range as shown in figures 13 to 18. The hollow lines are the values of salinity when concentration increases by 0.5S/m steps.

### Reliability of mathematical model.

From figure 12 to figure 18, experimental values are given in solid circles and, estimated values with mathematical model are given as hollow circles.

Fig. 12 The density plot of salinity as a function of temperature

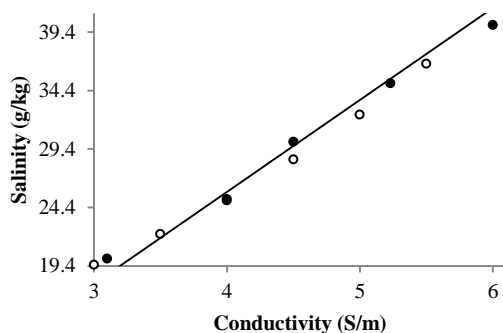


Fig. 13 The graph of Salinity versus conductivity at constant temperature  $t=25\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

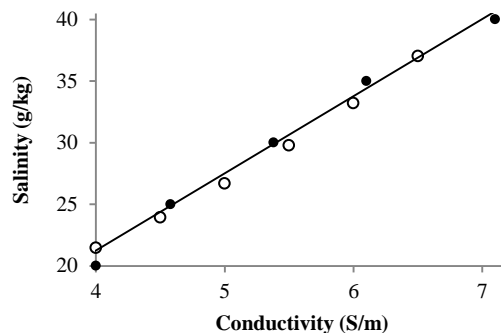


Fig. 14 The graph of Salinity versus conductivity at constant temperature  $t=35\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

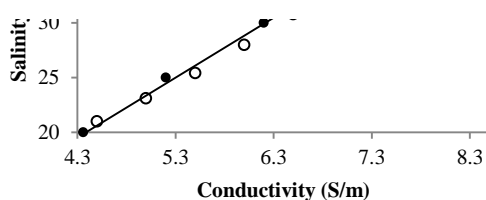


Fig. 15 The graph of Salinity versus conductivity at constant temperature  $t=45\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

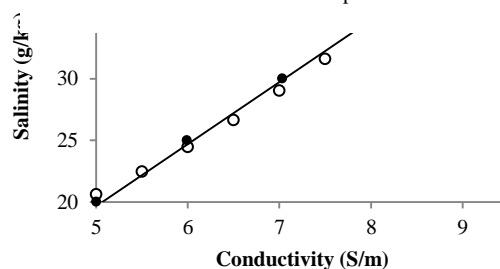


Fig. 16 The graph of Salinity versus conductivity at constant temperature  $t=55\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

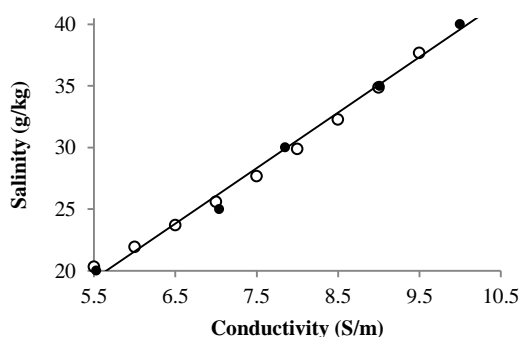


Fig. 17 The graph of Salinity versus conductivity at constant temperature  $t=65\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

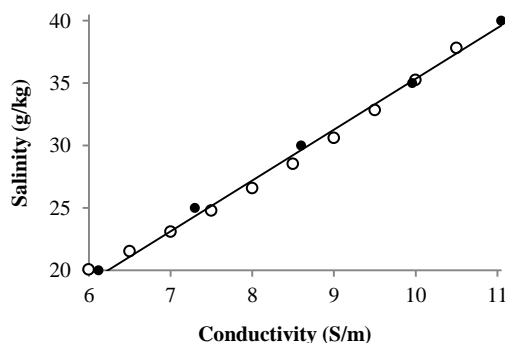


Fig. 18 The graph of Salinity versus conductivity at constant temperature  $t=75\text{ }^{\circ}\text{C}$  and comparison between mathematical model and experimental data.

## Conclusion

With this type of a model it is possible to show that the value of salinity increases with the concentration of solution and the salinity reading decreases with the increase of temperature. Therefore, the response of salinity measuring instrument performed well at high concentration and low temperatures. The experimental values tally with the estimation of the model as shown in figure 13 to 18 (experimental values are given in solid circles). This model shows that salinity reading varies exponentially with the increase of conductivity and salinity. Therefore the shape of the curves in

model may be curved but for short range of temperature and conductivity, the shape of curves can be considered as linear. The most suitable range of conductivity for this model is from 3 S/m to 11 S/m and the temperature is from 25 °C to 75 °C. Now this type of sensor can be used to get the salinity reading of solar pond with appropriate thermocouple and without any trouble.

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Development of a magnetically levitated density meter for salt gradient solar ponds R. N. Abdel-Messih<sup>a</sup> and T. A. Newell<sup>b</sup>

<sup>a</sup> Ain Shams University, Faculty of Engineering, Energy and Automotive Department, Cairo, Egypt

<sup>b</sup> Department of Mechanical and Industrial Engineering, University of Illinois at Urbana-Champaign, Urbana, IL

Experimental research and analysis of salinity measurement based on optical

Techniques. Yong Zhao<sup>a</sup>, Bo Zhang<sup>b</sup> and Yanbiao Liao<sup>b</sup>

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Energy, environment, and sustainable development by **İbrahim Dinçer, Marc A. Rosen**

Temperature-Electrical Conductivity Relation of Water for Environmental Monitoring and Geophysical Data Inversion

MASAKI HAYASHI, *Department of Geology and Geophysics, University of Calgary, Calgary, Alberta, Canada*

Fundamentals of Fluid Mechanics, by Joseph A. Schetz and Allen E. Fuhs.

## Nomenclature

R - Resistance

$\rho$  -Resistivity

$l$  -separation of electrode

- $A$  -effective area of electrode
- $C$  - Conductivity of Solution
- $S$  - Salinity of Solution
- $t$  - Celsius Temperature of Solution
- $C(S,t)$  - Conductivity as a function of Salinity and Temperature
- $S(C,t)$  - Salinity as a function of Conductivity and Temperature.
- $\left(\frac{\partial C}{\partial t}\right)_S$  - Partial derivative of Conductivity with respect to temperature at constant Salinity.
- $A_1$  - Constant value
- $A_2$  - Constant value
- $B_1$  - Constant value
- $B_2$  - Constant value
- SP - Solar pond
- SGSPs - Salinity gradient solar ponds
- UCZ - Upper Convective Zone
- NCZ - Non Convective Zone
- LCZ - Lower Convective Zone
- CuO - Cupress Oxide
- S/m - Siemens per meter
- g/kg - something in grams per kilograms of solution. (It is equal to the number of parts of something available in 1000 parts of solution)
- DC - Direct current
- AC - Alternating current

## **Potential use of biogas as an alternative energy source: Case Study at Kotelawela Defence University**

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### **Introduction**

Food wastes are generated in large quantities all over the world. Organic food waste is generated specially from where food is prepared or consumed, e.g. large scale canteens and kitchens, restaurants and households. Management and disposal of food wastes is one of the major issues in Sri Lanka since it creates serious environmental problems due to its high biodegradability. Dumping of food waste on land-fills leads to land pollution and releases odor compounds such as Volatile Fatty Acids (VFA) which affects public health and disturbs environmental beauty. Millions of tons of food waste disposed in land-fills emit heaps of green house gases such as methane, carbon dioxide, sulphur dioxide; hydrogen sulphide etc. Directly lead to air pollution. The effect of methane atom on ozone layer depletion is 23 times greater than that of carbon dioxide atom which also heavily affects global warming. Disposal of solids and effluents of food waste pollute inland water bodies and causes eutrofication, increasing biological oxygen demand (BOD) and chemical oxygen demand (COD) in rivers, lakes and water streams. Sri Lanka is a biodiversity hotspot included in world heritage where indigenous flora and fauna species are highly threatened by the malpractices of organic waste disposal. Organic pollutants greatly affect general public by means of land, water and air pollution posing a severe threat to human health.

In addition, energy crisis is another problem faced by today's world. Today economy and technologies largely depend on non renewable resources. Predicted estimates for the utilization rate of energy resources show that coal deposits will deplete within the next 150 – 200 years and the petroleum resource in the next few decades. Besides this, the damage being caused to the environment by these fossil fuels is a matter of great concern all over the world. Therefore at present the world is moving towards alternative appropriate sources of energy, which should be sustainable and clean.

Although different solid wastes treatment techniques are available, anaerobic digestion is considered as the most appropriate technology for its environmental foot print and potential use of biogas as an

alternative energy source. Based on Anaerobic Digestion Model No 1 (ADM 1) proposed by Batstone et al., (2002), anaerobic digestion is a biological process by which a wide variety of organic molecules can be metabolized into  $\text{CH}_{4(g)}$  and  $\text{CO}_{2(g)}$  in the absence of  $\text{O}_{2(g)}$  : whereas the major four phases are hydrolysis, acidogenesis, acetogenesis and methanogenesis. The digestate from anaerobic digestion contains essential plant nutrients and can thus be used as liquid fertilizer and soil amendments.

Although the anaerobic digestion is widely accepted for its potential to contribute towards renewable energy production and waste management, there have been many operational failures reported in Sri Lanka due to inadequate process control for pH, alkalinity, seasonal variation of load of pollutants etc. It was reported that only 29% of the digesters in Sri Lanka are operational (According to de Alwis AAP 1997), as by 1997. Anaerobic digestion of different types of food waste is being studied extensively in all over the world.

Different types of food wastes result in various degrees of methane yield. Different ratios of carbon and nitrogen, protein, carbohydrates and lipids as substrates or co-substrates results in different amount of biogas yields and need different hydraulic retention times. Fats and oils used as substrates or co – substrates for anaerobic digestion process constitutes an important factor due to the higher methane yield under favorable temperature, pressure and pH conditions. Although lipid rich food wastes are considered as better substrate to obtain methane theoretically in anaerobic digestion, in practice it is often hampered as the theoretical methane production is not easily achieved. (Angelidaki et al., 1992). Therefore to understand such anomalies between theoretical values and practical observations empirical research has a greater value to optimize reactor operations.

This research study was initiated as an outcome of the pilot scale biogas project which was set up at KDU premises with the objective of using biogas as an alternative energy source, using canteen food wastes. This leads to replacing the existing LPG and gaining economic benefits.

## **Materials and Methods**

The reactor type is known as Lanka tunnel model which has been designed according to the plug flow principle consisting of inlet, outlet, tunnel shape digester and its special feature is the presence of multi functional hydraulic chamber. The capacity of the biogas digester was  $40\text{m}^3$  which was determined based on wet weight basis organic loading rate (OLR) of 8.75-  $10\text{kg}/\text{m}^3/\text{day}$ . Initially,

400L of inoculum was fed into the biogas reactor which was collected from successfully functioning plug flow type biogas reactor at “Mahamewna Asapuwa”, Polgahawela.

The research was conducted as an empirical research and it was done as a batch experiment preceeding semi continuous digester feeding. Digester input feeding was carried out on a daily basis twice a day at selected times of 9.00a.m and 3.30p.m.

Feed stock contained 1: 1 ratio of water and food waste disposed from the cadet mess at Kotelawela Defence University. Organic loading rate (OLR) was managed in the range of 8.75- 10kg/m<sup>3</sup>/day wet weight basis. Organic loading rate (OLR) was measured using the following equation.

$$OLR = QS/V$$

Whereas OLR is organic loading rate (kg/Day/m<sup>3</sup>), Q is digester input feeding rate (m<sup>3</sup>/Day), S is substrate concentration and V is volume of the digester.

Daily pH monitoring was conducted before and after 10 minutes of each feeding of the effluents in both inlet and outlet of the digester using PINPOINT –P1model pH meter.

Biogas pressure was measured by water displacement method using simple mano- meter. Biogas pressure was monitored twice a day at selected times at 8.50a.m and 3.20p.m. before feeding.

Incremental biogas volume was measured using G 2.5 B Chinese model biogas flow meter.

## **Results and Discussion**

Biogas pressure (kPa), organic loading rate and the biogas burning pattern for 15 weeks after feeding is shown in figure 1.

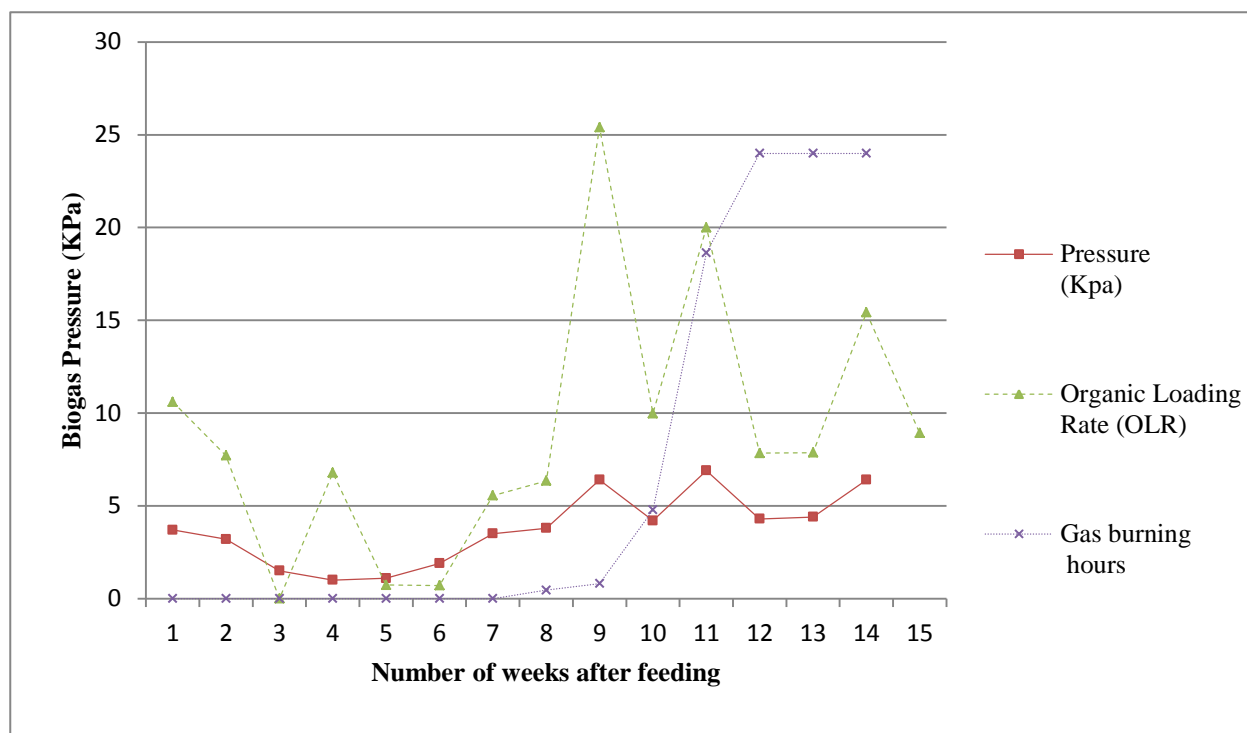


Fig.01: Relationship between biogas pressure, organic loading rate and biogas burning for 15 weeks after feeding

Organic loading rate (OLR) was adjusted according to the biogas burning pattern and biogas pressure. Biogas burning was started after 49 days of feeding. Continuous 24 hrs biogas burning was started after 84 days of feeding. (Fig.01). Favorable organic loading rate was 8.75 - 10kg/m<sup>3</sup>/day during the optimum gas production period.

The variation of pH profile of the reactor is illustrated in the figure 02. The average pH of the reactor was varied from 3.0 to 6.5. Burning of biogas was started when average pH value was adjusted to 6.2.

Biogas burning pattern was observed as a sigmoid curve and reached its maximum of burning over 24 Hrs, during the observed period. Average biogas volume was 15.81m<sup>3</sup>/day from reactor volume of 40m<sup>3</sup>. (Fig.03). Biogas generating rate per hour was 0.67m<sup>3</sup>/Hour during the experimental period. Average biogas production percentage is 39.53% from reactor volume. (Fig. 04)



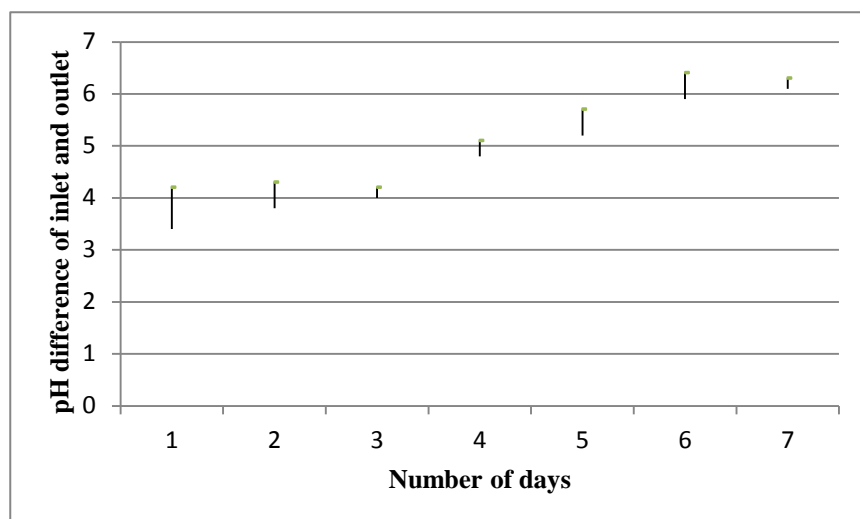


Fig.02: Average pH value fluctuation in inlet and outlet

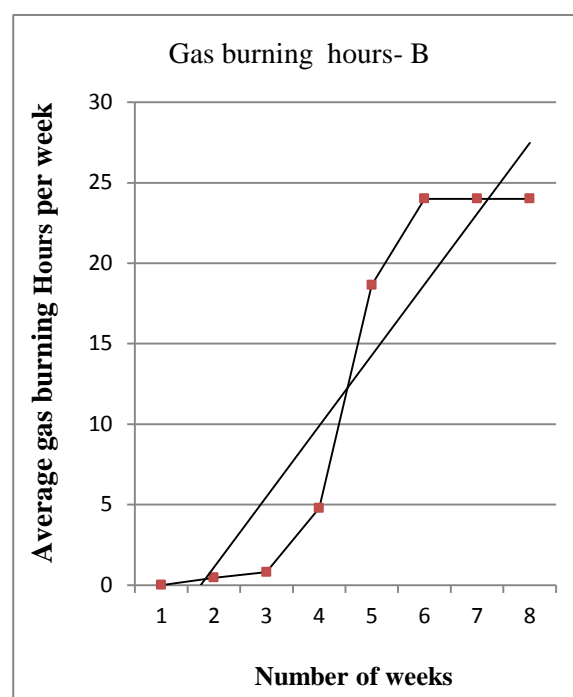
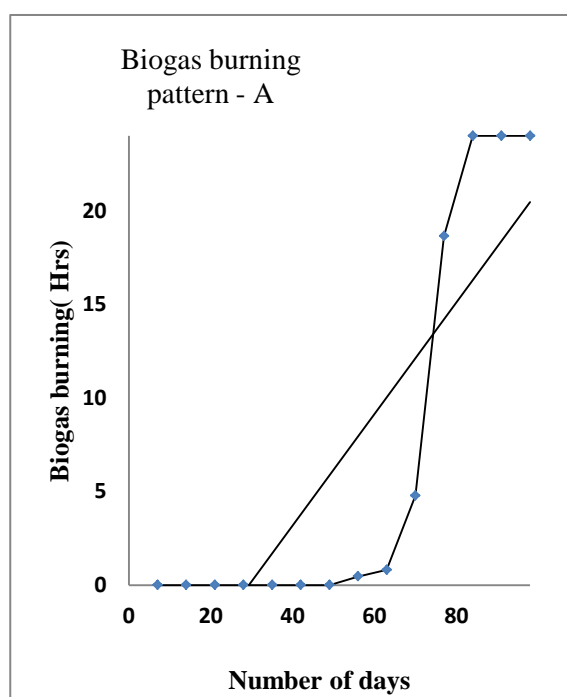


Fig.03: Biogas burning pattern for number of days (A) and number of weeks (B)

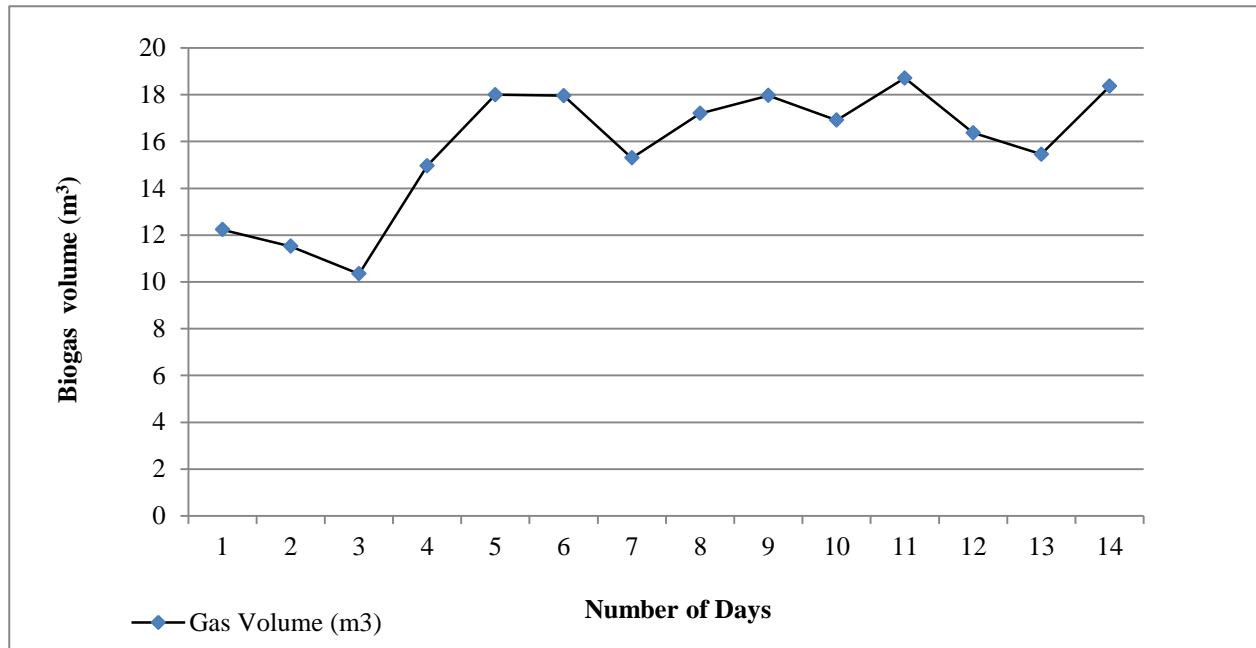


Fig.04: Average biogas volume fluctuation during optimum experimental period for 2 weeks

## Conclusion

It could be concluded that the percentage of 39.53% from reactor volume is an above average biogas production comparing with other continuous, semi continuous, and batch type biogas digesters in Sri Lanka.

Evidence from this study suggests the need for extended field experiments to study the effect of organic loading rate (OLR) and pH of inlet and outlet to optimize medium and large scale reactor operations. In-depth microbiological analysis is also needed to study the effect of acclimation process. Further studies based on experimental and theoretical investigations are needed to optimize the reactor operation and will be conducted in collaboration with academic and research institutes. Practical experiences and operating data obtained could be used to promote and develop medium and large scale biogas reactor technology in Sri Lanka.

Extensive studies of gas phase and bulk liquid phase bio-chemical and physico- chemical parameters in large scale biogas reactors such as TS, TVS, VSS, COD, BOD, CO<sub>2</sub>, CH<sub>4</sub>, NH<sub>4</sub><sup>+</sup> etc. are needed in this regard. Further studies are needed on characterization of biodegradable waste in Sri Lanka.

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**MEDICINE****PLENARY SESSION**

*Medical Ethics and Legal Ethics for Medical Profession*

Chaired by Prof. Carlo Fonseka

### **Summary**

*Plenary session in Medicine focused on two important areas in medicine. They were health in economic development and medical ethics. The speakers were; Prof. Nimal Attanayake - the role of health in economic development Dr. Kumari Nawaratne - problems and prospects of health and their relationship with economic development”, Prof. Susirith Mendis - medical ethics, R ADM Palitha Fernando -legal ethics.*

### **INTRODUCTORY NOTE**

*Professor Carlo Fonseka*

According to Prof. Nimal Attanayake, an improvement in health reinforces economic growth. Higher labor productivity and higher life expectancy that results from a healthy population contribute positively for this relationship. In addition, better health leads to a reduction in health expenditure both at micro level as well as at macro level. Therefore a better health improves the quality of life and contributes to economic development.

According to Prof. Attanayake, the current per capita health expenditure in Sri Lanka is Rs 10 per year. Dr. Kumari Nawaratne drew the attention of the audience to the possible health hazards associated with economic development. These hazards are potentially associated with environmental pollution, traffic congestions, stressful working environments, and finally household problems that are associated with the acceleration of economic growth. She emphasized the importance of empowering the health system to address these challenges.



*Prof. Carlo Fonseka chairing the Medical Plenary Session (IMG\_1942)*

Speaking further, Dr. Kumari Nawaratne indicated that malnutrition needed to be considered in health promotion programs. She elaborated the necessity of focusing health promotional programs in Northern and Eastern provinces during the post conflict era. Answering to a question from the audience both Dr. Kumari Nawaratne and Prof. Nimal Attanayake agreed that the psychological health of the community needs to be addressed. They indicated the importance of psychological wellbeing in promoting other aspects of health.

In the presentation on medical ethics, Prof. Susirith Mendis explained how doctor- patient relationship is important in maintaining health in the contemporary competitive world. According to Professor Mendis, a doctor should be a counselor rather than a decision maker for the patient. He also noted that Sri Lankan medical profession cannot forget the characteristics of Sri Lanka and its unique cultural and historical features. With regards to legal aspects, Additional Solicitor General R Adm. Palitha Fernando said that if a doctor does not make the expected deliveries to his patient in line with doctors' training and qualifications he or she can be guilty for negligence which can be taken up in the court. He indicated importance of safeguarding the confidentiality of information divulged during the doctor patient interaction. Further, R Adm. Palitha Fernando said that there is a need to reinforce the law to bridge the gaps between doctor patient relationships. He mentioned sensitive areas such as treating children/minors where medical and legal ethics have not been given adequate attention when compared with countries like the United Kingdom. He mentioned that Sri Lanka needs to introduce legal guidance to help doctors to practice their profession effectively with lesser problems. Thereafter the technical sessions were proceeded.

## **Role of Health Service in Economic Development**

*Professor Nimal Attanayake, Department of Economics, University of Colombo*

Thank you very much, Professor Carlo Fonseka, for the introduction. Today I am going to talk about the role of health services in economic development. I would like to start my presentation with a study that was carried out approximately a year ago by me and my colleagues. This research was on wheat flour fortification in Sri Lanka as a remedy for iron deficiency anaemia and folic acid deficiency. We did this study about a year back.

In this study, we tried to look at this issue from the economics point of view to assess the economic losses due to iron deficiency anaemia and folic acid deficiency in Sri Lanka. What are these economic losses? Perinatal mortality due to mothers' anaemia, loss of adult work force due to iron deficiency anaemia, future productivity losses of children due to anaemia and mortality and disability from birth defects due to folic acid deficiency. So, with this background, we tried to estimate benefits gained through introducing a wheat flour fortification program to avoid iron deficiency anaemia and folic acid deficiency. So we made some projections for the next 10 years, for instance, estimating the cost of national fortification program. Thereafter we estimated the benefits of the national fortification program for the next 10 years. We went on to calculate the cost benefit ratio for the next 10 years and the unit cost per person per year. The results were very interesting. What we have found is that for wheat flour fortification we have to spend only SLR 7.40 per year per person, which would lead to the reduction of the burden of diseases and economic loss. The economic loss accounts for more than US dollars 90 million in over 10 years, so the cost benefit ratio is very high. That means if you spend US\$1 for flour fortification, at the end you will be getting an earning or save US\$2 in the future. So, In addition there were other benefits, such as the reduction of infant deaths that was 9000 per year. However, there is no possibility of making an estimate for that. With this background I would like to say that there is a very close relationship between health and economic development.

As Professor Carlo Fonseka said, health is not only the absence of illness; it encompasses social well-being, spiritual and mental well-being. People measure economic development narrowly as an increase in goods and services produced during a given period, normally a year. It is a very narrow definition. You can see the relationship between the health and economic development, for instance look at malnutrition. Malnutrition leads to poor health, poor health leads to low productivity, low productivity leads to poverty; this kind of a vicious circle is there. However, we have to interrupt this vicious cycle it not only through economic development but through other means as well.

Economic development has two types of effects: the direct effect is labor productivity. One example is the reduction of malnutrition which leads to increase in productivity and production. The indirect effects are on health: reduced infant mortality and reduced maternal mortality; this reduces indirect household cost of illness and these reductions of cost can be used for other purposes more emphasis on education and reduced provider cost. These will affect economic development positively. However, increasing life expectancy gives rise to different health issues such as diseases involved with elderly population.

Sri Lankan health care services are delivered by two sectors, which are the Public and Private sectors. The public sector is well established and provides healthcare services to majority of the population. However, there are deficiencies in the Public Health Sector such as deficiencies in drugs, lack of facilities for investigations and increased workload for healthcare workers. In some instances the patient may have to bear the cost of medicines when it is not available in the state sector.

On the other hand, the private sector is less developed and less organized because it largely focuses on the urban, financially wealthy population. The government expenditure on health accounts for approximately 1.2% of the GDP. On the other hand, contribution of service receivers also counts for approximately 1.5% of the GDP. This totals to approximately 3% of the GDP, which when compared to a developed country is a small amount. For instance the USA, spends around 14% on healthcare. In Sri Lanka, 3% of the GDP that is spent on healthcare is equal to spending Rs. 10/= per person. However, Sri Lanka has been able to achieve a good health status with limited resources.

Sri Lankan healthcare system faces new challenges. One is the emergence of non communicable diseases. It is important to develop effective strategies to face non communicable diseases in a cost effective manner. Other challenges faced by the health sector involves; emerging issues with demographic transition, adopting new technologies in advancing patient management and providing care for more informed, educated patients. Some of these challenges are directly linked to economic development.

Therefore health and economic development are inter-related. This relationship may be show positive or negative reinforcement.



Now I would like to look at the term “Economic Development” in a different way, not just as the improvement of the GDP or the per capita income. Dudley Searse, a prominent economist described development as social phenomenon which involves more complex components than an increase in per capita output. It involves elimination of poverty, unemployment and inequity. Such an approach brings out the necessity of addressing structural issues, namely; education, health, population growth, urbanization, agriculture and industrial reforms in the efforts of economic development.

The World Bank has a similar approach that aims to achieve a better quality of life. It involves providing better education, higher standards of health and nutrition, less poverty, a clean environment, more equality of opportunities, greater individual freedom and a richer cultural life. These can hence be considered as components of economical development according to the World Bank.

Now, I would like to direct your attention towards another view that is of Amartya Kumar Sen the first economist from our region to win the Nobel Prize. According to him, economic growth cannot be sensibly treated as an end in itself. Development has to be more concerned with enhancing the lives we lead and the freedom we enjoy. It is called the capability approach. . Capability approach emphasizes the importance of looking beyond the means, for example, income to be facilitated with freedom that allows individuals to obtain what they value. It’s a very philosophical concept and that extends far beyond increasing the per capita income. Freedom is given much emphasis in this approach.

The challenge faced by our nation is to determine a way of dealing with the issues mentioned above in a socially and economically acceptable manner. This cannot be achieved by the health sector alone. Education, housing and sanitation in addition to attainment of human rights and richer cultural life are aspects that need consideration. Better health is essential for economic development but not sufficient. There is a vast range of many other additional factors. This brings out the necessity of introducing an intersectoral approach to make the role of health services more effective in economic development.

Thank you.

## Medical Ethics Some Concepts, Issues and Trends

*Prof. Susirith Mendis, Vice-Chancellor, University of Ruhuna & Senior Professor of Physiology, Faculty of Medicine*

*"What is at stake is a fundamental recasting of the traditional image of physicians. One with profound implications for their social situation as well as their image of themselves. The need for this recasting is implicit in the disquietude expressed by many patients who call for a more 'humanistic profession'"<sup>1</sup>*

Edmund D. Pellegrino,  
John Carrol Professor of Medicine & Medical Ethics, Georgetown University,  
in *"Humanism and the Physician"*

*Medical Ethics can be broadly classified into two categories. One is Normative (or rule) Ethics which include medical negligence, malpraxis and professional misconduct, abuse of doctor's privileges, medical confidentiality, association with unqualified persons, advertising and improper conduct within a professional relationship. The other, which in recent times, has been given greater emphasis in current medical ethics discourse is Meta Ethics which includes conceptual issues, moral judgements and values. Meta Ethics looks at medical ethics from the point of view of "a broad framework for the discussion of moral and philosophical issues in the principles and the practice of medicine" and Medical ethics as "the theory of moral justification and evaluation as applied to medicine".*

Thank you Sir.

Prof. Carlo Fonseka and the distinguish members of the Head Table, ladies and gentlemen. I am indeed privileged to speak on the subject of medical ethics at a session chaired by my reverent teacher who has been in my younger days my role model and idol and perhaps I chose academic career in physiology because of his influence. Today, I have been given the task of speaking in 15 minutes less or more a few seconds on the topic of medical ethics. Obviously, those of you who know about it would clearly realize that it is an almost impossible task. So, I am also aware that if you are a good teacher you can speak on any subject in any given period of time. To ensure that I am known and accepted as a good teacher, which means I am going to keep to my 15 minutes. This also means that I

have to select and ensure that I only touch upon some areas in medical ethics and what I have chosen to do is to take two areas. They are to talk about the doctor patient relationship, patient autonomy and informed consent and two other areas that don't get much talked about and these are ethics of institutional medicine and truthfulness.

### **The Doctor-Patient Relationship**

Historically, the relationship between the physician and the patient had been dominated by the doctor's point of view. Traditionally medical ethics was derived from the physician-centred view of 'what they are' and 'what they ought to do for their patients'. These physician obligations which were based on a professional ethos that had developed through an exalted image of the physician in society had served reasonably well in the past. They have, for quite some time, been in need of serious reappraisal.

The concepts of medical ethics are fast changing within the medical profession as well as within the 'consumers' of medical care. Medical decisions and quality of care are increasingly becoming issues of public concern. Varied reactions to them are appearing in medical, medico-legal, non-medical literature and the public media. The conduct of medical professionals is receiving increasing attention and criticism in the national press. In this context it is pertinent to quote Dr. A.J. Dyke<sup>1</sup>:

"The distinctive mark of a profession and a source of the confidence it engenders is its ability and willingness to specify and justify standards by which its conduct can be judged by its members and society."

### **Patient Autonomy and Informed Consent**

The principle of autonomy of the patient lies in the inherent quality in all rational beings that enable them to make reasoned choices which in clinical practice means respect for the patient, his intellect, individuality and values. This principle was affirmed by the famous Judgment of US Justice Cordoza in 1914, when he said that "*Every human being of adult years and sound mind had a right to determine what shall be done with his own body*". This is today the foundation on which the concept of autonomy is based.

The Doctrine of Informed Consent is based on the concept of the autonomy of the patient. It has rested on two standards based on the nature of information that must be disclosed to the patient. One is the Materiality Standard – which determines what a patient would consider ‘material’ or meaningful to his decision-making process and the other is the Medical Practice Standard set by the community as to the accepted extent of disclosure.

These two standards are mutually exclusive sometimes and can lead to different conclusions and ethical dilemmas. Therefore, the current legal trend is that: *“the role of the physician should be as counsel to the patient and not decision-maker”*.

Therefore it is very important for the doctor to create conducive conditions for informed consent. This is particularly important as modern medical practice is by its very nature an interventionist one and in principle, all medical interventions need the informed consent of the patient to be ethically acceptable. The roots for informed consent lie in the concept of autonomy. Medical practice without meaningful informed consent indicates disrespect for patients, a violation of his autonomy and defeats the very ethos of medical practice.

### ***Ethics of Institutionalized Medicine***

The institutionalization of all aspects of medical care is an established fact. Within each institution, the health-care team is essential to the practice of comprehensive medicine. Physicians and non-physicians now co-operate in providing the spectrum of special services made possible by modern technology. Competence, confidentiality, integrity and personal concern are far more difficult to assure when such diverse professionals have varying degrees of responsibility and contact with the patient. Thus, the most delicate of the doctor’s responsibilities - protecting the patient's welfare - must now be fulfilled in a new and complicated context. Instead of having the more traditional one-to-one relationship, the physician is the coordinator of a team, sharing with others some of the most sensitive areas of patient care. The physician is still bound to see that group assessment and management are rational, safe and personalized. The physician must especially guard against the dehumanization that can so easily be perpetrated by a group in the name of efficiency and collective responsibility. The doctor must acquire new attitudes. Since ancient times, he has been the sole dominant and authoritarian figure in the care of the patient. He has been supported in this position

by traditional ethics. The traditional ethics has now to be tempered by the new concepts of patient autonomy and patient rights enshrined in international conventions and covenants.

In the clinical emergency, his dominant role is still unchallenged, because he is supposed to be well trained to make quick decisions in ambiguous situations. But he is not prepared for the negotiations, analysis and ultimate compromise fundamental to group efforts that are essential in non-emergency situations. A whole new set of clinical perspectives must be introduced, perspectives difficult for the classically trained physician to accept, but necessary if the patient is to benefit from contemporary technology and organization of health care.

Therefore, as stated in the Declaration of Health issued by the Sri Lanka Medical Association in 1995, patients are entitled to (i) be referred to an appropriate professional or institution when referral is indicated; (ii) be competently and adequately assessed by their medical professionals; and (iii) request and receive a second opinion, when appropriate.

### **Truthfulness**

At the core of the doctor-patient relationship must lay a feeling of trust between the two. If a patient does not trust his/her physician, then the doctor's effectiveness is greatly compromised. Patients must know, and be convinced, that their physicians have their best interests in mind and telling the physician the truth about their illness and progress is important. The physician is also ethically obliged to report the truth to the patient, the exact extent being debatable in different socio-cultural contexts.

The history of literature on medical truth telling dates far back. Thomas Percival in 1803 said: *"...to a patient, who makes inquiries which, if faithfully answered, might prove fatal to him, it would be a gross and unfeeling wrong to tell the truth"*.

This view can be contrasted with that of Saul Radovsky who said: *"Doctors are not wise enough to tell in advance who should not be told [and] that shielding is ultimately impossible and that the price of its temporary achievement is an enduring sense of betrayal. Once lied to, even supposedly in their own interest, people will not trust their doctor fully again"*.

We in Sri Lanka, have a long way to go in establishing some of the norms of the basic tenets of medical ethics that I have briefly mentioned in the preceding paragraphs. We need to go there quickly and surely before we become, by default, an intolerable medically litigious society.

*"Medicine stands at the head of natural sciences and does not know which way to go. It has a record maximum of knowledge and a minimum of understanding. It has art and wonders if it has science; it is suffering from an intellectual imbalance of virtues."*

Scott Buchanan in *"The Doctrine of Signatures: A defence of Theory in Medicine"*

#### References:

1. A.J. Dyke, New England Journal of Medicine, 1976, 295(20): 1132-

**MEDICINE**

**TECHNICAL SESSION 1: MILITARY HEALTH**

**CHAired BY PROF. ROHAN JAYASEKARA**

## **Summary**

### ***Pattern of anorectal injuries caused by terrorist attacks in soldiers and civilians***

*This paper presm August 2005 to December 2009. It is a retrospective analysis of 51 patients, who were assessed with anorectal manometry (ARM) and endoanal ultrasound (EAUS). Study showed a male preponderance (33:18) with a mean age of 28.8 years (SD 5.2 years). Commonest causes were blasts and gunshot injuries. There were associated fractures and neurological damage. Normal anatomical morphology of internal and external anal sphincters was seen in only 4 and 7 patients respectively. On ARM, 15 had weak resting pressures and 10 weak squeeze pressures. 5 patients had to undergo colostomy prior to definitive surgery. The study shows that anorectal injuries are associated with anal sphincter injury which should be assessed prior to any definitive surgery since the outcome may alter if it is not done.*

### ***Skin problems in amputees: an observational study***

*This paper presented by Major Nishantha Pathirana was based on 200 consecutive amputees attending the Dermatology clinics conducted by him. In the study author presented the dermatological problems on the stump of amputees which affect the functioning and quality of life. 96% were serving soldiers or ex-servicemen. At least one skin condition was found in 82% of which the common conditions were hyperpigmentation (37%), scaling (22.5%), callosities (21%), lichenification (14.5%), traumatic ulcers (11.5%) and verrucous hyperplasia (10.5%).*

*Since some of these conditions can lead to problems of using the prosthesis, early recognition and treatment of these common conditions should be done. In conclusion the author proposed expanding the dermatological services considering the numbers requiring such services. The need for a comparative analysis in our settings was mooted during discussion time.*

### ***Prevalence of combat related post traumatic stress disorder (PTSD) and associated risk factors among combat military personnel in Sri Lanka Army***

*This paper presented by Major Savin Semage was a study to determine the prevalence of PTSD in a recruited sample of 1784 combat military personnel using a multistage sampling method. A validated (PCL-M) was used to assess PTSD. Point prevalence of combat related PTSD among currently serving combat military personnel of Sri Lanka Army is 10.5% with a 95% confidence interval between 9.2% and 12.0% which compares well with the figures from other countries. Younger age at first battle exposure, history of battle injuries, witnessing killing of terrorists and involvement in*



*special operational assignments were significantly associated with PTSD. Latter should be a factor to be considered during deployment. Severity of battle injuries, killing of terrorists by themselves, age, rank, marital status, educational status had no significant association with PTSD. Other relevant significantly associated factors were being abused in childhood and history of psychiatric illness. These and the age of first battle exposure can be recommended for consideration in identifying high risk individuals for PTSD in the future.*

*Early detection of cases and expansion of existing mental health services to include psychotherapy and counselling were discussed during question time. Current shortage of such services within the Army medical services was highlighted. This paper evoked much discussion during question time. Necessity of a similar study involving family members was identified. A compensation scheme for victims of psychological war trauma was proposed.*

***Association of chronic pain in neck and lower back with degenerative changes in cervical and lumbar spines in service personnel***

*This paper presented by Col PTR Makuloluwa described the causation of low back and neck pain occurring with age and its early onset and rapid progression in service personnel. A total of 278 patients below 40 years of age presenting to the Army Hospital with persistent lower back and/ or neck pain during a 3-year period were analysed retrospectively. Of the sample, 69% had lumbar radiculopathy, 12.6% lumbar facet joint changes and 11.9% cervical radiculopathy. 6.5% had involvement of both cervical spine and lumbar spine. Lumbar spine was affected more than the cervical spine. Degenerative changes were evident in affected personnel at a relatively young age. Author highlighted the relationship between the increased physical exercises and early onset degenerative changes of the spine. During question time, having doctors qualified in sports medicine to tailor and monitor these activities was proposed to prevent too rigorous exercises by instructors.*

***Effective management consumption of sugar, oil and salt to reduce prevalence of heart diseases and type 2 diabetes mellitus among naval population in Sri Lanka: a retrospective study***

*Sherman Fernando[MD,MRCP] and Surg. Lt. Commander HDI Samarawickrama*

*This paper presented by Lt Commander HDI Samarawickrama was on preliminary findings of an ongoing intervention study of great importance. Baseline levels of heart disease and type 2 diabetes mellitus among RNR naval personnel found in a survey in 2006 were 15.5% and 20.5% respectively. Intervention included advocacy for policy makers to control consumption via restricted issue from food stores, identification and involvement of group leaders, caterers and other informal leaders to educate the personnel through peer education, a communication strategy to obtain cooperation of personnel in the intervention and counseling services for alcohol and tobacco addiction. Introduction of rational drinking of alcohol and zero tobacco use with or without therapeutic counseling was also done. Levels of heart disease and type 2 diabetes mellitus among RNR naval personnel after the intervention were 5 to 10%. The intervention is on-going.*



*Prof. Rohan Jayasekara chairing a Medical Technical Session (IMG\_2057)*

## **Association of Chronic Pain in Neck and Lower Back with Degenerative Changes in Cervical and Lumbar Spines in Service Personnel: A Case Series**

**Col (Dr) P T R Makuloluwa**, Consultant Anaesthetist, Military Hospital, Colombo, Senior Lecturer in Physiology, FMS / USJP\* Corresponding author: ptr\_makuloluwa@hotmail.com

### **Introduction**

Degenerative changes in cervical and lumbar spines mainly account for chronic pain conditions in the neck and lower back. These changes are age related and commonly occur in the middle age, between 40 -60 years [1, 2]. Degenerative changes in IVD result in prolapse of intervertebral discs (IVD), formation of marginal osteophytes in vertebrae, hypertrophy of facet joints and ligaments in the spine[1, 4]. These changes in turn cause narrowing of spinal canal and intervertebral foramina. Pain is commonly due to irritation / pressure on nerves exiting through spinal foramina leading to radiculopathy with variable physical disability and psycho social problems. Pain and severe disability may rarely be due to myelopathy with pressure on the spinal cord. Repetitive, subclinical trauma to spine is a likely cause influencing early onset and rapid progression of degenerative changes occurring in younger patients [2, 3]. The aim of this study is to identify the underlying causes of chronic pain in the neck and lower back in service personnel and their association with degenerative changes in the spine.

### **Methods**

The study was carried out at the Pain Clinic of Military Hospital, Colombo. Retrospective analysis of patient records maintained over a period of 3 years from January 2008 to December 2010 was done. The Service personnel below the age of 40 years referred with persistent pain in the neck and lower back were included in the study. Pain secondary to trauma, infections and malignancies in the spine together with pain originating from sacroiliac joints were excluded.

The likely underlying cause/s of their pain in the neck and lower back were identified from the entries made on the clinic records. Degenerative changes were noted in the plain x rays of cervical and lumbar spines. Narrowed IVD spaces on X-rays were considered as indicative of degenerative changes in the discs as they have the potential for prolapsed and cause pressure on exiting nerve roots (radiculopathy) and spinal cord (myelopathy).

Radiculopathy was diagnosed in the presence of radicular symptoms / signs down the hands or legs in association with degenerative changes on x rays of cervical or lumbar spines respectively.

Degenerative changes in facet joints were predicted in the presence of pain and tenderness over affected joints. Diagnosis was confirmed by the relief of pain achieved following diagnostic local anesthetic injections in to the joints.

## Results

There were a total of 278 patients referred over a period of 3 years with pain in the neck and lower back in the age group of 25 – 40 years. The majority 227 (81.6%) were presented with pain in the lower back. A minority has presented with pain in the neck alone (11.9 %,  $p < 0.001$ ) and with pain in the neck and lower back (6.5%,  $p < 0.001$ ) (Table 1).

Degenerative changes were evident in the plain x rays of affected spines of all the patients. Radiological evidence suggestive of degenerative changes in cervical and lumbar spines included narrowing of IVD spaces and marginal osteophytosis of vertebrae (Table 2). Degenerative changes in facet joints were not visible on plain x rays.

Of the 227 patients with lower back pain, 192 (69.1 %) had clinical and radiological evidence suggestive of lumbar radiculopathy; 35 (12.6%) had features suggestive of degenerative changes in lumbar facet joints. 18 (6.5%) had pain in neck and lower back with features of cervical and lumbar radiculopathy respectively. A minority with pain in the neck 33 (11.8 %,  $p < 0.001$ ) had radicular symptoms in upper limbs in association with degenerative changes in cervical spine (Table 3).

**Table 1 Number and percentage distribution of presenting symptoms**

Symptom	number	Percentage (%)	Probability (p)
Neck pain	33	11.9	$< 0.001$
Lower back pain	227	81.6	
Neck pain & lower back pain	18	6.5	$< 0.001$

**Table 2 Degenerative changes evident in the x rays of cervical & lumbar spines**

Neck pain	Back pain
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<ul style="list-style-type: none"> <li>• narrowing of inter vertebral disc spaces</li> <li>• marginal osteophytosis of vertebrae</li> </ul>	<ul style="list-style-type: none"> <li>• narrowing of inter vertebral disc spaces</li> <li>• marginal osteophytosis of vertebrae</li> </ul>
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**Table 3 Number and percentage distribution of underlying causes of pain in neck and lower back**

	n	%	p
Neck pain with <ul style="list-style-type: none"> <li>• cervical radiculopathy (with degenerative changes in IVD)</li> </ul>	33	11.9	
Lower back pain with <ul style="list-style-type: none"> <li>• lumbar radiculopathy (with degenerative changes in IVD)</li> <li>• lumbar facet joint disease (with evidence of degenerative changes in facet joints)</li> </ul>	192 35	69.1 12.6	< 0.001
Neck pain & lower back pain with <ul style="list-style-type: none"> <li>• cervical &amp; lumbar radiculopathy (with degenerative changes in IVD)</li> </ul>	18	6.5	

## Discussion

Persistent pain in the neck or lower back is a condition where the pain continues beyond a period of 3 months. Condition is commoner between the ages of 40 to 60 years of age and usually related to degenerative changes associated with ‘wear & tear’ in the spine. Degenerative changes in the IVD cause narrowing of disc space with tendency to cause prolapse of discs. Prolapsed discs, osteophytes

and degenerative changes in facet joints produce chronic pain by irritation of adjacent neural structures.

In the studied group of patients, the persistent pain in the neck and lower back were observed in association with degenerative changes in the cervical and lumbar spines respectively at a relatively younger age range. Personnel in the armed forces have their spines exposed to strenuous physical activities from a relatively young age. Cervical and lumbar spines subjected to repetitive injuries during their physical activities could possibly have triggered the early degenerative changes in the spines.

Degenerative changes were more frequently observed in the lumbar spine (81.6 %) than in the cervical region (11.9 %). Lumbar spine bears the majority of body weight and therefore is more likely to suffer wear and tear effects than the rest of spine. However in a statistically significant number, cervical spine alone ( $Z=8.73$ ,  $p<0.001$ ) and both regions were affected ( $Z=9.345$ ,  $p<0.001$ ).

In the majority of patients with lower back pain (69.1%), radicular symptoms were evident down the legs indicating pressure on exiting nerve roots. Narrowed IVD spaces noted in the X rays suggest prolapsed discs as the most likely reason for their lower back pain and radiculopathy. Degenerative changes in lumbar facet joints (12.6%) were another significant cause of lower back pain ( $Z=12.46$ ,  $p<0.001$ ). Radicular symptoms were evident down upper limbs in all the patients with pain in the neck. Narrowed cervical IVD spaces in the X rays of all the patients too may suggest prolapsed discs as a likely cause of their symptoms. However cervical facet joint disease was not clinically evident in any of the patients in the study group. In a statistically significant number, the degenerative changes occur in relation to IVD of both the cervical and lumbar spines of individuals (6.5%) leading to pain and radicular symptoms ( $Z=7.96$ ,  $p<0.001$ ).

## **Conclusions**

The degenerative changes in the cervical and lumbar spines were the main cause of chronic pain in the neck and lower back in service personnel. Degenerative changes were evident in the spines at a relatively young age. Further studies may be indicated in identifying the physical activities predisposing to early changes in spine in order to recommend preventive measures.

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**Effective reduction of sugar, oil and salt consumption cause to reduced prevalence of heart diseases and type 2 diabetes among RNR naval persons, Sri Lanka: [Retrospective study] Dr. Sherman Fernando [MD,MRCP] and Surg. Lt. Commander HDI Samarawickrama**

## **Introduction**

It is vital that the increasing importance of chronic disease anticipated, understood and acted upon urgently. Sixty percent of all total global deaths reported annually due to chronic diseases. Eighty percent of chronic diseases deaths occur in low and middle income countries. Each year at least 7.1million people die as a result of raised blood pressure, 4.9 millions die as a result of raised total cholesterol levels. This requires a new approach by leaders who are in a position to strengthen chronic disease prevention control efforts, positively change the underlying determinants and common modifiable risk factors such as unhealthy diet, physical inactivity, excessive alcohol and tobacco use. Intermediated risk factors which are including hypertension, raised blood glucose, abnormal blood lipids and overweight/obesity can be prevented via optimal strategy plan implement at early stage of life.

## **Subjects and Methods**

### **Stepwise Frame Work**

Estimating need

1. Planning step 1
  - a) Collect information about fat, salt, alcohol and sugar consumption among the naval population based on a simple sampling method
  - b) A Pilot study that was carried out in Southern Naval Area in 2006, found a high level of consumption of sugar, fat and salt among Naval population[according to WHO standards]
  - c) A physical measures was developed and standardized to collect data on blood pressure, BMI and other parameters. This was carried out through voluntary medical screening for naval population.
  - d) It is expected to be applicable to both the medium and long term, and included action plan 3-5 years. Plan aimed to reduce the overall risk factors, to improve early detection via voluntary scanning medical examinations and treatment to provide accessible naval health service



- e) Applied life course perspective risk factors accumulate from beginning at naval life, preventive control policies adopted from beginning of naval career.
- f) Step wise implementation core interventions that are fusible to implement within existing resources in the short form chosen first. Other activities are included in expands and desirable steps of implementation.

### **Formulate and Adopted Policy**

- a) As a First step it through communicated the latest and most accurate knowledge and information to naval population
- b) Communicated with policy makers (Area authorities & NHQ) influencing implement policy to control Consumption via restricted issue from food stores.
- c) Identification and engagement of group leaders, cateress, and other influential naval persons for spread message in different forums tenthly of counselling service aim to prevented drug addiction.
- d) Introducing of rational drinking of alcohol and zero tobacco use method with or without NRT (Therapeutic counselling for stop addiction]

### **Implementation of policies**

- a) Health finance – A line item for chronic disease prevention and control is included in the annual naval healthy budget <sup>238</sup>allocation for naval PHI department.
- b) Legislating and regulating.
- c) Tobacco control legislation- strictly prohibited smoke in all indoor naval premises enforced bans on sales tobacco products inside naval bases.
- d) Made compulsory to get through physical exercise test (PET) and for promote physical activities among naval population.

### **Factors Success**

- a) DGHS mandated to develop a policy frame work.
- b) Committed group of naval PHI staff who involved with estimating need, advocating for action, devolving policy and plan.
- c) Area authorities and Commanding Officers provided necessary support.

- d) Adequate consulting in the process done by medical officers
- e) Maintained good communication strategy for all stages of process.
- f) Implementation of result oriented objectives.

<u>S u g a r O i l a n d S a l t D a i l y</u>			
<u>C o n s u m p t i o n A v e r a g e P e r</u>			
<u>P e r s o n</u>			
E s t a b l i s h m e n t	I n 2 <sup>n d</sup> Q u a r t e r 2 0 1 0		
	S u g a r	O i l	S a l t
K a n c h a d e w a	9 1 . 9 3	3 6 . 6	1 6 . 1 4
E l a r a	4 9 . 8 6	2 5 . 3 4	2 1 . 1 7
U t t a r a	5 1 . 9 4	2 6 . 9	1 8 . 9 9
W a s a b h a	1 0 1 . 2 2	4 5 . 5 6	1 3 . 1 9
G o t a i m b r a	6 5 . 1 2	3 3 . 8 2	2 2 . 0 6
A g b o	6 8 . 2 3	2 5 . 0 4	2 4 . 9 4
W e l u s u m a n a	6 2 . 8 8	5 3 . 6 9	3 2 . 8 9

<u>S u g a r O i l a n d S a l t D a i l y</u>			
<u>C o n s u m p t i o n A v e r a g e P e r</u>			
<u>P e r s o n i n</u>			
E s t a b l i s h m e n t	4 <sup>t h</sup> Q u a r t e r 2 0 1 0		
	S u g a r	O i l	S a l t
K a n c h a d e w a	3 2 . 2 3	3 6	6 . 7 1
E l a r a	3 3 . 9 8	1 3	1 2 . 3
U t t a r a	4 1 . 0 1	2 5 . 4 8	1 1 . 6 7
W a s a b h a	4 5 . 7 6	3 2 . 8 4	1 4 . 9
G o t a i m b r a	4 1 . 3 5	1 0 . 1 5	1 0 . 1 5
A g b o	3 5 . 6 8	3 0 . 6	1 7 . 3 1
W e l u s u m a n a	4 2 . 0 4	1 2 . 3 2	9 . 2 1

This retrospective, qualitative and observational study was based on the concept that heart disease and type 2 diabetes could be prevented through healthy diet, regular physical activity and avoidance of tobacco use. The chronic disease epidemics take decades to become fully established. Given their long duration there are many opportunities for prevention. Chronic diseases need long term and systematic approach to treatment. Sri Lanka navy implemented program to prevent chronic diseases named SOS project at 2006. after 05 year program recent simple study done among RNR Naval persons in eastern and northern area revealed prevalence of chronic diseases reduced up to 9.6 in northern command and 7.46 percent in eastern command.

<b><u>EASTERN COMMAND 2010-MAY</u></b>						
SR.NO	SHIP	HD	DIABETICS	RNR		
01	SLNS TISSA	04	01	35		
02	DOCK YARD	03	01	80		
03	NMA	02	02	15		
04	SBS HQ	NIL	NIL	NIL		
05	SLNS PARAKUMBA	01	NIL	13		
06	SLNS VIJAYABA	NIL	NIL	07		
07	SLNS WALAGAMBA	01	NIL	03		
08	SLNS MAHAWELI	NIL	01	13		
09	ND KINNIYA	NIL	NIL	08		
10	ND PULMUDAI	01	NIL	06		
11	ND THOPOOR	01	01	14		
12	ND MULATHIVE	NIL	NIL	03		
TOTAL		13	06	197		
<b><u>NORTHERN COMMAND</u></b>						
SR NO	SHIP	HTN	DM	HYPERCHLOSESTERALAEMIA	TOTAL RNR/VNR	SICK TOTAL
01	SLNS ELARA	02			09/03	02
02	SLNS UTHTHARA		02		27	02
03	SLNS KANCHADEWA				05	01
04	SLNS WASABA				04	
05	SLNS WELUSUMANA				04/05	
06	SLNS GOTAIMBARA			01	04/03	
07	SLNS AGBO				12	
TOTAL		RNR -67				
		VNR - 12				
		OFFICERS - 01				

**MEDICINE**  
**TECHNICAL SESSION II**  
**GENERAL MEDICAL AND SURGICAL**

Chaired by Professor Ranil Fernando  
Professor in Surgery Faculty of Medicine, University of Kelaniya

### **Summary**

***Astigmatism in Sri Lankan School Children.*** This paper presented by Prof. Saman Wilmalasundara showed findings of a study done in Bope-Poddala area in Galle. The study has focused on refractive errors in school aged children. The author hypothesized that refractory errors in the human eye are common. These errors include myopia, hypermetropia and astigmatism especially in children. These refractory defects can result in poor vision and associated symptoms, and can affect the academic performance if undetected and uncorrected. In the study population of 5600 children 321 children had refractory errors. The prevalence of refractive errors was 6.2%. Out of this group, more than 50% were errors due to various forms of astigmatism in either unilaterally or bilaterally. The conditions detected were

The author in reply to a question from the audience stated that astigmatic defects cannot be picked up in routine eye screening for visual acuity done at school health camps and requires specialized eye clinics for refraction tests.

### ***Prevalence of Chlamydial infection among infertile males and females and effect of chlamydial infection on formation of auto sperm antibodies (ASA-IgG) in males.***

This paper presented by Lt Col HHLK Fernando was on findings of a study done in a reproductive biology clinic for sub fertile couples. Study has attempted to identify the prevalence of chlamydial infection in patients attending a reproductive biology clinic and its relationship between the presence of auto sperm antibodies (ASA). Chlamidia trachomatis is a bacterial pathogen which can cause sexually transmitted disease in humans. Chlamydial genital infections are commonly encountered in adults and adolescents in many countries. Prevalence of Chlamydia infection was 10.2% and 12% among males and females of the study population. Presenter concluded that there was a significant association with chlamydial infection and presence of auto sperm antibodies. Author suggested that further studies are required to identify the relationship between Chlamydial infection, ASA and causation of sub fertility.

### ***Capsule endoscopy in the assessment of iron deficiency anaemia and obscure gastro intestinal bleeding.***

This paper presented by Dr DP Wickramasinghe described this relatively new tool of Capsule endoscopy (CE) introduced in 2000 used in visualizing the gastro-intestinal (GI) tract. It is useful in assessment of patients with obscure gastrointestinal bleeding (OGIB) and iron deficiency anaemia (IDA). Each CE unit consists of a small capsule which contains a camera and a transmitter and

wearable external detectors. The capsule can be swallowed and passes through the gastrointestinal system taking photographs which are transmitted to the external detectors.

CE is useful in assessment of small intestinal pathology which is difficult to visualize with endoscopy and colonoscopy. In this study 24 patients were selected and prior upper GI endoscopy and colonoscopy examination had been done for OGIB and IDA. CE investigation revealed new information in 20 patients and lead to change in management in 19 patients. Therefore, the presenter concluded that, though the cost was significantly high compared to other investigations, there is a significant impact on patient management in using CE as a diagnostic tool. In an answer to a question from the audience the presenter said that the cost of each CE capsule is about Rs. 100,000.00 and can be used only once.

#### ***Post conflict contraceptive needs of internally displaced women***

This paper presented by Dr S Prathapan and others had aimed to study the contraceptive knowledge and practices and to identify barriers in contraceptive usage in women in an IDP camps in Mannar district. Interviewer administered questionnaires and in-depth interviews were used in this study. Majority of women were aware of oral contraceptive pills and intra uterine contraceptive devices. However, only 43% were using any type of contraceptive method. Many reasons were given by the women of the study group for the low usage of contraceptive methods compared to national averages. These were mainly related to the hardships they were undergoing as IDPs at the time of this study. Provision of health services by trained personal and constructive steps to overcome these barriers were recommended by the authors.

In reply to a question on timing of the study the presenter replied that it was done during the final stages of the war in 2009. A comment was made that the health services had broken down in the war affected area and this only was a smaller component in the whole scenario. However the services were restored very quickly and a member of the audience suggested that attitudes of these women may have changed now 2 years after ending of the war and the returning of some normalcy to the north and east. It would be interesting to repeat the study now.

#### ***Challenges and issues in health sector developments in post conflict scenario in Northern province – a case study***

This paper presented by Dr ASA Safras discussed the provision of health services to the war ravaged Vavuniya district in the immediate post war period. Authors of this paper were involved in organizing

*health care provision for IDP camps including setting up of health clinics, organizing of health care personnel to staff these units in the immediate post war period. Also authors were involved in the planning and implementation of programs aimed at rehabilitation of hospitals, clinics and peripheral units in the Vavuniya. The paper discussed the problems and difficulties faced by the authors in setting up health care services in the area and how these difficulties were handled. The members of the audience greatly appreciated the work done by the presenter under difficult and trying circumstances in this crucial period.*

## Astigmatism in School Children of southern Sri Lanka

*Prof. Saman Wimalasundera MBBS, DO, PhD, Department of Community Medicine, Faculty of Medicine, Galle*

### Introduction

Errors of refraction in the human eye include myopia, hypermetropia and astigmatism in their different forms. When the eye can not focus sharply in one meridian in the visual plane the eye is said to be astigmatic. It may be myopic, hypermetropic, and compound or mixed type.

### Objective

To find the prevalence of astigmatism in school children.

### Method

Visual screening was performed in Pre School and school children aged 3 – 14 Years using Snellens test types (chart and symbols) to detect visual acuity defects. Positive cases were subjected to refraction test to find the different types of refraction.

### Results

Of the 5649 children screened 351 were detected with refractive errors (prevalence: 6.2%); 2.3% were unilateral and 3.9% were bilateral. Astigmatic errors were found in 63% of the children with unilateral involvement and 55.0% who had bilateral involvement.. Different types of astigmatism are presented in table 1.

Table 1: Types of astigmatism found in the study

Type of Astigmatism	Unilateral	Bilateral			Average of Astigmatism unilateral and bilateral
		Right	Left	Average	
Myopic astigmatism	52.3%	37.2%	40.8%	39.0%	<b>45.7%</b>
Hypermetropic	2.3%	4.0%	4.5%	4.25%	<b>3.3%</b>



astigmatism					
Compound myopic astigmatism	1.6%	7.6%	6.3%	6.95%	<b>4.3%</b>
Compound Hypermetropic astigmatism	2.3%	-	0.4%	0.20%	<b>1.3%</b>
Mixed astigmatism	4.6%	4%	3.1%	3.55%	<b>4.1%</b>
<b>Total astigmatism out of all refractive errors.</b>	<b>63.1%</b>			<b>54.0%</b>	<b>59.0%</b>

### Conclusion

Majority of refractive errors in Sri Lankan children (Nearly 60%) are in the category of astigmatic errors.

## **Prevalence of Chlamydial Infection among Infertile Males and Females and Association of Chlamydial Infection and Auto Sperm Antibody (ASA-IGG) in Males.**

*By Lt Col (Dr) HHLK Fernando, Prof. TR Weerasooriya, Reproductive Biology Laboratory, Faculty of Medicine, Galle.*

Chlamydia is the most prevalent sexually transmitted disease in industrialized countries (242). It is more common in men and women in their reproductive years. In Sri Lanka the prevalence of chlamydia is 7.5 % while its prevalence in female adolescents ranges between 24.1% to 27% (1,2).

Chlamydia is caused by an intracellular bacterium, *Chlamydia trachomatis* which is colonized to sialic acid receptors on the eye, throat or genitalia. It exists as 15 different serotypes. The sexually transmitted infections are caused by the serotype D to K. Chlamydia has a unique cell wall which is able to inhibit phagolysosome fusion in phagocytes (245). It infects mainly the mucosal membranes such as the cervix, rectum, urethra, throat and conjunctiva. It is primarily transmitted via sexual contacts (3).

Symptoms of the infection are quite variable. In fact, 75% of women and 25% of men with Chlamydia infection show no symptoms at all (3). In women, the symptoms of the infection include abnormal vaginal discharge, burning sensation during urination, irritation of the area around the vagina, bleeding after sexual intercourse, lower abdominal pain and abnormal vaginal bleeding. Pelvic inflammatory disease and tubal damage are the clinically important complications of the infection.

In men, the main symptoms of the disease are very similar to non-gonococcal urethritis. These include clear, White, or yellow discharge from the urethra, burning and pain during urination and tingling or itching sensation. In addition this can also cause male accessory glands infections.

The impact of the chlamydial infection on semen parameters and cervical mucus hostility is controversial. Previous research has suggested that men with chlamydial infection do not show an alteration in sperm motility, morphology or count (4). However, sperm function *per se* has not been investigated in men with chlamydial genital tract infection yet.

Detection of the bacterium can be accomplished using either by a culture method or by a non- culture methods. Though the culture method is 100% specific it is very expensive, time consuming and

labor –intensive. As such culture method is now used less frequently and non- culture methods have become more popular. The non- culture methods include the following,

- Detection of host response
- Detection of chlamydial inclusions and elementary bodies using labeled antibodies for chlamydia trachomatis.
- Detection of chlamydial trachomatis specific antigen.
- Detection of chlamydial specific DNA using PCR techniques. (5)

### **Anti sperm antibodies**

Research on antisperm antibodies was begun around 1899 when Landsteiner initially observed that sperm were antigenic if injected into a foreign species (6). Then Metalnikoff reported that the spermatozoa were also antigenic to the same species (6). But the possibility of serving ASA as one of the mechanisms of human infertility has been first recoded by Willson in 1954 when he observed the presence of natural sperm agglutinating autoantibodies in two infertile men exhibiting spontaneous sperm agglutination (7).

In 1980, Hass et al. used radio-labeled agglutinin assay to evaluate 614 serum samples of men and women with unexplained infertility and observed that 7% of men and 13% of women were ASA positive (8). In 1987 Pattison and Mortimer evaluated 300 infertile men using IBD and reported an ASA prevalence of 10.7% (9). Nip et al. in 1995 used ELISA and reported that 77% of women with unexplained infertility were ASA positive (10). However there is now mounting evidence to support the immuno-modulation of the couples with unexplained infertility.

Antisperm antibodies may disrupt normal sperm function by affecting sperm motility. Upadhyaya et al., Mathue et al. and Check et al. have recorded a significant reduction in linearity, velocity and percentage motility in men with ASA. Sperm with abnormal motility may not penetrate the cervical mucus (11,12). Stten et al. showed that poor cervical mucus sperm penetration in men with ASA compared to men without ASA (6). Though Price et al. suggested that compliment-dependent sperm immobilizing antibodies could interfere with sperm migration in the female genital tract at the level of the fallopian tube, the motility of ASA positive spermatozoa in the uterine fluid has not been studied yet (13).

There are several hypotheses for ASA formation. Theoretically, any mechanisms which breach the blood – testicular barrier can expose developing immunogenic spermatozoa to the immune system, initiating a cascade of immune responses resulting an inflammatory reaction and ASA formation (6).

The commonest cause for ASA formation in male is obstructive lesions of upper genital tract like congenital malformations (congenital bilateral absence of the vas deference), vasectomy, trauma, varicocele, iatrogenic causes and cystic fibrosis (14,15). Organisms that cause sexually transmitted diseases also act as inducers of ASA formation by both inflammatory processes and autoimmune mechanisms. Some times various bacterial, fungal and viral particles attach themselves to the outer sperm membrane which serves as antigens, inciting an immune reaction (6).

Though *Chlamydia trachomatis* is considered as a one of the commonest STDs, its effect on ASA formation in men is controversial. Witkin et al. noticed antichlamydial antibody was present in 51.4% of men with positive ASA compared with 16.8% of men with negative ASA (16). Dimitrova et al. in 2004 also showed a significantly higher ASA incidence among the males with genital chlamydial infection (17). But a study done by Eggert-Kruse et al, did not show any relationship between the presence of seminal chlamydial antibodies and the major parameters of sperm analysis, semen cultures, local ASA and sperm penetration testing as an indicator of functional capacity (18,20,21).

In Sri Lanka, only a few studies have been done on chlamydial infection and sub-fertility and its prevalence among our sub-fertile males and females too not recorded correctly. As discussed above the correlation between presence of chlamydial infection and presence of ASA in sub-fertile males is also controversial. As such this study has been designed to study the followings

- The prevalence of chlamydial infection among males and female of the study group
- Correlation between presence of chlamydial infection and presence of asa antibodies in men of the study group.

## Method

This study was done at the RBL, department of anatomy, Faculty of Medicine, University of Ruhuna, Galle. All the couples who were referred to the clinic for medical consultation and investigation were screened and those who full filled the inclusion criteria were recruited for the study after obtaining their voluntary consent in writing. The inclusion criteria for the study as follows

1. Female who had with normal ovulation and patent tubes
2. Males who had seminal fluid analysis report with minimum of  $15 \times 10^6$  concentration, 1.5 ml of volume, 30% of normal morphology, 60% of viability and 50% of motility.

The male partners were advised to have a minimum of 48 hours but not longer than 7 days of sexual abstinence before collecting the seminal fluid sample to assess ASA antibodies (18). The samples

were collected by masturbation in a private room near the RBL, by masturbating into a sterile, wide mouthed plastic container. The male partners were instructed to clean their hands and the penises thoroughly with clean water before masturbation. The semen samples were kept in an incubator for about at 37C<sup>0</sup> for 45 minutes till the samples were liquefied and they were used for the ASA testing(18).

Urethral swabs from the male partners and cervical swabs from female partners were collected for Chlamydia screening. Assessment of chlamydial infection was done by using a commercially available test kit, “CHLAMYGEN – Rapid chlamydia swab test” from TSB INC, china. It is a Chlamydia trachomatis specific enzyme detection system that screen for the presence of Chlamydia trachomatis directly from the patient specimens. The specificity and sensitivity of this method are 97.9% and 97.1% respectively. IgG was screened by using Sperm MAR reagent from Fertipro N.V., Belgium. Ten (10)  $\mu$ l of unwashed fresh semen was mixed with 10  $\mu$ l of IgG coated – latex particles. 10  $\mu$ l of antiserum to human IgG was then mixed with the above mixture and incubated for about 3 min and again after about 10 min. At least 200 motile spermatozoa were counted and the spermatozoa that had latex particles adhered (Positive) to them were recorded. If the percentage of positive spermatozoa was more than 40%, the sample was considered as positive. If the sample was negative in 1<sup>st</sup> assessment (after 3 minutes), it was rechecked after 10 minutes before recording the sample as negative.

## Results

### Chlamydial infection in females

Chlamydia	Number	Percentages
Negative	240	87.6
Positive	34	12.0
Not Assessed	1	0.4
<b>Total</b>	<b>275</b>	<b>100.0</b>

The prevalence of chlamydial infection among the females of the study sample was 12% (34 females had chlamydial infection).

### Chlamydia infection in males

Chlamydia infection	Number	Percentages
Negative	245	89.4
Positive	28	10.2
Not Assessed	1	0.4
<b>Total</b>	<b>274</b>	<b>100.0</b>

The iprevalence of chlamydial infection in males of the study sample was 10.2% (28 males had chlamydial infection). It was slightly lower than the incidence of 12% which has been reported for the females.

### Correlation between male chlamydial infection and ASA IgG type

		ASA (IgG)		
		Positive	Negative	
	<b>Positive</b>	9 (36%)	20 (8.2%)	<b>29</b>
	<b>Negative</b>	16 (64%)	224 (91.8%)	<b>230</b>
<b>Total</b>		<b>25</b>	<b>244</b>	<b>259</b>

$(c^2 = 15.45, df=1, p=0.00(p<0.001) - Yates correction was applied)$

There is a highly significant correlation between male chlamydial infection and presence of ASA-IgG.

### Discussion

The Incidence of chlamydia infection among females of our study sample is 12%. It was very much lower than the incidence, 28.2% which has been reported by Abida M. et al, 2006 for infertile females in India and 18% to 20% which has been reported by WHO, 1995 (14, 288). However in 1999, Macmillan and Templeton (as quoted by, Jolande A.) (289) reported an incidence of endo-cervical

chlamydia colonization among sub fertile females as a range of 0% to 10.4% and it was also slightly lower than the incidence, 12% which has been reported by us.

The incidence of chlamydia in males of the study sample is 10.4% and it is lower than the prevalence among females 12%. Most of the males who visited the clinic have been pre-treated by various antibiotic regimes including Doxycycline. It is not a uncommon practice among our physicians. That may be the reason for having slightly lower prevalence of chlamydia infection among males.

Our study showed a statistically significant correlation between the presence of ASA, IgG type and male chlamydial infections. This finding was also more or less compatible with the observation which has been made by Waltraud E.K. et al, in 1996 (246). Though they have not observed a statistically significant correlation between ASA and male chlamydial infection, they have observed a fairly high percentage of ASA IgG type (but not IgA type) in chlamydia positive males of their study sample (IgG-6.3% and IgA 0%).

### **Conclusions and recommendations**

The prevalence of chlamydial infection among females and males in the study group were 12% and 10.2% respectively. There is an association between Chlamydial infection and the presence of ASA in males.

Chlamydia screening should be included in routine investigations of sub fertile couples. Prompt identification and treatment of Chlamydia among sexually active males and females is recommended to prevent sub fertility.

Further studies are recommended to establish the association between chlamydial infection and ASA.

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## **Challenges and issues in Health Sector Developments in Post Conflict Scenario in Northern Province - a case study**

*Dr.Safras, A.S.A. and Dr. Ranasinghe , Thushara*

### **Introduction**

Sri Lanka faced number of civil conflicts during past four decades, two in Sinhala-dominated South in 1971 and 1989 and the protracted conflict which later grew in to a full scale war between the government military forces and the Liberation Tigers of Tamil Eelam (LTTE) in the Northern and Eastern Provinces of the country. This conflict brought tragedy and pain to poor communities in all the regions of the country especially the Northern and Eastern Provinces. Thousands of young people lost their lives. With the military defeat of terrorism in May 2009, Health sector was faced with new challenges specially providing services for the Internally Displaced Persons (IDPs).

Provincial Department Health Services (PDHS) of the Northern Provincial Council provided health services to these IDPs. Ministry of Health facilitated this process by providing additional human resources, equipment and medical supplies to Regional Directors of Health Services in the districts. Senior officials of the ministry from various administrative and technical fields visited the area at regular intervals to provide the necessary advice and assistance. These officers discussed the problems and issues likely to arise if large number of IDPs to arrive in Vavuniya with the provincial health authorities and ensured remedial action before the arrival of IDPs.

### **Healthcare Services for IDPs at Manik Farm**

Providing Healthcare Services for almost 290,000 IDPs was a mammoth task. Initially there were three main locations where IDPs were sheltered. They were Jaffna, Mannar and Vauniya Later more IDPs were settled in Manik Farm in Cheddikulam in Vavuniya District where more than 260,000 individuals were housed.

Central Ministry of Health took over the direct control over Manik farm to provide better and comprehensive health care services to IDPs in consultation with provincial authorities in April 2009. Ministry of Health adhered to an efficient coordination mechanism according to a master plan to

provide healthcare services for IDPs avoiding any unnecessary bureaucratic and administrative delays.

Health services for the IDPs were initially provided through the Northern Provincial Council. The Regional Director of Health Services (RDHS), Vavuniya played a leading role and the medical officers and other health workers attached to Vavuniya RDHS division were mobilized to provide curative and preventive health services. The line ministry supported the process by appointing additional health workers including doctors and by mobilizing health workers from the rest of the country on a rotational basis.

The retaining of medical staff at these difficult circumstances was not an easy task. Therefore, MoH provided incentives like accommodation, transport, communication, career development avenues and special allowances for health workers. This work was coordinated directly by the IDP directorate and Ministry of Health later in order to give the optimum services to displaced people and to facilitate the health worker adaptability with the situation.

There were a considerable number of civilians crossing into the government controlled areas from time to time as the conflict escalated. They were located in welfare centers in Vavuniya District in identified places initially.

***Table 1 : Transitional Population in Vavuniya in March - April Period 2009***

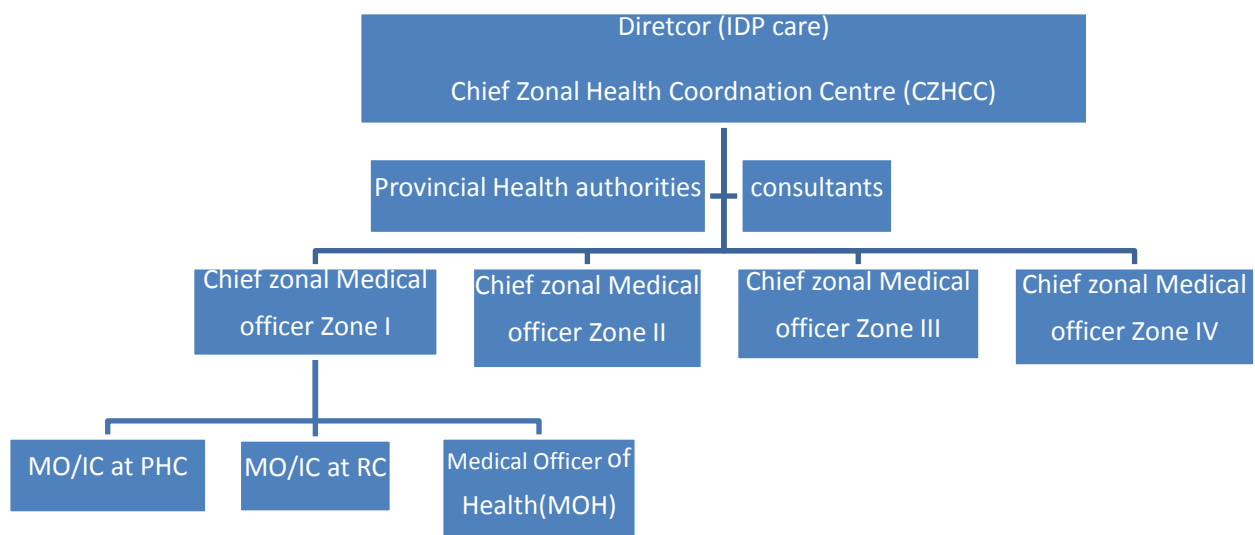
<b>Welfare Centre</b>	<b>16th</b>	<b>2nd April</b>	<b>15th April</b>	<b>23rd April</b>
<b>Cheddikulam Mahavidyalayam</b>	1997	1979	1796	1804
<b>Aravithottam School</b>	601	617	617	599
<b>Kadiragamar village (Menik farm)</b>	5349	6676	7956	10324
<b>Nelukkulam welfare centre</b>	3097	3551	3548	3489
<b>Pampaimadu campus hostel</b>	4172	4109	4346	4256
<b>Gamini Mahavidyalayam</b>	1395	1748	1408	1096
<b>Poonthottam Mahavidyalayam</b>	1323	1339	1339	1282
<b>Nelukulam Technical college</b>	3063	3287	3305	3235
<b>Saivapirakasha school</b>	2788	3246	2749	2544
<b>Kovilkulam Hindu college</b>	1167	1449	1330	1262
<b>Vavuniya Tamil M.M.V</b>	4809	5486	3869	6542

<b>Muslim M.V. Paddanizoor</b>		1573	1685	1515
<b>Arunachalam Village</b>		11960	14668	26617
<b>College of Education</b>	5177	5527	5532	5537
<b>Total IDPS</b>	<b>34938</b>	<b>52547</b>	<b>54148</b>	<b>75889</b>

Source: Disaster Preparedness and Response Unit – Ministry of Health

As the number of IDPs coming to Vavuniya rapidly increasing, Government decided to locate them in the welfare village in Cheddikulam, Vavuniya. Overall IDP population relocated in Vauniya District was more than 265,000 as of 22nd May 2009 at the end of the conflict. Given the magnitude of IDPs expected to arrive, Ministry of Health took an extra step forward to develop a master plan, in March 2009, to provide health services to IDPs. All aspects of healthcare were included in this plan and were implemented even before the massive influx of people into the area in late April 2009. New directorate was established and a public health specialist was appointed as a director to manage the overall situation at field level.

**Figure 1; Cheddikulam IDP care directorate**



(MO/IC- Medical Officer In Charge ,PHC-Primary Healthcare Center, RC-Referral Center)

Ministry of Health working in partnership with United Nations agencies, local and international non-governmental organizations, donor governments and other actors mounted a major humanitarian response to address the needs of the war displaced communities. The Ministry of Health took a leading role in coordinating the health care programs for the Internally Displaced Persons (IDP) including establishment of an emergency health service to the displaced.

The overall objective of the Ministry of Health Care and Nutrition was to ensure the provision of life-saving, curative, preventative, promotive and rehabilitative care services for the populations displaced by the conflict. Coordination mechanisms established, both within the Ministry and also externally with Health sector partners.

During the emergency phase in May 2009 both the Inter agency health cluster meetings were held bi-weekly in Colombo and regional meetings in Vavuniya. These meetings were co-chaired by World Health Organization (WHO) and the Ministry of Health. This became a forum for planning, sharing information and to address the concerns at the field level by all the UN Health cluster partners.

Framework prioritizing main activities for responding to identified needs of the IDPs were planned in consultation of all the stakeholders. This was based on the fact that a mass movement of people with its associated overcrowding would subject them to communicable diseases such as diarrhea, respiratory tract infections, Chicken pox, Skin infections etc in addition to the mental stress they would undergo.

This framework prevented duplication of efforts. The main actors in this emergency response were namely Ministry of Health, Ministry of Resettlement and Disaster Relief Services, Ministry of Defense, Ministry of Disaster Management and Human Rights, Ministry of Social Services, Ministry of Nation Building, Ministry of Education, United Nations (UN) Agencies and local and international Non-governmental Organizations (INGOs). A master plan for Health was developed which included infrastructure plan and it was supported by human resource plan to achieve the objective of providing comprehensive health care for people.

Following direct and indirect challenges were identified by the health partners and plans were made to address the issues in each sector in consultation.

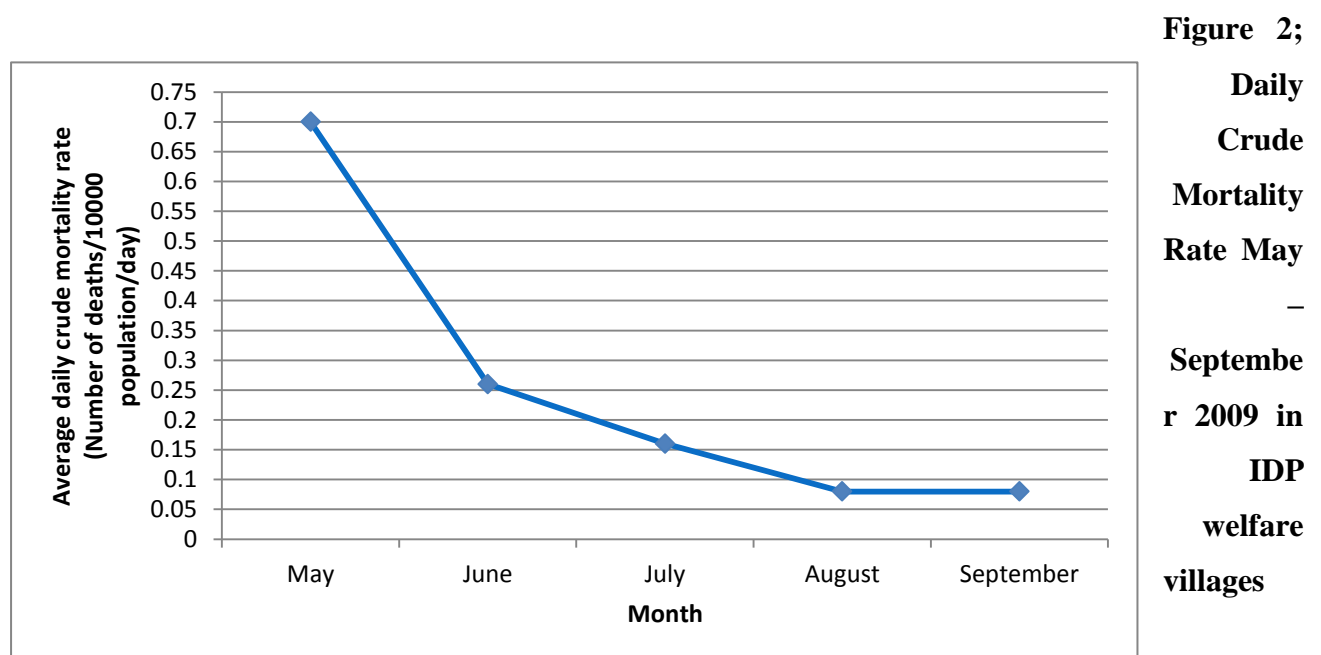
**Table 2; Direct and indirect challenges faced by the health sector in IDP care**

Direct	Indirect
<ul style="list-style-type: none"> <li>❖ <b>Curative Health</b> <ul style="list-style-type: none"> <li>• Health staff</li> <li>• Health facilities</li> <li>• Drugs &amp; equipments</li> <li>• Referral system</li> <li>• Transportation</li> <li>• Other logistics</li> </ul> </li> <li>❖ <b>Preventive Health</b> <ul style="list-style-type: none"> <li>• Health staff</li> <li>• Malnutrition and Immunization</li> <li>• Other logistics</li> </ul> </li> <li>❖ <b>Mental Health and Psychosocial Care</b></li> <li>❖ <b>Health Education/Promotion</b></li> <li>❖ <b>Communicable Disease Control</b></li> <li>❖ <b>Morbidity and Mortality</b></li> </ul>	<ul style="list-style-type: none"> <li>❖ <b>Water Supply</b> <ul style="list-style-type: none"> <li>• Drinking water</li> <li>• Raw water</li> </ul> </li> <li>❖ <b>Sanitary facilities</b> <ul style="list-style-type: none"> <li>• Availability of toilets</li> <li>• Emptying of septic tanks</li> </ul> </li> <li>❖ <b>Solid &amp; liquid waste disposal</b></li> </ul>

Each IDP welfare center was divided into blocks to facilitate the proper administration. There were Referral Hospitals (RH), Primary Health Care Centers (PHCC), Medical Officer of Health (MOH) Offices and Nutrition and Rehabilitation Program (NRP) Centers. The RH function 24/7. It consisted with emergency therapy unit(ETU), male and female wards, emergency labor room corner, pharmacy and a laboratory to carry out the basic investigations. PHCC function from 8am to 5pm as an outpatient care service. There were ambulances located at each PHCC to transport patients to RF during any emergency.

NRP centers located with each PHCC to assess the level of malnutrition in children age below 5 years. MOH offices were located in each welfare village to monitor communicable diseases, malnutrition and to promote hygiene/health education.

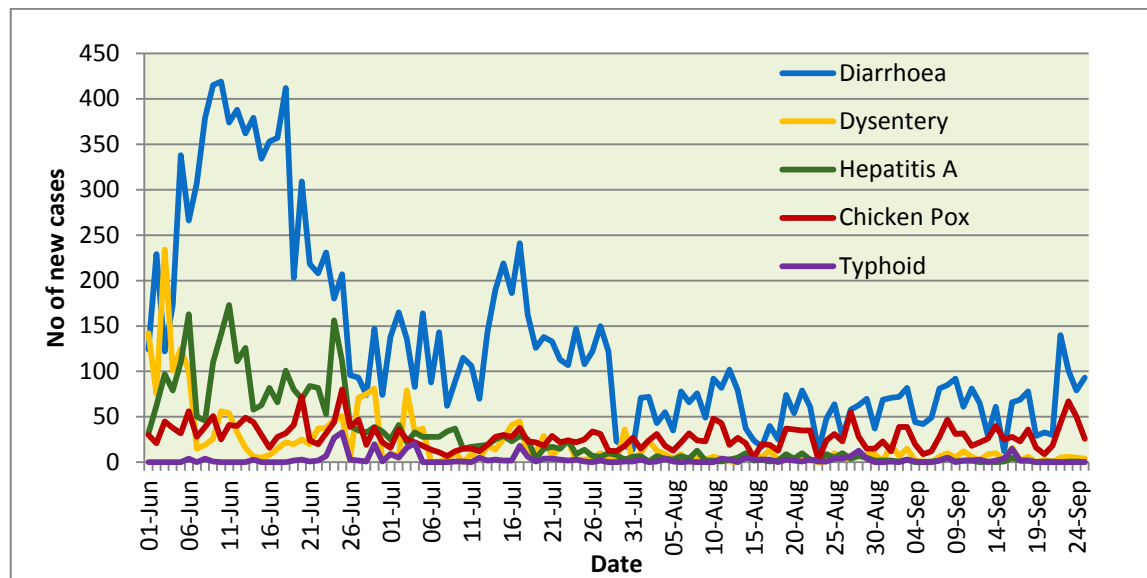
Morbidity and Mortality rates are a good indicator for overall health status of the people and health services provision in any disaster. As in any emergency/disaster the morbidity and mortality rates were initially more than accepted for the national rates. But with effective curative, preventive and promotive healthcare services manage to bring the rates down, with a shortest time frame.



Source; Health sector response to IDPs – Ministry of Health 2009

As the number of people reaching the IDP welfare villages increasing in early stages of emergency phase in May 2009, the number of deaths per day per 10000 populations (Crude Daily mortality Rate) averaged to 0.7. The figure settled to less than 0.5 per 10000 in June 2009. According to the Sphere Project guidelines that developed a set of minimum standards in a disaster situation, the baseline for daily crude mortality rate should be 0.25 per 10 000 population per day for South East Asia. The emergency threshold level is 0.5 per 10 000 per day for this region.

**Figure 3 - Communicable conditions at IDP welfare Villages June- September 2009**



Source; Health sector response to IDPs – Ministry of Health 2009

Diarrhea, dysentery were the main cause of morbidity at the welfare villages at the start of the temporary settlements. The Figure 4 above shows the declining trend of communicable diseases notified over the time in IDP Welfare villages. This was another indicator of the effective comprehensive health services provided to the IDPs.

Approach taken by the Ministry of Health to address the challenges faced in the emergency phase helped it planning the resettlement of the affected people and health services needed for them immediately after the resettlement. Comprehensive preparation and decommissioning planning were done for the health sector in the resettling areas in the Northern Province.

### **Healthcare Services for Returnee Population in Resettlement Areas**

At the beginning of the resettlement process, health authorities identified access to health facilities as a critical issue. They undertook a well-planned extensive program aimed at repairing, equipping and reopening of the hospitals, clinics and peripheral units within the shortest timeframe possible for resettlement.

With the commencement of resettlement in late 2009, Ministry of Health together with the Provincial/ Regional Health Authorities carried out health facility assessments in areas where demining activity



has been completed. Following the assessment, potential sites for resettlement were identified and available health facilities were renovated and services reinstalled.

Ministry of Health had the following objectives to improve health services in the resettlement areas.

- To make health care services accessible and available to the re-settled population
- To provide comprehensive maternal and child health services
- To re-vitalize the health services through improving the infra-structure facilities
- To control and prevent communicable & non-communicable diseases
- To improve mental health and psychosocial services
- To improve nutritional status of re-settled population
- To improve the human resources for health development and management
- To strengthen the health management information system

With the conclusion of three decades of separatist war the Government of Sri Lanka took the utmost challenge in rehabilitation and reconstruction of all the service facilities in the Northern Province. Out of all the endeavors government gave a special concern in rehabilitating health facilities by reconstructing infrastructure and reinstalling the services by increasing the human resource for health.

**Table 3: Healthcare Facilities in the Northern Province**

Facility	Numbers
Preventive Care Institutions	161
Curative care Institution	91
Chest Clinics	5
Leprosy Units	1
STD Clinics	4
Ayurvedic Medical Institutions	83

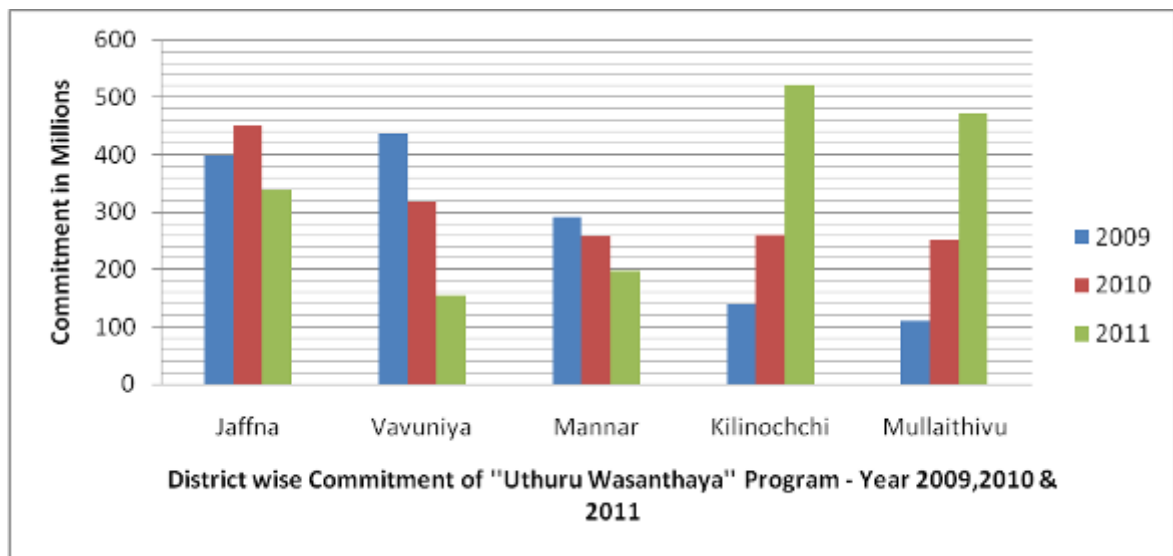
Source: Ministry of Health, Northern Province

The health institutions in Northern Province comprises of hospitals as District General Hospital, Base Hospital(BH), Divisional Hospital(DH) and Primary Medical Care Units(PMCU) as curative care institutions and MOH Offices, Gramodhaya Health Centers(GHCs), Anti Malaria Campaigns and School Dental Clinics as preventive care institutions. The Ayurvedha Sector is functioning with only curative care institutions in Northern Province. These institutions provide patient care and preventive

care services to promote the health status of the population. Beside this, One Teaching Hospital is functioning in Jaffna district under Line Ministry.

Government made continuous commitment to improve the health sector in the Northern Province by allocating adequate funds in the preceding years in order to resurrect the disrupted health system in the North.

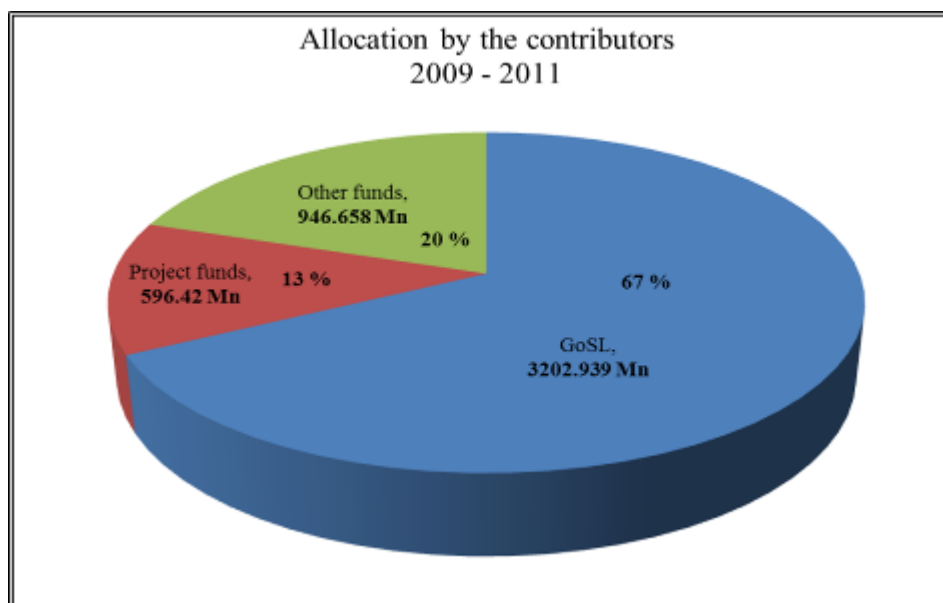
**Figure 4: Commitments of the “Uthuru Wasanthaya” Program during the Year 2009, 2010 & 2011**



Source: Ministry of Health, Northern Province

Funds for the health sector are mainly allocated through the government budget, and project or external funding were less than 40%. It showcased the government continued commitment to the health sector and affected people in the Northern Province.

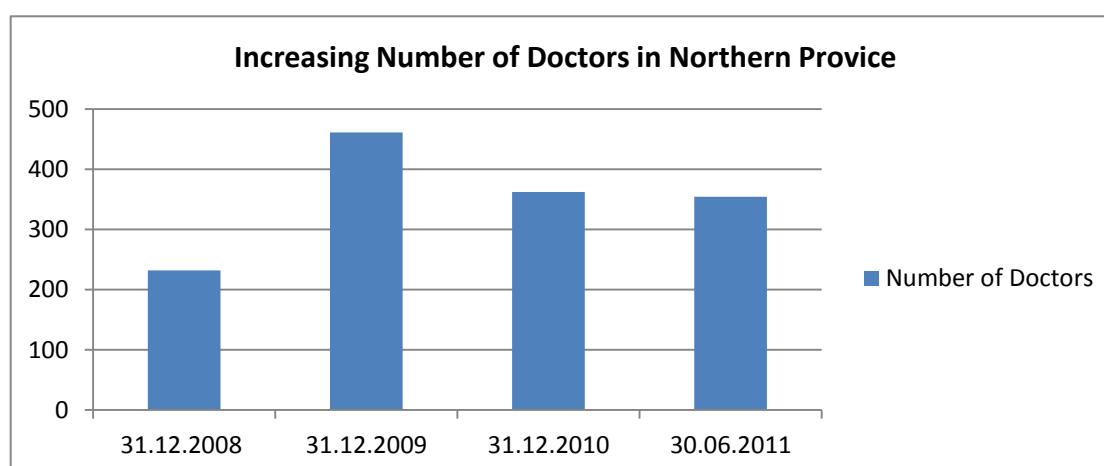
**Figure 5: Allocation by contributors 2009-2011**



Source: Ministry of Health, Northern Province

In 2009, 431 new staffs were appointed to Northern Province Health sector .Those included 151 Medical Officers, 05 Consultant Physician, 01 Consultant Pediatrician, 18 Pharmacists, 68 Nursing Officers, 01 Radiographer, 09 PHIs (Public Health Inspectors), 19 Midwives, 29 HMAs (Health Management Assistance), 03 MAs (Management Assistance), 04 Bio Medical Technician, 10 Spray Machine Operators, 69 Sanitary Labourers and 44 Ordinary Labourers.

**Figure 6: Deployment of Doctors in Northern Province 2008-2011**



Note: The figure shows increase number of doctors in Northern Province in year 2009 as many doctors were appointed to serve for the IDPs in Manik Farm

Source: Ministry of Health, Northern Province

The Ministry of Health, Northern Province also recruited three hundred candidates with G.C.E. (O/L) qualifications for basic training of PHM(Public Health Midwife) in 2009 . This decision was taken with cabinet approval as PHMs other areas were selected with A/L qualification. Finally 222 PHM students completed their course and deployed in June 2011. Decision also has been taken to recruit another 250 Nursing Officers with the qualification of GCE (A/L) any stream instead of science stream with the approval of the cabinet only for Northern Province. These proactive decisions will help in fulfilling the human resource needs of the Northern Province to give comprehensive health care to the people.

## **Conclusion**

Government has taken a practical approach in resurrecting and rehabilitation of the health sector. It faces a great challenge in mobilizing adequate human resources to match the physical resources they have provided in order to establish the system on par with the other areas of the country. Lack of strong leadership, post conflict mentality of some officers and business as earlier models have hindered the progressive development. Challenges and issues like language, accommodation for health workers and lack of career development opportunities are hindering the governments' vision of providing comprehensive health care for the people specially Mullaithivu and Killinochchi districts. Incentives like accommodation, transport, communication facilities, and special allowances for health staff for are recommended to revive the Northern Health sector to its full capacity. Some of the lessons learnt in the emergency phase of the conflict may be useful in implementation with close monitoring through a Central Provincial coordination mechanism with identified clear targets.

## **Post conflict contraceptive needs of the internally displaced women**

*Dr.S.Prathapan, Dr.R.Prathapan, Dr.S.R.Jude, Mr.G.Suthananthan, Dr.W.A.A.Wijeyasiri*

### **Introduction**

In 1994, the Women's Commission for Refugee Women and Children focused attention on the serious reproductive health problems facing refugees and the lack of services. Thereby in both the 1994 International Conference on Population and Development in Cairo and the 1995 Fourth World Conference on Women in Beijing highlighted the needs of the displaced populations which included mainly pregnancy and family planning (Women's Commission for Refugee Women and Children & United Nations Population Fund, 2007).

It is well known that the high fertility rate among the refugees or displaced women leads to high morbidity and mortality during pregnancy and childbirth (Bartlett et al., 2002). Many studies on displaced women or refugees include contraceptive associated factors for low contraceptive prevalence or high fertility rates (Swenson I et al., 1989, Presswell NJ., 1982, Kulig JC., 1988). However, even with all known factors taken into consideration, the contraceptive prevalence among the displaced or the refugees is low comparative to the rest of the non displaced or the host population (Morrison V., December 2000, Madi H., 1998). The low contraceptive prevalence among refugees and displaced raises questions on psychological factors associated with contraceptives.

The health policy of Sri Lanka states that health is fundamental to human welfare and that health is recognized as a basic right of the people. But due to inequities in services, the President appointed a Presidential Task Force in 1997, and one of the recommendations of the Task Force was to expand the services to victims of war and conflict. where women and children are particularly vulnerable during displacements.. However when comparing the health care indicators in the North and East, with the rest of Sri Lanka, the current use of contraception is 36.2% in the North East and is 70% in the rest of the island. Likewise the total fertility rate is twice of that found in the rest of the island (Family Health Bureau, 2008).

These disparities and psychological factors associated with low contraceptive prevalence were considered when designing this study. The objective of this study was to describe the contraceptive knowledge and practices and to identify current barriers to contraceptive use with respect to psychological factors of women living in camps for Internally Displaced Persons (IDPs) in Sri Lanka during the post conflict period.

## Methodology

One of the Sri Lanka's largest displacement camps, in the Mannar District was selected for this study. The study was performed in April to June 2009. The first phase of the study was a descriptive study. The sample size was calculated using Epi-Info Stat Calc with an expected contraceptive prevalence of 50% and 5% precision, with a 95% confidence interval. Data were collected from 322 women aged 18-45 years by trained female data collectors, who were also counselors in the area. The survey instrument was derived from the Centers for Disease Control and Prevention (CDC), America. The reliability and validity of these surveys are well documented because these questionnaires have undergone field validation and cross-cultural comparisons. The interviewer administered questionnaire was translated into Tamil. Minor revisions were made to the translated questionnaire, during the training of interviewers and the pilot test. Closed ended questions were used to assess the use age of contraceptives. Double entry was used to verify the accuracy of all entries. Data was analyzed using SPSS version 15.

The second phase of the study was a qualitative study. In-depth interviews were performed in women who did not intend to use a family planning method at present or in the future. Saturation was reached with 18 women. The questions asked were 'why do you think that you do not need a contraceptive method in the present or future?' or 'what is the reason for your silence'. Ethical clearance was obtained from the ethics committee of University of Sri Jayewardenepura.

## Results

Data was incomplete or there was a non response in 62 (16.1%) women. Among the 322 displaced women, awareness on oral contraceptive pill was 81%, of which only half of them (48%) had ever been taught or instructed to use it. Usage of contraceptives ranged from 67% for Depo-Provera injections to 21% for intrauterine contraceptive devices (Table 1). Among 261(81%) women who had used a contraceptive method in the past, only 138 (43%) women are using a method at present of which only 4% (13 women) were sure that they would use it in the future. Intention of using a family planning method in the future was doubtful in 195 (61%) women (Table 2). Older women (59%) were using contraceptives than the younger women (28%) and more educated women (54%) were using contraceptive than the less educated women (22%). Both of these associations were found to be statistically significant ( $p < 0.001$ ) (Table 3).

Table 1: Percent distribution of family planning methods on awareness and usage

types of contraceptives	Ever heard of the contraceptive		Ever been taught/instructed on using it		Ever used it	
	Yes	No	Yes	No	Yes	No
<b>OCP</b>	261(81.1)	61(18.9)	155(48.1)	167(51.9)	155(48.1)	167(51.9)
<b>Depo-Provera</b>	217(67.4)	105(32.6)	35(10.9)	287(89.1)	215(66.8)	107(33.2)
<b>IUCD</b>	195(60.6)	127(39.4)	192(59.6)	130(40.4)	66(20.5)	256(79.5)
<b>Condoms</b>	239(74.2)	83(25.8)	120(37.3)	202(62.7)	199(61.8)	123(38.2)

Table 2: Family Planning users in the past, present and future

	Yes	No	No response
<b>Ever used a family planning method in the past</b>	261 (81.1)	61 (18.9)	0 (0)
<b>Using a family planning method at the present</b>	138 (43.0)	146 (45.2)	38 (11.8)
<b>Intend to use a family planning method in future</b>	13(4.0)	114 (35.4)	195 (60.6)

Table 3: Association between age and education with usage of family planning methods

	Usage of family planning method		P value
	Ever used (%)	Never used (%)	
<b>Age</b>			
15-35 years	60 (27.9)	69 (64.5)	0.001
36 – 49 years	127 (59.1)	38 (35.5)	

Education			
< Grade 5	49(22.0)	38 (38.4)	0.001
> Grade 6	121 (54.3)	31 (31.3)	

Three major themes were apparent in all women in the in-depth interviews.

### **Theme one: Focus on survival**

The displaced women lamented that their prime focus was on survival and the thought of a family planning method has not occurred to them, nor has it been their prime concern.

As one woman put it: *'I have lost my husband and now I have been running from place to place for the last 12 to 13 years. I sometimes wonder if it is worth it to run like this. If not for my child, it would have been better if I had been killed with my husband. We were only married for 3 years. I don't want another child into this world. My only concern is that of my daughter.'*

Another woman said *'How can we think of anything other than the war and where we have to go next. I don't think that any of us have even a small thought of it (contraceptives).'*

Another woman voiced the same opinion as *'we left our houses ...(counts with her fingers) 12 years and 7 months ago. Since then we have been living in relatives or friends houses and when they were displaced, we moved to another friend's house. Like this we have been sharing and living in four houses before we came to this camp. All the big people say that the war is coming to an end. But I don't think so. But I don't know where we will be moving to if the war comes here also. ...'*

### **Theme two: Distressing to think of the future**

One of the pervasive themes apparent in all women questioned was related to their future. Women voiced that they were not interested in using family planning methods, primarily because they were not sure of what the future would be in store for them.

One woman's quote was *"... we don't think of anything other than the present. We don't know if we will get our next meal. We may have to run again tomorrow. How can we think of all this? Even if you go and ask everyone here, no one will have even a small thought of a method. We have learnt not to think of the future..."* ‘



Another woman voiced her opinion as "... we have been displaced; now our children and even some of the grand children have never lived in our house. They say that we may have to move again. I am fed up with this. Sometimes they come to the camp and say that we need all this (contraceptives). (She laughs), this is like giving a pot of gold to a person who did not have anything to drink (she laughs again)."

### **Theme three: lack of services**

The breakdowns in health facilities were significant concerns. The women expressed their wish for family planning, but again deplored the lack of services. These are some quotes of the women interviewed:

*'these people can't provide us with food, shelter and drugs. Even for a Panadol (Paracetamol) we have to stand in big queue to get it. They will never provide us with family planning methods regularly.'*

*'It's better to go by the traditional methods, as one day they say that they have the pill and the other day they say that we have to wait until the stocks come.'*

*'We have been following the traditional method for so long, and it has worked. Why do we need the pill? To get just one pill we have to spend one day'*

### **Discussion**

The study used was a mixed method of quantitative and a qualitative design. Contraceptive prevalence rates among the displaced women in our sample were lower than those reported among the non displaced in the rest of the country (70%) (Family Health Bureau, 2008). The awareness and the usage were also low and an explanation for this could be the war (Hopkins, D. D. & Clarke, N. G., 1983), which was for quarter of a century. It is of note that the non response rate was high among those intending to use a family planning method in the future. The qualitative results showed that the decision to use a family planning method rests not only on the availability of services, but also on selected psychological factors such as survival and distress.

Another second concern for the low contraceptive usage is the 'catch-up' phenomenon, in which the women do not use a contraceptive method, purely for the reason that the displaced women make up

for the fertility lost during the war (Weeks J.R., et al., 1999). The displaced women from the North of Sri Lanka could also fall into this phenomenon. Another study at this point would be beneficial.

This study thus reveals that although the provision of preventive health services is an important factor, it should also be borne in mind that psychological factors should be taken into consideration in these traumatized women. The Ministry of health should take steps in providing family planning clinics in joint services with counseling for improving the usage of contraceptives among the displaced women.

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## **MEDICINE**

### **TECHNICAL SESSION III: BIO-CHEMISTRY AND BASIC RESEARCH**

Chaired by Prof Susirith Mendis  
Vice Chancellor, University of Ruhuna

## **Summary**

*The paper presented by Dr CL Goonasekara was on her research done in Canada on Tropomyosin. Tropomyosin binds to Troponin and F-Actin to form thin filaments of striated muscle which is the assembly that regulates muscle contraction. At the introduction, a brief account on the structure and function of muscle and the role of Actin, Myosin and Troponin was given. The study was to investigate the role of Amino –Terminal Acetyl group of Tropomyosin for its interactions with F-Actin and Troponin. Investigators found that unacetylated tropomyosin showed reduced affinity to both Troponin and aminoacetyl segment compared to acetylated tropomyosin. The authors concluded that amino acetyl group of tropomyosin is an essential factor for its interactions with troponin and F actin, and therefore in the assembly of thin filament. A question on the technique which has been used to isolate and purify the samples was raised. In response the researcher stated that affinity chromatography was used and it yielded a good purified sample.*

## **Probiotic Effects of Water Soluble Carbohydrate of Amorphallus Campanulatus on Probiotic Yoghurt**

*This paper presented by RHGR Wathsala was on using Amorphallus Campanulatus (Kidaram) as a probiotic for yoghurt. Aqueous carbohydrate extraction of Kidaram was analysed using Gas Chromatography and Thin Layer Chromatography for probiotic effect compared to a control and Raftilose. After 15 days Kidaram carbohydrate extract showed 20 times higher lactic acid bacterial count compared to controls. Author concluded that Kidaram carbohydrate extract could offer prebiotic effect on yoghurt and would be advantageous as a herbal medicine. There were several questions during the discussion time. In response to a question on pharmacological properties of Amorphallus Campanulatus (Kidaram), the author stated several uses in the treatment of kidney diseases and as an anticancer agent in traditional medicine. Offensive odour of Kidaram could be overcome by harvesting yams before flowering. Author was unaware of any toxicological studies on Kidaram.*

## **A Comparison of Some Sri Lankan Medicinal Plant Extracts on invitro Radical Scavenging activity**

*This paper presented by AP Attanayaka was on anti oxidant properties of some plants used in herbal medicine. Anti-Oxidative abilities of some Sri Lankan medicinal plants, namely Osbeckia aspera (Heen Bovitiya), Pavetta Indica (Pawatta), Vetiveria zizanioids (Savanna) and Coriaria*

*sativum* (Kottamalli) were investigated. Experiments were done using DPPH and Nitric Oxide inhibition assays with ascorbic acid as control. The results revealed that all the plants tested had moderate antioxidant potentials when compared to the standard compound (Vitamin C) in vitro. In response to a question from the audience, the author stated that the active chemical components of these plant extractions have not been isolated and the bio-availability of the extractions has not been tested.

***Hypoglycaemic Effects of Water Extracts of Dried Flowers of Aegle Marmelos on Healthy Wistar Rats: Time and Dose Response Curves***

*This paper presented by KDKP Kumari was on an experiment on healthy Wistar rats model to identify the hypoglycaemic effect of water extracts of dried flowers of Aegle Marmelos (Beli). Water extracts of Aegle Marmelos were administered in graded doses to seven groups with one control group and their blood sugar was estimated at different intervals after administering glucose. Aegle Marmelos showed hypoglycaemic effects at all the doses and optimum dose was 500mg /kg of extract and the optimum effect was seen at 2 hours after administration. Since the study was done on healthy Wistar rats it would be repeated on diabetic rats as well.*



*Prof. Susirith Mendis chairing a Medical Session (IMG\_2172)*

## **Amino-terminal acetyl group of tropomyosin is a major determinant of thin filament assembly, which regulates muscle contraction**

*Charitha Goonasekara, Faculty of Medicine, General Sir John Kotelawala Defence University, Sri Lanka*

### **Introduction**

Cardiovascular disease is an emerging cause of death in developing countries. Features of the muscle or its constituents that regulate cardiac muscle contraction can, therefore, be important drug targets. Tropomyosin (TM) is a coiled coil protein built up from two alpha-helical chains. In muscle it exists in polymeric form and in association with F-actin and troponin. These three components, tropomyosin, actin and troponin, constitute the striated muscle thin filament, an assembly that regulates muscle contraction.

The physical continuity of the thin filament is dependent, in part, upon a merger of contiguous tropomyosins at their ends, involving an overlap of the first, and last, ten or so amino acids. The recent NMR work on two model peptides of the ends proposed that, in the merger, the amino-terminal end fits into a 'jaw' that is created by the opening of the coiled coil at the carboxyl-end (Greenfield et al. 2006). The connection is stabilised, in part, by the amino- and carboxy-terminal regions possessing opposing net charges at physiological pH and, by the troponin-T tail (Jackson et al 1975, Pato et al 1981, Mak et al 1983, Heeley et al 1987, Li et al 2002). The 1987 crystallographic study of White et al., showed that the head region of troponin complex binds at the central region of tropomyosin and the tail extends away from the core, along the carboxyl half of tropomyosin, past the tropomyosin end-to-end overlap region, spanning the first 10-15 amino acids of adjacent tropomyosin molecule.

The two end regions of tropomyosin are a critical feature for tropomyosin function. While the amino-terminal region is highly conserved, the carboxy-terminal region is more variable. In addition, the first amino acid or the amino-terminus of tropomyosin is acetylated, a modification that has been postulated to be important for the stability of the amino-terminal end (Greenfield et al. 1994 and Brown et al. 2001).

The end regions of tropomyosin have been investigated biochemically by group modification and subtraction of primary structure. The removal of carboxy-terminal residues (Johnson and Smillie

1977, Mak and Smillie 1981, Mak et al. 1983, Heeley et al. 1987) as well as deletion of amino terminal residues (Cho et al. 1990, and Moraczewska and Hitchcock-DeGregori 2000, Goonasekara and Heeley 2009), yields shortened tropomyosins which neither self-associate nor bind to troponin or F-actin under conditions where the full-length protein displays the expected property. The absence of amino-terminal acetylation of tropomyosin reduced its end-to-end association and actin affinity (Hitchcock-DeGregori and Heald 1987, Heald and Hitchcock-DeGregori 1988, Urbancikova and Hitchcock-DeGregori 1994). In the current study we have built on the above finding by further exploring the significance of this post-translational modification for the structural integrity of thin filament. The current findings confirmed reduced affinity of tropomyosin for F-actin upon removal of amino-terminal acetyl group. In addition, unacetylated tropomyosin showed markedly reduced affinity towards troponin or the tail region of troponin-T.

## Methodology

### Protein preparation

A cDNA encoding full-length salmon fast muscle tropomyosin (Heeley et al. 1995), previously cloned into the expression vector pTrc 99A (Pharmacia 27-5007-01) and then transformed into *Escherichia coli* BL21 DE3 (Jackman et al. 1996), was used to prepare unacetylated full-length tropomyosin (residues 1-284). Acetylated tropomyosin was isolated from Atlantic salmon fast muscle (Heeley et al. 1995). Actin (Spudich and Watt 1971), whole troponin (Heeley et al 2002), amino-terminal chymotryptic fragment of troponin T (N-TnT, residues 1-158) (Pearlsone and Smillie 1981) were prepared as described. In all instances, protein enrichment was assessed by SDS polyacrylamide gel electrophoresis, SDS PAGE. Protein concentration determinations were carried out using near UV absorbance measurements in a Beckman DU-64 Spectrophotometer. Measurements were between 0.1-1.0 absorbance units. The following extinction coefficients,  $\epsilon_{280}$  1mg/ml, were used: tropomyosin, 0.25; troponin, 0.47; and N-TnT, 0.143; after correction for light scattering by subtracting  $1.5 \times A_{320}$ . F-actin was determined using  $\epsilon_{290}$  1mg/ml, 0.694 and correcting for scatter by subtracting  $1.34 \times A_{320}$  (Johnson and Taylor 1978). The molar masses (g/mole) of proteins were taken as: tropomyosin, 66,000; troponin, 70,500; G-actin, 42,000; N-TnT, 18,600.

### Gel electrophoresis



SDS PAGE was carried out according to the method of Laemmli (1970) using either 12% or 15% (w/v) polyacrylamide slabs (thickness, 0.75mm) consisting of an acrylamide/N,N-methylene-bis-acrylamide (BioRad) (w/v) ratio of 37.5:1. All samples were dissolved in SDS sample buffer (a trace of Bromophenol blue, 13% (v/v) glycerol, 1.3% (w/v) SDS, 0.02% (w/v)  $\text{NaN}_3$  and 0.79% (w/v) Tris-HCl, pH 6.8 and ~1mM DTT) to a final dilution as noted in the figure legends. The gels were stained using 0.2% (w/v) Coomassie Brilliant Blue R-250 (Bio-Rad) in 50% (v/v) ethanol, 10 % (v/v) acetic acid and then destained in 20% (v/v) ethanol, 10% (v/v) acetic acid.

### **Affinity chromatography**

Whole troponin (20mg) or tropomyosin (10mg) was coupled to CNBr activated Sepharose 4B (Pharmacia) following the instructions suggested by the supplier. Samples (either tropomyosin or the amino-terminal chymotryptic fragment of rabbit skeletal troponin T, N-TnT, residues 1 - 158) were applied to columns (0.9cm x 8cm) containing the appropriate ligand equilibrated in 10mM imidazole, 0.5mM EGTA, 0.25 mM DTT, 0.01%  $\text{NaN}_3$ , pH 7, at 4°C. Elution was effected by a linear gradient of 0 to 500mM NaCl. Fractions were analyzed electrophoretically and by the Bradford assay (Bradford 1976). The NaCl concentrations of fractions were obtained by measuring the conductivity (Radiometer Copenhagen, CDM 80 conductivity meter and CDC 114 electrode) and then converting into molarity using a standard curve generated for conductivity vs. NaCl concentration.

### ***Actin binding experiments***

Binding was investigated by sedimentation in an ultracentrifuge (TLA 100.2; rotor, TLA 100) at 4°C. For qualitative analysis (gel electrophoresis) of binding, unlabeled tropomyosin was used whereas  $^{14}\text{C}$  labeled protein was used for quantification. Stock solutions of various tropomyosins were prepared in binding buffers of varying ionic strength (as indicated in the respective figure legend), dialyzed overnight and stored at 4°C. Whole troponin was dissolved in the same buffer and was used for 1-2 days after the overnight dialysis. G-actin was polymerized by overnight dialysis against the above buffer. Proteins were combined, by adding them in the order F-actin, tropomyosin and troponin, at final concentrations of 7  $\mu\text{M}$ , 0.25- 9  $\mu\text{M}$  and 4 $\mu\text{M}$  respectively. The total volume of the mixture was 100 $\mu\text{l}$ . Solutions were carefully mixed by using a Gilson Pipetman with a cut off tip and set at  $2/3^{\text{rd}}$  of the volume, incubated for 45 min at 4°C and then centrifuged in the ultracentrifuge (Beckman TLA 100; rotor, TLA 100.2) for 30 min at 150,000 x g. Samples taken before and after centrifugation were analyzed on SDS PAGE. Alternatively, two 10 $\mu\text{l}$  aliquots were removed before and after centrifugation for radioactivity counting. The difference was attributed to the amount of

tropomyosin bound. Correction for aggregation of tropomyosin was obtained by sedimentation in the absence of actin.

## **Results**

### **Affinity for troponin**

The interaction between tropomyosin (full-length and truncated) and troponin was investigated by affinity chromatography. Firstly, unacetylated or acetylated tropomyosins were chromatographed over troponin-Sepharose. Secondly, the tail fragment of troponin T, N-TnT, was chromatographed over various tropomyosin-Sepharose. The results are shown on Figure 1 and note that the respective elution profiles were superimposed for ease of comparison. The NaCl concentration of the column fraction of maximal protein concentration in each profile was taken as an indication of the strength of binding to the affinity medium.

When acetylated or unacetylated tropomyosins were passed, separately, over troponin-Sepharose, the chromatography profile of acetylated tropomyosin peaked at a salt concentration of 0.19 M. The unacetylated tropomyosin eluted at 0.11 M NaCl (Figure 1A). To further evaluate this observation, a similar experiment was conducted where tropomyosin was immobilized in the column and troponin T tail, N-TnT, was applied to the column. When N-TnT peptide was passed through separate affinity media prepared using either acetylated or unacetylated tropomyosin, the peptide eluted at NaCl concentrations of 0.15, 0.13M respectively (Figure 1B). It is apparent that the unacetylated protein shows decreased affinity towards troponin or N-TnT. The results infer that the absence of amino-terminal acetyl group affects tropomyosin binding to troponin.

### **Affinity for F-actin**

The affinity of unacetylated tropomyosin for actin was assessed by sedimentation assays. Tropomyosin and, when present, troponin were mixed with F-actin in the assay buffer and were sedimented following a 45min incubation period. Fractions before and after sedimentation were analyzed by SDS PAGE. The sections of the stained gels containing tropomyosin and F-actin, are presented in Figure 2A.

As anticipated given the ionic conditions, acetylated tropomyosin complexes with actin in the absence of troponin (Figure 2A; gel-1, lane 6) but the unacetylated tropomyosin do not. (Figure 2A; gel-1, lane 3). Interestingly, in the presence of troponin, unacetylated tropomyosin also co-sedimented with F-actin (Figure 2A; gel-2 and 3, lane 3) at both high and low calcium concentrations, indicating its binding to F-actin.

For quantification, binding curves were constructed by increasing the concentration of tropomyosin between 0.25-9 $\mu$ M, while maintaining troponin and F-actin concentrations constant at 2 $\mu$ M and 7 $\mu$ M, respectively. The apparent constant for the binding of tropomyosin to actin,  $K_a$ , is expressed as the reciprocal of the free tropomyosin at half saturation of the actin filaments. Unacetylated tropomyosin showed a stronger affinity to actin in the absence of  $\text{Ca}^{2+}$  ( $2.9 \times 10^7 \text{ M}^{-1}$ ) than in the presence of  $\text{Ca}^{2+}$  ( $K_a$ ,  $1.0 \times 10^7 \text{ M}^{-1}$ ), indicating calcium sensitivity in F-actin binding (Figure 2B). The binding constants for acetylated tropomyosins were immeasurably high ( $\gg 10^8 \text{ M}^{-1}$ ) due to their strong binding to actin in the presence of troponin. Collectively, the results suggest that the absence of amino-terminal acetylation has weakened tropomyosins interactions with F-actin

### ***Discussion***

Unacetylated tropomyosin prepared by expressing salmon fast muscle tropomyosin cDNA in bacteria proved useful in probing the structural and functional roles of this acetyl group. This information was acquired using two independent methods: affinity chromatography and sedimentation assays. In each instance, the measured parameter (either chromatographic elution (Figure 1) or induction of binding to F-actin (Figure 2)) was disrupted or abolished, in the case of the unacetylated protein relative to one with the proper modification. The inference, at least from the methods used here, is that the terminal acetyl group is 'required' for the full association of tropomyosin with other thin filament proteins.

As outlined elsewhere, the amino-terminal acetyl group of tropomyosin occurs in a 'crowded' region of the thin filament. Firstly, it occurs within the overlap site of tropomyosin. Secondly, the tail section of troponin T bridges this overlap site. Thirdly, N-TnT has been suggested to bear binding sites for the first few amino-terminal residues of tropomyosin (Goonasekara and Heeley 2009).

That unacetylated tropomyosin (residues 1 – 284) exhibits weakened affinity for N-TnT or troponin (Fig 4.1) can be rationalised in terms of a local destabilization of the coiled coil structure at the amino-terminal region of tropomyosin (Greenfield et al. 1994 and Brown et al. 2001), one which is sufficient to disturb a N-TnT binding site. The positive charge generated at the amino-terminus (and in a core position) in the absence of an acetyl group is suggested to interfere with full formation of tropomyosin tertiary structure. As a result, the first few residues of unacetylated tropomyosin adopt a

random coil structure rather than a coiled-coil. Therefore, though complete in amino acid sequence, in the absence of proper conformation, amino-terminal region of unacetylated tropomyosin fails to fully interact with troponin or N-TnT. The failure of unacetylated tropomyosin to interact with F-actin in the absence of troponin can be explained by its inability to self-associate, again, on account of its destabilized conformation at the amino-terminal region. Troponin, via its interactions with both carboxyl- and amino-terminal halves of tropomyosin links two tropomyosin molecules together and facilitates end-to-end interactions, thereby promotes binding to F-actin.

The most important consideration from these results is that the interactions of troponin with tropomyosin overlap region are thought to be crucial for proper thin filament architecture and muscle contraction regulation. For example, removal of first six residues of tropomyosin reduced the inhibition of myosin ATPase activity, in consequence of its disrupted N-TnT binding site (Goonasekara and Heeley 2009). Whether unacetylated tropomyosin leads to the same effect, therefore, is an important question to test in a future study.

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**Figure 1.**

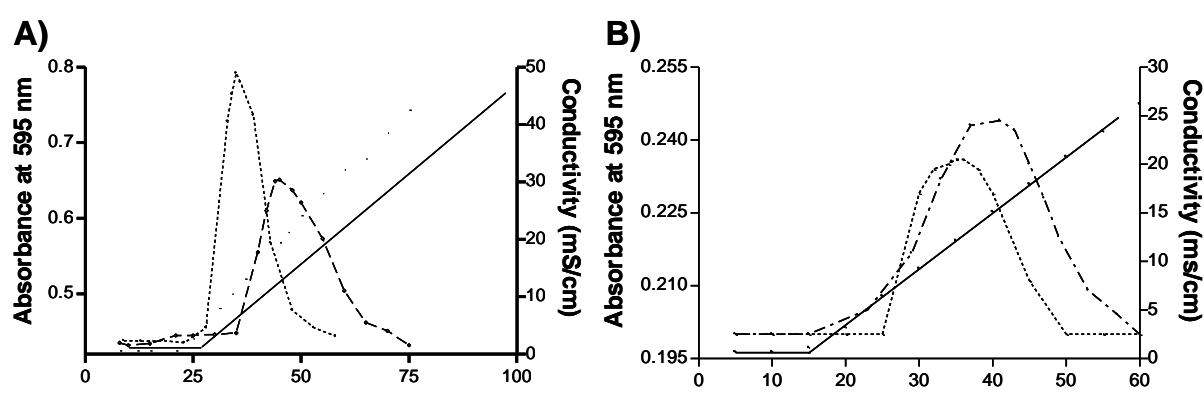
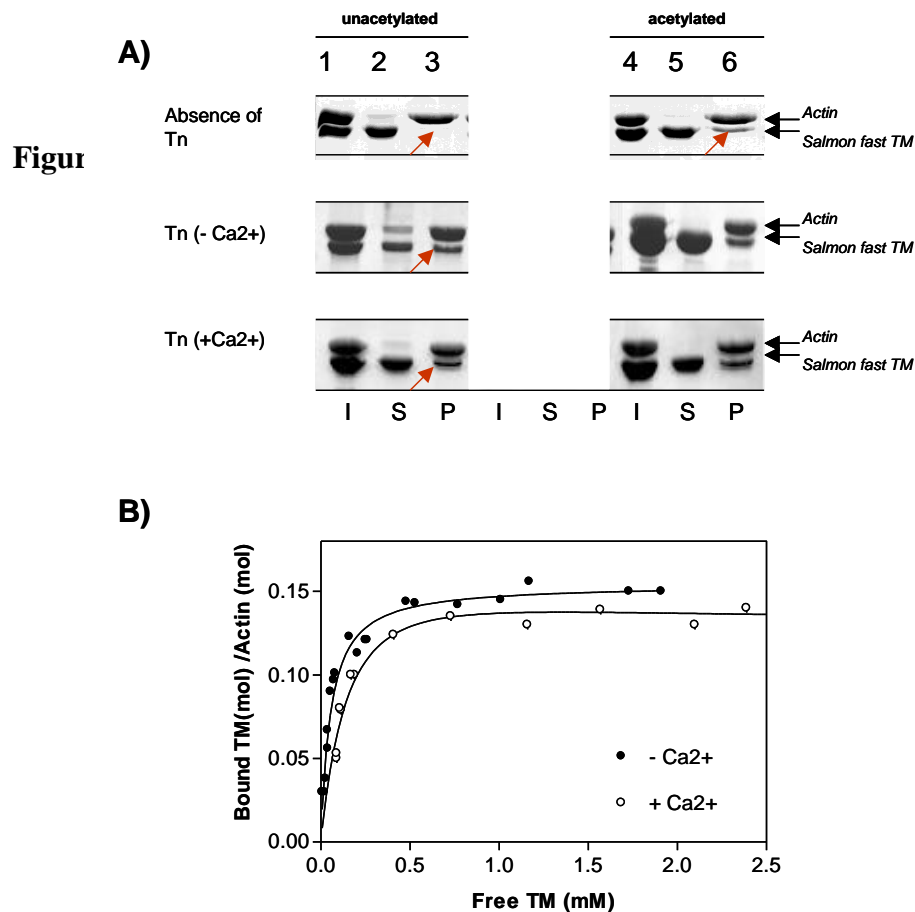


Figure 2.



Chromatography was performed in the cold (4°C). Buffer, 10mM imidazole, 0.25mM DTT, 0.01% NaN<sub>3</sub>, pH 7; salt gradient, zero to 0.5M NaCl (total volume, 100ml); fraction volume, 1.2ml; flow rate, 0.24ml/min; amount of protein loaded, tropomyosin, 1mg and N-TnT, 0.4mg; protein detection was by Bradford assay of the eluant. Conductivity values were converted to molarity using a standard curve of conductivity (ms/cm) vs. NaCl (M) concentration. The mean NaCl concentrations at peak elution are averages of between two and four determinations.

A) Elution profiles of different salmon tropomyosins from troponin-Sepharose. The profiles are for separate experiments, which have been superimposed for purpose of comparison. The NaCl concentrations at peak elution: unacetylated tropomyosin,  $0.11 \pm 0.002$  M (.....) and acetylated

tropomyosin,  $0.19 \pm 0.004$  M (-----).

- B) Elution profiles of N-TnT peptide from tropomyosin-Sepharose. Profiles from separate experiments have been superimposed for purpose of comparison. The NaCl concentrations at peak elution are: unacetylated tropomyosin,  $0.13 \pm 0.001$  M (.....) and acetylated tropomyosin,  $0.15 \pm 0.001$  M (-----).

**Figure 2 : Binding of salmon fast tropomyosins to actin in the presence and absence of troponin.**

Buffer: 10 mM MOPS, 50 mM KCl, 5.5 mM  $\text{MgCl}_2$ , 1 mM DTT, pH 7, and either 0.5 mM EGTA (- $\text{Ca}^{2+}$ ) or 0.5 mM  $\text{Ca}^{2+}$ .

- A) Actin, tropomyosin and troponin (if present) were mixed at a 7uM : 4uM : 4uM ratio. Samples before (I) and after (p, pellet and s, supernatant) were mixed with SDS sample buffer and loaded 10uL per lane, onto a 12% SDS polyacrylamide gel. The three gels are respectively: in the absence of troponin, in the presence of troponin (- $\text{Ca}^{2+}$ ) and in the presence of troponin (+ $\text{Ca}^{2+}$ ). Lanes: 1-3, unacetylated; 4-6, acetylated. The section of the stained gel containing tropomyosin and actin is presented. The absence/presence of tropomyosin in the pellet fractions are highlighted by red arrows where necessary.
- B) Actin and troponin concentrations were kept constant at 7 uM and 2uM respectively, while tropomyosin concentration was varied. F-actin binding isotherms were generated by measuring radioactive labeled tropomyosin before and after centrifugation. Curves were fit using the equation, Sigmoidal dose-response (variable slope)  $Y = Y = B_{\text{max}} / (1 + 10^{(\log K_d - \log X) * n})$ , GraphPad Prism software.



## **Comparison of Some Sri Lankan Medicinal Plant Extracts on *in Vitro* Radical Scavenging Activity**

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### **Introduction**

Natural extracts have been used in many domains including medicine, nutrition, flavoring, beverages and other industrial purposes. The use of plants as sources of remedies for the treatment of many diseases dates back to pre-historical times and people of all continents have this old tradition. According to a WHO estimate, majority of the population in developing countries depends on traditional and herbal medicine as their primary source of health care (Marquele-oliveria et al. 2008). Reactive oxygen species have been implicated in over hundreds of disease states including arthritis, complications of diabetes mellitus, carcinogenesis, aging, infections, acquired immunodeficiency syndrome etc.(Velavan et al. 2007). In the treatment of such diseases antioxidant therapy has gained an immense importance. Free radicals are fundamental to any biochemical process; represent an essential part in aerobic life and produced during normal metabolism. The reactive species as superoxide ( $O_2^{\cdot-}$ ), hydrogen peroxide ( $H_2O_2$ ), hydroxyl ( $HO^{\cdot}$ ), nitric oxide ( $NO^{\cdot}$ ), peroxy nitrite ( $ONOO^{\cdot}$ ) and hypochlorous acid ( $HOCl$ ) are produced in normal metabolic pathways. The generally accepted hypothesis is that there must be a balance between formation of reactive species and their removal. Overproduction of reactive oxygen and nitrogen species can cause oxidative and nitrosamine stress respectively. This may occur when the generation of reactive species exceeds the system's ability to neutralize and eliminate them. The excessive production of reactive species in the cell leads to oxidize and nitrocytate biomolecules that can cause DNA damage, lipid per oxidation and protein damage. Antioxidant agents of natural origin have attracted special attention in the recent scientific developments throughout the world due to their potent radical scavenging activities, absence of side effects and economic viability.

Sri Lankan flora is remarkable for its diversity and is a rich source of medicinal plants. However it's still needed to explore the usefulness for many of them in modern therapy. Little is known about the antioxidant potential of Sri Lankan medicinal plants. Considering the global trend for natural antioxidants it is rather important to evaluate radical scavenging potentials of Sri Lankan medicinal plant extracts.

Several methods have been developed for the determination of total radical scavenging capacities of foods, beverages and plant extracts. These assays differ in their chemistry (generation of different radicals and or target molecules) and in the way endpoints are measured. A simple perfect test that would be able to measure all possible mechanisms do not exist and all test methods are not immune to interferences present in complex plant extracts (Mira et al. 1999; Wang et al. 1987; Pellagrani et al 2000; Benzie and Strain 1999; Pellagrani et al. 1999). Therefore the objective of the present study was to determine the radical scavenging activity of five widely used aqueous medicinal plant extracts by DPPH (2, 2-diphenyl-2-picrylhydrazyl hydrate) and nitric oxide inhibition assays.

Plant Common name	Family	Part used
<i>Osbeckia aspera</i>	Melastomaceae	leaves
Heen bovitiya		
<i>Azadirachta indica</i>	Meliaceae	leaves
Kohomba		
<i>Pavetta indica</i>	Rubiaceae	leaves
Pavtta		
<i>Vetiveria zizanioides</i>	Graminae	roots
Sevendara		
<i>Coriandrum sativum</i>	Umbelliferae	seeds
Kottamalli		

Table 1: Ethno-botanical information of medicinal plants selected for the study

### Materials and methods

DPPH (2, 2-diphenyl-2-picrylhydrazyl hydrate), sodium nitroprusside, sulfanilamide, naphthylethylenediamine dihydrochloride, sodium chloride, potassium chloride, disodium hydrogen phosphate, potassium dihydrogen phosphate, L-ascorbic acid were purchased from Sigma –Aldrich Company (St Louis, MO, USA). All chemicals and solvents were of analytical grade and used

without any purification. For spectrophotometric measurements in the UV region a Sanyo Gallenkamp (model SP65) spectrophotometer was used.

### **Preparation of the extract**

The Botanical identity of all plants was determined by the descriptions given by Jayaweera (1982) and confirmed by comparing with the authentic samples at the National herbarium, Royal Botanical Gardens, Peradeniya. A voucher specimen has been deposited at the Department of Biochemistry, Faculty of Medicine, and University of Ruhuna.

Selected plant parts were cut to small pieces, dried at 40° C until a constant weight was reached and coarsely ground. Powdered plant material (2.5g) was dissolved in 60.0mL of distilled water and refluxed for two hours. The mixture was filtered and final volume was adjusted to 50.0mL. The concentration of the extract was 0.05 mg L<sup>-1</sup>. A concentration series of extracts were prepared (1-500µg mL<sup>-1</sup>).

### **DPPH assay**

The method described by Brand Williams et al (1995) was used. The radical scavenging activity of plant extract against stable DPPH\* was determined. When DPPH\* reacts with an antioxidant compound, which can donate hydrogen. The change in colour (from deep violet to light yellow) was measured spectrophotometrically. L- Ascorbic acid was used as the reference compound.

### **Nitric oxide radical scavenging assay**

The method described by Marcocci et al (1972) was used. Nitric oxide generated from sodium nitroprusside in aqueous solution at physiological pH, interacts with Griess reagent and the absorbance of the chromophore formed was measured spectrophotometrically. Scavengers of nitric oxide compete with oxygen leading to reduced production of nitric oxide. L- Ascorbic acid was used as the reference compound.

The percentage inhibition was calculated in both assays as % radical scavenging activity (% inhibition) = (absorbance of control - absorbance of test sample) / (absorbance of control) \* 100. The antioxidant activity is expressed in terms of IC<sub>50</sub> (micromolar concentration required to inhibit DPPH / NO radical formation by 50%).

### **Statistical analysis**

The results were analyzed by one way analysis of variance and were expressed as  $\pm$  SD. A probability ( $P$ ) value less than 0.05 will be statistically significant.

## Results

All extracts and the standard compound exhibited concentration-dependent radical scavenging activity.

All plant extracts exhibited  $IC_{50}$  value in DPPH, NO radical inhibition assays less than 185 and 432  $\mu\text{g mL}^{-1}$  respectively. The highest radical scavenging activity (lowest  $IC_{50}$ ) was found in the extract of *Osbeckia aspera* in both assays. The radical scavenging activity in DPPH assay, was in the decreasing order of *Azadirachta indica*, *Pavetta indica*, *Corriandrum sativum* and *Vetiveria zizanioides*, followed by *Azadirachta indica*, *Vetiveria zizanioides*, *Pavetta indica*, *Corriandrum sativum* in the nitric oxide radical inhibition assay ( $P < 0.05$ ).

## Discussion

Plants were selected on account of their availability and popularity among the traditional medical practitioners in Sri Lanka and all are used as medicinal remedies in the treatment of different disorders. *In vivo* hepatoprotective and hypoglycaemic effects have been scientifically proven in all plant extracts. Plant extracts were prepared in the common way in which they are prepared for human consumptions and they are assumed to be relevant medicinally.

All crude plant extracts exhibited moderate radical scavenging activities when compared with the corresponding standard compound. DPPH assay is based on the ability of DPPH, a stable free radical to decolorize in the presence of antioxidants. This is reported to be a direct and reliable method for the determination of radical scavenging activity where the structure of electron donor (e.g. plant extract) is not known. DPPH assay method can afford data on reduction potential of the sample and hence can be helpful in comparing the reduction potential of unknown compounds.

A key mediator released by activated macrophages that has been implicated in toxicity is nitric oxide. A large number of laboratories have shown that increased amounts of that highly reactive nitrogen intermediates are produced during tissue injury associated with inflammation (Laskin et al. 1990; Lyons, 1995). It has been pointed out that modulating nitric oxide production can modify tissue injury (Laskin et al. 2001). Nitric oxide radicals combine with superoxide radical & forms peroxynitrite which is cytotoxic. Due to lack of endogenous enzymes responsible for ONOO<sup>-</sup> inactivation, development of specific ONOO<sup>-</sup> scavengers or NO scavengers is considered important (Alisi and

Onyeze, 2008; Szabo, 2003; Choi et al. 2002). Recent studies by several authors have shown in-vitronitric oxide scavenging activity by fruits and isolated compounds from plant extracts (Jagetia et al. 2004). Therefore the plant or plant product may have the property to counteract the formation of nitric oxide and inturn may be of considerable interest in preventing the effects of excessive nitric oxide generation in the human body (Van Acker et al. 1995; Wang et al. 2002; Kelly et al. 2006).

However the IC<sub>50</sub> of standard compound (L-ascorbic acid) as a powerful antioxidant was more pronounced in DPPH and NO radical scavenging assays and values are comparable with previous studies (Zhu et al. 2004).

## Conclusion

The selected plant extracts exhibited relatively high radical scavenging activities. The results predict the *in vitro* antioxidant potential of selected plant extracts by their radical scavenging activities. Based on the results of investigation the antioxidant capacity has been speculated to contribute to the clinical efficacy of the aqueous extracts. Extensive *invivo* investigations are needed to be carried out to find out the antioxidative mechanisms of plant extracts.

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