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#

# Summary

International Research Symposium on Valuation of Forest Ecosystem and their Services was held on 18th October 2016. Proceedings of the Symposium was conducted under 3 broad sessions; recognizing, demonstrating and capturing the value of forest ecosystem and their services. It was a platform for researchers from Sri Lanka and outside to share their experiences in relation to valuation of forest ecosystems and their services. Key note speech for the first session was given by Dr. Eskil Mattson about the research on Assessment of Carbon and Non-Carbon Benefits of Tropical Home Gardens. Key note speech for the second session was given by Dr. Herath Gunethilake on Natural Capital, Ecosystem Services and the Role of Environmental Valuation in Policy Making. Key note speech for the third session was given by Dr. Madhu Verma on Incorporating Ecosystem Services and Biodiversity Benefits into Decision Making through Economic Incentives and Reducing Environmentally Harmful Subsidies Due to Governmental or Institutional Inaction. Apart from key note speeches each session had three presentations elaborating the theme of the session. After the presentations were made, a panel discussion was held with the participation of Alexis Corblin, Chief Technical Advisor, UN REDD Programme, Sri Lanka (Moderator), Dr. Eskil Mattson, Dr. Herath Gunatilake, Dr. Madhu Verma (Keynote Speakers), Mr. Anura Sathurusinghe, Conservator General of Forests and the National Director of UN REDD Programme, Sri Lanka, Prof. Nimal Gunathilake, Head of the Technical Working Group for International Research Symposium on Valuation of Forest Ecosystems and their Services and Dr. Ananda Mallawathanthri, Country Representative, IUCN. Finally report has combined the experiences of each presenter into major recommendation that can be used by the government in future; 1. Valuation of Forest Ecosystems and their Services in Sri Lanka, 2. Integrate Sustainable Development Goals into Development Agenda of the Country, 3. Multi-Stakeholder Participation in Protection and Conservation of Various Ecosystems, 4. Creative Designs to Make Private Sector Engage in the Process, 5. Strengthen Community Forestry and Participatory Forest Management Systems, 6. Using New Ways to Reinstate the Sustainability of Degraded Agro-Ecosystems, 7. Capacity and Awareness Building for Various Stakeholder, 8. Dissemination of Findings through Policy Briefs, Flyers, Workshops, etc.

# Introduction

1. International Research Symposium on Valuation of Forest Ecosystem and their Services was held successfully on 18th October 2016 as a part of the International Conference on Climate Change organized by ‘Sri Lanka Next in the Blue-Green Era’ organized by the Ministry of Mahaweli Development and Environment.
2. The symposium introduced the new concept of valuation of forest ecosystem services for better informed decision making and market-based mechanisms promoting sustainable conservation management of forest biodiversity in Sri Lanka.
3. Objectives of the research symposium were;
	1. To synthesize the available knowledge base on ecosystem services of forests and their valuation,
	2. To introduce emerging global trends in ecosystem valuation (qualitative and/or quantitative) to the local context,
	3. To identify gaps in knowledge and research needs related to ecosystem valuation and make recommendations towards upgrading the knowledge base with a view to their implementation.

1. The proceedings of the Symposium was conducted under 3 broad sessions;
	1. Recognizing the value of forests systems,
	2. Demonstrating the value of forest ecosystems, and
	3. Capturing the value of forest ecosystems.

# The Value of Sri Lanka’s Forests

1. Forest ecosystems incorporate the complex relationships between forest plants and other organisms with which they interact in different ways, and between forest plants and water as well as soils, etc. Humans depend on forests in many ways that we are only beginning to understand and appreciate their true value now.
2. Benefits to humans provided by forest ecosystems include support services such as nutrient cycling, primary production and biodiversity habitat, etc. Forests also provide regulating services such as windbreak and erosion control, which happens through the retention of soils by root. Some other services that forests provide include water storage and filtration, waste treatment, and climate regulation.
3. There is now a cooperative effort to globally value forest ecosystems and their services they provide in order to understand the economies that they produce. The forest is more than just trees to be harvested. They perform invaluable services as they stand and grow and thrive with us.
4. To safeguard our forests, we must understand them first. Studying such a vast and intricate ecosystem is no easy task. It is necessary to outline innovative methods used to study the health of forests and the impact these forests have on a nation. By evaluating the environmental, social and economic benefits that forest ecosystems provide, we will be able to ensure that they are protected and forested through forward-thinking national policies.
5. The UN REDD Programme is setting the stage in Sri Lanka for great advances in forest ecosystem management by supporting the Ministry of Mahaweli Development and Environment to set a mechanism in place that considers the impact of government policy decisions which can have an impact on forest ecosystems.

# International Research Symposium on Valuation of Forest Ecosystems and their Services

1. International Research Symposium on Valuation of Forest Ecosystems and their Services attempted to bring the latest developments in valuing ecosystems and their services- according to The Economics of Ecosystems and Biodiversity (TEEB, 2010) methodology- to the forefront in Sri Lanka.
2. The three main focus areas of TEEB that deal with recognizing, demonstrating and capturing the value of ecosystems and their services were explored by twelve selected national and international researchers who presented their findings on how forest ecosystems and their services can be valued using ecosystem indicators which revealed the contribution of such ecosystems and their services to mainstream economy of a nation.
3. Three international specialists gave keynote addresses on the main focus areas of the symposium and joined a panel discussion at the end of the event.
4. In accordance with one of the objectives of the research symposium- to provide with a set of recommendations to the government of Sri Lanka indicating specific actions to be taken in line with the findings of the symposium- this report is made highlighting the importance of each presentation in the Sri Lankan context.

# Session 1: Recognizing the Value of Forest Ecosystems

## Keynote Address: Assessment of Carbon and Non-Carbon Benefits of Tropical Home Gardens in relation to Natural Forests for REDD-Related Activities in Sri Lanka- Eskil Mattson, M. Ostwald and S. P. Nissanka

1. Forests are the key to global sustainability since they provide a range of values and ecosystem services, therefore recognizing the value of forest ecosystems is very important. Values of forest ecosystems can be identified under 5 categories; (1) Socially- forests affect the livelihoods of 20% of the world’s population; (2) Products & Energy- provisions of raw material for a broad variety of goods that are renewable and widely recyclable; (3) Biodiversity- forests are home to 80% of terrestrial biodiversity connecting forested landscape to intact land use mosaics; (4) Water- forests protect watersheds, reduce erosion and control floods and droughts; (5) Carbon Capture- global forest carbon stocks about 861 billion tones of the worlds annual carbon emissions from fossil fuels.
2. Since Sri Lanka has comparatively a low forest cover and a low deforestation rate, REDD+ in Sri Lanka should take an inclusive approach where sustainable land management and non-carbon benefits would be the primary focus.
3. When it comes to climate mitigation and adaptation potential in the land use, home gardens plays a huge role in Sri Lanka. Home gardens which accounts for 14% of total land area provide multiple benefits like fuel woods, timber, food and income. Also home gardens are potential of meeting REDD+ goals. Most importantly home gardens are promoted nationally by the government providing free seeds, fertilizer and technical advice. Further, home gardens provide food security and nutrition by providing a range of low-cost food and nutritional products throughout the year.
4. However, there are a little empirical evidence and quantification of the food security benefits gained from home gardens in Sri Lanka. Therefore, a valuation of overall ecosystem services on home gardens in relation to other land-use systems are needed at the landscape level since the benefits of agro-forestry systems are found at the individual, district, provincial, regional and national levels which can target synergies and trade-offs with climate and development goals while promoting community based sustainable management and conservation.

## Paper 1: Mini-Hydro; An Injurious Novel Threat to Highland Forest Ecosystems of Sri Lanka- E.I.L.Silva and E.N.S.Silva

1. Mini-hydropower projects are often identified as environmental friendly energy source when compared to larger dams and fossil fuel combustion with no effect on global climate change. However it is proven that mini-hydropower plants are not environmental friendly projects and they support global climate change.
2. Highland of Sri Lanka has become a mushroom of mini-hydropower plants which were developed over past 10 years. There are about 147 mini-hydro plants constructed in major rivers in Sri Lanka like Mahaweli, Kelani, Kalu, Walawe and about 63 of them are under construction.
3. In developed countries establishment of mini-hydro plants is coupled with very stringent regulations. But Sri Lanka without stringent regulations, without even a proper policy has been exploiting mini-hydro power in a rapid scale. Poor construction and incorrect operation of mini-hydropower plants have caused significant damage on mountain ecosystems.
4. There are certain myths associated with development of mini-hydropower plants; they are run-of river systems, they do not emit GHGs, they have minimum effects on aquatic life and there is no significant impact on forest by them. Neither of them is true.
5. Discontinuing stream flows has resulted in drying off of springs and associated waterfalls in dry season, whereas earth slips and landslides are frequent during monsoon rain season. Also forest cover gets eliminated due to inundation behind the weir, clearance of the area for construction, laying of penstocks, development of infrastructure, etc.

## Paper 2: The Ecological and Economic Value of Natural Forests in Relation to the Sri Lankan Leopard- Andrew M. Kittle, Anjali C. Watson, Samuel A. Cushman and David W. McDonald

1. The Sri Lankan leopard (*Panthera pardus kotiya*) is an endangered, endemic sub-species, the island’s top predator and only member of its guild. Therefore the Sri Lankan leopard is identified as a probable keystone species in the ecosystem which makes the ecological value of the leopard in Sri Lanka extremely high.
2. Also Sri Lankan leopard in its ecological setting has an economic importance as well. It was found by a research done based in Yala National Park, that local recreational value of the Sri Lankan leopard is high, where 58% of the tourists’ (N=250) main priority was to watch Sri Lankan leopard and 28% had the sole purpose of watching the leopard by visiting Yala. This accounts for about Rs. 115 millions of income.
3. With these findings according to which the Sri Lankan leopard is very important ecologically as well as economically it is suggestive that the animal has to be protected and conserved in its ecological setting.
4. To conserve, protect and manage the species in future Sri Lanka should understand the landscape of the distribution of the Sri Lankan leopard and the factors that helps this distribution. In an effort to understand the factors that best predict presence in Sri Lanka, an island of high human population density and decreasing forest cover, the research has used multi-scale maximum entropy modeling incorporating potential observer bias, to investigate the influence of a suite of potentially relevant ecological, climatic and anthropogenic variables on observed leopard presence across the island.

## Paper 3: Assessment of Canopy Dieback in Horton Plains National Park Using Multispectral Satellite Data- Prabha Rupasinghe, Sisira Ediriweera and Tithira Lakkana

1. Horton Plains National Park (HPNP) has a unique ecosystem and is represented by about 57 species of vascular plants. However, several studies have reported that trees have been dying due to a yet unknown factor. In Thotupolakanda and Kirigalpotta areas more than 75% of the canopy trees had been disappeared and the remaining trees also shows signs of degeneration. Although several assumed reasons such as air pollution, disease, etc were put forward to explain this phenomenon, any studies could not prove any relationship between forest dieback and the above mentioned reasons.
2. Objective of this study was to understand catastrophic dying of canopy tree species in HPNP forest using remote sensing techniques which was new methodology to Sri Lanka.
3. The key findings of the study revealed that slope, aspect and Topographic Wetness Index have significant influence on the spatial distribution of forest dieback at HPNP. Further the study provides evidence that the remote sensing and GIS based analysis are more capable and offer accurate result on investigating the tree mortality in forested areas.

## Paper 4: Performance of Coastal Vegetation in Dissipating the Energy of the Incoming Flow- R.M.C.L. Bandara, E.A.D.D.D. Egodawatta, H.R. Abeywickrama, and S.S.L. Hettiarachchi

1. Several post-tsunami field investigations carried out at representative locations along the Sri Lankan damages caused by the Indian Ocean Tsunami, 2004. Significant reductions in inundation depths have been reported at locations where different types of coastal vegetation were present. Since most of the other geographical features such as seabed topography and environmental conditions could assumed to be homogeneous for the surrounding coastline, it has been identified that the presence of vegetation has led to localized reductions in inundation depths at such locations.
2. Sustainable and effective counter measures are planned against coastal hazards like Tsunamis, considering both the severity of impacts and the frequency of occurrence. Coastal vegetation barriers have been identified as a cost effective, sustainable and viable option (especially for developing countries) compared to hardcore structures, which demand higher capital costs and create adverse impacts on the natural coastal eco-systems as well.
3. Results for steady and unsteady flow conditions indicate higher head loss gradients for shorter barriers for any given flow velocity and porosity value underlining the effectiveness of even short vegetation barriers in dissipating energy from the upcoming flow. Flow conditions inside the porous vegetation barrier were investigated by analyzing the relationship between head loss gradient and bulk velocity through the vegetation barrier. Despite of the restrictions imposed by small scale experimental setup, limitations in simulating vegetation barriers and the limited range of flow conditions, the results reveal the effectiveness of coastal vegetation barriers in dissipating energy of upcoming flow.

# Session 2: Demonstrating Ecosystem Service Values

## Keynote Address: Natural Capital, Ecosystem Services and Role of Environment Valuation in Policy Making- Herath Gunatilake

##

1. The central development challenges of the 21st century are ending poverty and achieving sustainable levels of population and consumption, while securing the earth’s life support systems that underpin human well-being. Essential to meeting this challenge is incorporating the economic values of natural capital and ecosystem services into decision making.
2. However, when it comes to the environmental natural resources like ecosystem services, the market demand-supply mechanism does not work because of which they do not have prices. There is no automatic allocation of value for those resources like in the case of other economic resources. Therefore, valuation of ecosystem services and other natural resources should be done to make sure that they will be taken into consideration in the decision making process. This valuation will assess the human welfare changes associated with environment quality changes or natural resource availability changes.
3. Although the paper is about forest ecosystem services, paper uses the word natural capital. Natural capital is a stock, from which people derive benefits. One subset of natural capital is ecosystems, and the benefits are then called ecosystem values.
4. Working together between science and economics is very essential in this process. First step of the process would be to identify the biophysical structure of the environment (vegetation cover, Net Primary Productivity, etc). Then the identification of functions of the structure should be done. Identification of functions will lead to the identification of services such as flood protection, providing products, etc. Next step would be to identify the benefits generated from these services. Finally benefits can be given an economic value.
5. There are a number of shortcomings of forest ecosystem valuation studies. A limited coverage of forest sites was valued so far. Some of the important ecosystem services like nutrient recycling, pollination, purification, etc were given little attention, therefore have been undervalued. Also decisions are made based on marginal values, not on total values; therefore, when it comes to policy making marginal change in the cost or benefit should be taken into consideration. Inconsistency of the use of terminology, lack of consensus on double counting, disservices are not valued and interdependencies among different ecosystems are not considered are some of the other problems associated with ecosystem services valuations.

## Paper 1: Valuing Ecosystem Services Together (VEST): A Social Marketing Strategy for the Promotion of PES in Northern Mindanao, Philippines- Evans Rosauro I Yonson

1. After the tropical storm Washi hit the cities of Cagayan de oro and Iligan in the Philippines in 2011 which devastated lives of many residents, it was found that one of the major factors contributed to such devastation is the massive forest denudation in the twin peaks of Bukidnon, Mount Kitanglad and Mount Kalatungan.
2. An initiative named Valuing Ecosystem Services Together (VEST) was launched in November 2013, with the objective of raising awarenss, and creating ripples of positive change towards payment for ecosystem services (PES) in Cagayan de Oro. A mechanism where indigenous tribes can sell ecosystem services like flood control, clean and portable water, etc to private and public corporations, cooperatives, schools and other institutions was made. Whole system is managed through an independent fund manager.
3. VEST was conceptualized as a social marketing strategy for PES, where a slew of information, educational and communication efforts were done.
4. Traditional and modern media forms like radio plugs, television programs, photographs, articles songs, short documentary films, lectures, posters and flyers, social media (facebook, twitter) and websites were utilized effectively in the process.

## Paper 2: Potential Income from REDD+ Activities From Nepal’s Terai Arc Landscapes (TAL)- Basanta Gautam

1. As a part of the REDD+ Readiness activities, Nepal developed Emission Reductions Programme Idea Note (ER-PIN) for 12 districts in Terai Arc Landscape (TAL) which was selected into the pipeline for result-based payment from carbon fund of the Forest Carbon Partnership Facility (FCPF).
2. The LiDAR-Assisted Multi-source Programme (LAMP) was used to estimate reference emissions level to estimate the potential income from REDD+ intervention. LAMP integrates satellite, field and LiDAR data.
3. This methodology can be considered as compromise between an extremely cost-intensive LiDAR data collection which would provide very accurate, high resolution biomass estimates. Using a conventional method without the use of LiDAR has comparably a low estimation accuracy. The LAMP method has therefore a high potential to contribute to the development of an operational forest monitoring, reporting and verification system for REDD+ as well as for forest reference level estimation.

## Paper 3: Recognizing Forest Ecosystem Services and Benefits- Priyanie Amerasinghe, Mathew McCarteny and Sanjiv de Silva

1. Presentation examined the examples of valuation of forest ecosystem services from different settings in Asia, to understand the forest ecosystem flows, purpose of valuation, cost-effectiveness of investments in conservation, impact of natural disasters, trade-offs between management options of multiple ecosystem services, influence on policies that have shaped and encouraged wise use of forest services for human well-being, effectiveness of awarenss building and communication of ecosystem concepts for preservation.

## Paper 4: Identification and Valuation of Direct Ecosystem Services from Protected Forest Areas in Bangladesh: A Case Study- Mohammed Jashimuddin, Samiul Islam and Tapan Kumar Nath

1. Chunati Wildlife Sanctuary (CWS) located at the south-east part of Bangladesh which was once home to numerous plants and wild species. More than 50,000 people live in or around it, majority of whom the forest resources collection is the major livelihood option. CSW faces with many threats such as over exploitation of forest resources (fuel wood, timber, bamboo, etc), encroachment, fire (mostly intentional), agriculture, betel leaf cultivation, etc.
2. Current study was aimed to explore the nature and type of forest resources collection and to quantify the amount of forest resources collected by local resource collectors.
3. It was found that local communities are very much dependent on CWS, because of which the forests are being depleted day by day. Therefore, the decision was taken to valuate direct ecosystem services with the intention of making people aware of the importance of forests to the local communities. Based on the data a mechanism of Payment for Ecosystem Services (PES) was designed to conserve the forests.
4. Since there is always a negative relationship between community livelihoods and protection of forest resources, protection of forests and biodiversity can only be done by creating alternative livelihood options for local communities.

# Session 3: Capturing Ecosystem Service Values

## Keynote Address: Incorporating Ecosystem Services and Biodiversity Benefits into Decision Making through Economic Incentives and Reducing Environmentally Harmful Subsidies due to Governmental or Institutional Inaction- Madhu Verma

1. When the true values of biodiversity benefits from forest ecosystems are not sufficiently taken into consideration in the decision making process, policies result in bad outcomes even though they had good intentions initially.
2. Research presented was an attempt to equip the policy makers with the information regarding the value of various ecosystems services of forests, such that the system of compensation and rewards can be institutionalized to compensate for losses on account of forest diversion, reward the states (in India) conserving large forest areas on account of policy directives, and incentivize the stakeholders who are engaged in the conservation process.

## Paper 1: Biofilm Biofertilizers for Incorporating Biodiversity Benefits and Reducing Environmentally Harmful Subsidies in Agriculture- Gamini Seneviratne and Wijepala P.C.

1. In forest conversion to conventional agriculture, stress factors like forest clearing, tillage and chemical inputs reduce biodiversity of functional flora, fauna and microbes. Most of the disappeared biodiversity enter into an inactive phase to bypass the stress factors which are stored in soil seed bank. Then, the natural food web collapses in agro-ecosystems. In the absence of other plants in conventional croplands to feed on, those forest structuring and diversifying remnant microbes and insects start feeding on our crops which are named as pathogens and pests.
2. Eventually, all the above anthropogenic activities lead to retarded nutrient cycling, soil moisture stress, yield decline, etc., thus collapsing sustainability of the agro-ecosystems. To address this, beneficial bio-films have been formulated to be used in agriculture as bio-fertilizers called Bio-Film Bio-Fertilizers (BFBFs). The BFBFs render numerous biochemical and physiological benefits to plant growth, and improve soil quality, thus leading to a reduction of environmentally harmful, subsidized chemical fertilizer (CF) NPK use by 50% in various crops.
3. The role of BFBFs is to reinstate sustainability of degraded agroecosystems through breaking dormancy of the soil microbial seed bank, and in turn restoring microbial diversity and ecosystem functioning. As such, this contributes to a more eco-friendly agriculture with an array of benefits to health, economics and the environment.

## Paper 2: Valuing Ecosystem Benefits Through Reforestation of Degraded Rainforest Patches in Sri Lanka Whilst Helping to Mitigate Climate Change- Lakmini Senadheera, W.M.P.B.S. Wahala and Shermila Weragoda

1. Economic values reflect what people are willing to trade to either employ or conserve the resources. Valuation plays an important role in the emerging markets of Ecosystem Services (ES). The main challenge of this valuation process is to identify the value (using market and non-market techniques) of the ES directly linked to the economic instrument (certification) used, and how the benefits and costs (including opportunity costs) are allocated to the different stakeholders, and in this case, smallholder farmers and local community groups affected by climate change impacts.
2. The current project focused mainly on valuing ES services such as sir quality enhancement, water quality improvement and biodiversity enhancement associated with the Hiniduma Bio-Link project, as a case study of a successful Sri Lankan carbon mitigation reforestation project. Main Objective of the project was to use the market based approaches; green payments from public funds including programs such as the Conservation & Stewardship Program, that rewards producers for good conservation practices; direct private sector payments for ecosystem services in which the private sector defines and purchases benefits; market based environmental standards and certifications that add value to products and services such as those that promote farming practices that limit/prevent pesticide use and enhance biodiversity.

## Paper 3: Mikoko Pamaja: A Small Scale Mangrove REDD+ Project in Kenya- J. Kairo and M. Czarchur

1. Carbon sequestration is higher in mangrove forests than any terrestrial forest, degradation of which can release large amounts of carbon to the atmosphere. With the objective of restoration and protection of mangroves through the sale of carbon credits REDD+ initiated the project called ‘Mikoko Pamaja’ with the meaning of ‘Mangroves Together’ where it was investigated how they could protect mangrove with developing communities.
2. ‘Mikoko Pamoja’ provides positive results in three areas; climate, biodiversity and community. Through the project forest conditions get improved. Crab and mollusk baselines were established. Communities benefits from clean water projects, education and jobs.

# Panel Discussion

Penalists:

Moderator: Mr. Alexis Corblin, Chief Technical Advisor, UN REDD Programme, Sri Lanka

Keynote Speakers: Dr. Eskil Mattson, Dr. Herath Gunatilake, Dr. Madhu Verma

Mr. Anura Sathurusinghe, Conservator General of Forests and the National Director of UN REDD Programme, Sri Lanka

Prof. Nimal Gunathilake, Head of the Technical Working Group for International Research Symposium on Valuation of Forest Ecosystems and their Services

Dr. Ananda Mallawathanthri, Country Representative, IUCN

**Introduction to the Programme by Mr. Anura Sathurusinghe**

This symposium has created an opportunity to discuss about this important topic-Valuation of Ecosystems and their Services- with the people involved as research personnel, governmental actors and other interested parties.

About 30 years ago, we were told that the GDP percentage contributed by the forestry sector is less than 10%. By that time Sri Lanka had a much better forest cover and there was no much pressure on forested land by the activities like illegal encroachment, illegal felling, etc. But now the trend has changed; forest cover depletes rapidly and the degradation of forests has gone up.

Today we talked about the carbon value, recreational value, etc. With the discussion we had since morning, emergence of a new trend can be seen. As we learnt from a couple of presentations today there are various methods, different techniques are used to value ecosystems and their services and some are practically used in Sri Lanka. But as Dr. Verma correctly pointed we don’t know whether we have adopted the correct methodology. Also there is always this problem how we could argue with policy makers and development agencies favoring the protection of forests or any other ecosystem against their development agenda. Still for most of the policy makers, forests are waste lands. They never try to capture value of ecosystems in their agenda. This is the question in front of us to answer to move forward. Lots of new ideas came up in answering that question.

In the past Forest Department (under Forest Ordinance) and Department of Wildlife (Under Fauna and Flora Protection Ordinance) were trying to protect protection in isolation which is not so successful in many ways. But with this new addition- REDD+- we are talking about multi-stakeholder participation which facilitates the participation of other governmental agencies, communities, civil society, private sector, etc. So, with this new approach I think we can negotiate in a more positive way with the Treasury of Sri Lanka for proper policy making.

**Prof. Nimal Gunathilake, Since you are more experienced in this field in Sri Lanka can you give us a snapshot of what is happening here in Sri Lanka in relation to eco system valuation.**

Symposium is designed under three themes; recognizing, demonstrating and capturing of values ecosystems and their services. In some areas we have strong researches and information and in other areas we don’t have much.

We have fairly good information and research with regard to recognizing values of biodiversity and ecosystem services and also about what would happen if we lose these services. Best example is the presentation we had about Mini-Hydro Power Plants. If we increase the number of these kind of studies we can easily design a ecosystem based development process compelling policy makers to give ecosystem services the right place in their development strategies.

But when it comes to the other two themes of the symposium, we see a lack of information and researches inside Sri Lanka. But of course we had a very good set of experiences from neighboring countries which we can use in future. If we take capturing values we had some isolated examples like the research on Biofilm Biofertilizers and Hiniduma Bio-Link Project. There is a need to up-scale these projects.

**IUCN has done a similar job (valuation of ecosystem services) in many countries including Sri Lanka. IUCN is the only institution that has developed a reference book on ecosystem valuation in Sri Lanka. So, Dr. Ananda since you are representing IUCN, can you give your ideas about the situation today in this field**.

We see a mindset change, with this mindset change we need to quantify and use them in policy making.

We have several issues with us today. In a broader sense we have an issue as to what we should do with our organic carbon pool, because reforestation and regeneration needs right type soil or the soil quality, organic carbon, etc. But because of the wrong decision making there is a big lose of organic carbon in Sri Lanka. Can we quantify that lose in term of ecosystem valuation and find ways where we can use them in better ways. Other issue is urbanization. Can we do forestry inside urban areas? Then we have number of infrastructure projects like Yan Oya and Moragaha Kanda. In all those projects certain areas are gone under water with lots of valuable trees and species. With some good engineering we could have protected some of them. So in all these things we need ecosystem calculations in a very sophisticated way to compel policy makers to resort to better ways.

**When looking at all the presentations today especially the recommendations, presenters talked about few things like the need to agree on a methodology of valuation, need to agree on a scale (whether project level, national level or sub national level), what should be the scope or criteria to be taken into consideration in assessing these ecosystem values, types of services that can be evaluated, etc. Another key issue is the availability of data and accuracy of available data in Sri Lanka. Also we need a better coordination among different stakeholders- between private sector and the government, between academia and the government, etc. Sri Lanka is far from having solutions to these issues. So I would like to ask Dr. Mattson as a person outside Sri Lanka what would you suggest?**

I know for a fact that REDD+ in Sri Lanka brings different people together through building awareness, capacity building which is a very good model for national resource management. I think it is the key to success. You will need more researches on natural resource management. When planning these researches all the relevant stakeholders- government, non-governmental organizations, academia- take part in the process, because researches are the beginning of identifying of strategies, participation of all these stakeholders from the beginning would help. Also we should look outside the forests. For an example home gardens is a very promising way to increase the forest cover while providing better livelihood options for communities.

**Dr. Gunathilake, what we understand from your presentation and from other presentations is that today there may be some limitations/factors that limit the investment in what you call natural capital. So how do you feel about this issue in Sri Lanka? And what would be your recommendation to approach the government?**

It is true that there are lots of issues or questions regarding ecosystem valuation, but we should have in mind that the valuation of ecosystems and their services is not the end of it. It is done to achieve something better than what we have and to augment and sustainably manage our natural capital. I think this is a very opportune time for any country to initiate meaningful actions on augmenting and sustainably managing natural capital because the international development landscape has changed a lot during last few years. We introduced Sustainable Development Goals and we signed the Paris Agreement. If we compare SDGs with Millennium Goals, SDGs have recognized the importance of natural capital in a very significant way. In Millennium Goals we had only one goal specifically directed towards the well-being of the environment. But in SDGs we have so many goals specifically targeting various areas like terrestrial ecosystems, marine ecosystem, resource efficiency and conservation, and climate change. The challenge is how to integrate these goals into our development plans. Ministry of Environment should take the lead in integrating these SDGs into development agenda in Sri Lanka. If we succeed in integrating them in a reasonable way that will be the beginning of a big change. From our side ADB is willing to help. We initiated a technical support project to support the environmental related projects which integrates SDGs. We are planning to select few countries in this region to do some pilots.

Also we should not take forests, wetland or any other ecosystem in isolation. Combine them with the development projects as far as possible is a good way of doing these projects. For an example if you take poverty reduction programs, there are very good examples from all over world conditional cash transfer projects like Janasaviya, Samurdhi can be used to do ecosystem services augmentation.

**Dr.Verma, you are not from Sri Lanka. You are from a country which has much more advanced technology in this matter. With lots of presentations since morning today you might have understood where we are. Of course we won’t get to the point where India is in one week. What would be your recommendations to start this long journey?**

In 1995 to 1998 we had a very interesting capacity building program in India with the help of World Bank; environmental management capacity building program. Under that we had intensive training programs in environmental economics, research programs, curriculum development programs. Now across the country we have these kinds of courses running and huge number of projects are done accordingly. And not just only the projects are done, but they have been documented. Now we have a very good data base. If you could do intensive capacity building program like that, definitely it will help.

As Dr. Gunethilake correctly mentioned, all these projects can be integrated with SDGs to achieve better results. For an example we did this project in India named Green India Mission which was a forestation project. In the project lots of jobs were created. It was done with the help of rural people and they were engaged in the project. After the initiation of the project we went beyond the initial plan and quantified these plantation activities and continuous monitoring was done. In this project forests were not regarded in isolation but it was regarded as a linked factor to all other segments of the environment. So we were trying to understand the value of total environment and also the development index of the country, just to convince the financial people with the intention to link Financial Ministry with SDGs. We are still in the process of developing of this index. It is not something conservation vs. development but conservation with development. And also if you want communities participate positively in the process, you have to make them aware. And they will not understand the technicalities in the process as we do. Therefore, when you take the information to the people you have to be creative; you can use films, flyers and such creative things.

**Mr. Anura Sathurusinghe, is there any evaluation or a research done on the Port City Project so far by the government?**

There’s nothing to do with the FD in this project. Port City Project is coming in the coastal zone so Coast Conservation Department has conducted that study. Based on the study Coast Conservation Department has given their clearance.

**How do we assess the damages to the ecosystem as a whole?**

I think we are pretty good in assessing the damage to the ecosystems on surface. What is missing with us is that how do you assess the details of damage to the couple of layers below; damage to the species, changes happened to the water flows, etc. The good part is earlier we did not have methods or technology to do assess these things. But right now we do have all the methods. So, it is high time we start using these methods available. We should first identify the variables, and have to search for the methods to quantify each variable. In Kelani River pollution issue, no one was able to suggest us the best method of valuing the whole ecosystem. Even if we have methods, still we need one thing to make the use of these methods success, we need different sectors to coordinate.

**The Green Accounting System is popular all over the world. Any thought of its application here in Sri Lank**a?

Green Accounting has already come to Sri Lanka, but involves forestry sector than any other sector. Techniques are available. What is needed is very high level convincing in the national budgetary process to adopt green accounting concept in investments. There are lots of pre-conditions that have be fulfilled before going for a green accounting system. It requires a very good information system as to what variable needs to be measured on what accuracy. Also we need to have a very good understanding about the environmental and social processes.

# Recommendations

1. **Valuation of Forest Ecosystems and their Services in Sri Lanka.**
* Intense, collaborative and multidisciplinary research has to be done in mapping, modeling, valuating and accounting of various ecosystems and their services. Information of such research, then can be incorporated in decision making process positively by using them to justify the importance of the ecosystems and their services in the development agenda of the country.
* A good methodology of doing so must be examined and adopted. Very importantly the same adopted methodology should be used by all stakeholders, without any conflict between sectors.
* Further this should be done in a holistic way without taking different ecosystem in isolation.
1. **Integrate Sustainable Development Goals into Development Agenda of the Country.**
2. **Multi-Stakeholder Participation in Protection and Conservation of Various Ecosystems.**
* Any governmental department cannot work in isolation without the help of other departments. Therefore, the country needs an efficient mechanism where all the governmental departments such as Forest Department, Department of Wildlife, Coast Conservation Department, Central Environmental Authority, National Policy Planning Department, Department of Agriculture, Treasury, Financial Bodies, etc. can come together in the decision making process in protection and conservation of various ecosystems.
* It is not only the government that has interests over the country’s valuable ecosystems. There are lots of other stakeholders like non-governmental organizations, private sector, academia, and most importantly communities. It is very important to ensure that these segments of the society participate in the decision making process.
1. **Creative Designs to Make Private Sector Engage in the Process.**
* Private sector has the ability to support the governmental agenda to protect and conserve the forests. However, the convincing the private sector to invest in the forestry is challenging. Government can resort to new creative methods to make them benefitted from investing; experiences as show cased in projects like Hiniduma Bio-Link project can be utilized properly.

1. **Strengthen Community Forestry and Participatory Forest Management Systems**.
* Community participation is a key factor in success of all these projects. Therefore, people should be given legal rights to make them involved in management of ecosystem services. Illegal encroachment, illegal felling and lots of other illegal behavior can be traced to the fact that people do not have legal rights to involve in the decision making and management level.
* Creative methods where communities are rewarded with alternative livelihoods is a good approach to make communities participate. Ex:- PES Systems.
* Also going beyond forests if we could use other lands, for an example home gardens, people will willingly participate in increasing the forest cover. Providing with free seedlings, plants will be a good approach, provided that people are given the plants they like, not what policy makers think suitable as an incentive to protect those plants.
* Another creative way to make people participate is to combine poverty reduction programs like Samurdhi, Janasaviya with protection of environment.
1. **Using New Ways to Reinstate the Sustainability of Degraded Agro-Ecosystems.**
* There are new ways tried to reinstate the sustainability of degraded agro-ecosystems. One such new formula is presented as Bio-Film Bio-Fertilizers which can be used in agriculture and plantation sectors in the country. Such new technologies should be further tested/ researched, introduced to the people island wide through awareness programs and provided with financial support such researchers.
1. **Capacity and Awareness Building for Various Stakeholders.**
* Since this is a new concept to Sri Lanka capacity building of various stakeholders is very important. Governmental, non-governmental, as well as whole society who are directly or indirectly involved with the process should be trained with proper and intensive capacity building programs across the country.
1. **Dissemination of Findings through Policy Briefs, Flyers, Workshops, etc.**
* Once the knowledge acquired, information should be disseminated through creative ways. Technical will be able to understand the process and knowledge even when they are presented in a more technical language. But when it comes to communities methods should be creative; simple flyers, films, documentary videos, etc are some good ways of doing it.