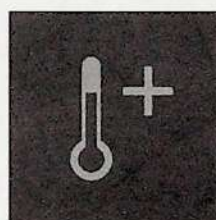
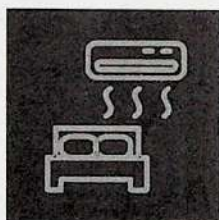
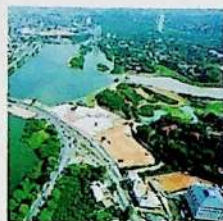
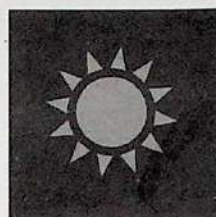


Climate Change **Issues** in Sri Lanka



January 2016

Volume - 02

A Collection of Articles from the IPS CLIMATEnet BLOG



INSTITUTE OF POLICY STUDIES OF SRI LANKA

Use of Traditional Paddy Cultivation as a Means of Climate Change Adaptation in Sri Lanka



3-6

Policy Challenges

in Climate Adaptation in Sri Lanka: Identifying Major Gaps

Sri Lankan Perspective of the Clean Development Mechanism (CDM): Approach towards Climate Change Mitigation

10-12



Clean Development Mechanism (CDM)
Trading with Emission Trading System
(EU-ETS): Are Developing Countries in a Crisis?

13-15



TOWARDS A
GREEN ECONOMY IN SRI LANKA:
A FORESTRY PERSPECTIVE

16-18



The Need for Climate Change Resilience in Urban Infrastructure:
A Closer Look at Sri Lanka

19-22

Multiple Actors: The Challenge of Building Adaptive Capacity to Climate Change in Sri Lanka

23-24

Climate Change Models Shift Boundaries of Agro-Ecological Zones in Sri Lanka

25-26



27-29

Is it the time to go back
to where we came from:
Addressing the debate
Organic Vs Inorganic rice
farming through a
new research approach?

Essential Factors in Bringing Back Organic Rice Farming: A Case Study from Nilwala River Basin

30-32

The
Impact of
Price on
the Organic
Rice Farming
Sector in
Sri Lanka



33-34

Role of ICTs in Early Warning of Climate-Related Disasters: A Sri Lankan Case Study

35



The Other Side of the Coin:
Can Climate Change
Bring in Positive Impacts?

36-37

CLIMATEnet Policy Discussion Forum:

Linking expert knowledge
to generate policy insights
on climate change
adaptation under
uncertainty

38-40

Foreword

Impacts of climate change are becoming evident more and more. These impacts are spread across many sectors namely agriculture, water, health, human settlements, coastal resources, tourism, and infrastructure. Adaptation as well as mitigation efforts towards these impacts will demand immense financial, physical and human resources. Efficiency and effectiveness of these efforts will make a contribution to define the economic growth of a country.

Sri Lanka has formulated a sound climate change policy, climate change adaptation strategy and a draft national climate change adaptation action plan. There are many discussions and research taking place at present in research think tanks and universities. Climate change is one of the major research interests of the Environment and Agriculture Policy Unit of the Institute of Policy Studies of Sri Lanka (IPS).

Over the years, IPS has been a leading economic policy research think tank that has been engaged in climate change discussions in Sri Lanka, exploring many impacts of climate change and proposing policy options to the relevant policy making bodies. This is the second issue of the Climate Change Magazine of IPS.

This volume of the Climate Change Magazine looks at many areas of climate change impacts. It discusses adaptation as well as mitigation of climate change impacts. The bulk of the discussion is dedicated to the paddy sector, tourism sector, energy and water sectors. I hope that the policy options identified in the articles will contribute to the efforts of adaptation and mitigation of climate change in Sri Lanka.



Saman Kelegama
Executive Director

ENVIRONMENT, NATURAL RESOURCES & AGRICULTURE

Growth that results in depleting the natural capital stock of a country is not smart as it cannot be sustained in the long term. Sustainability implies attaining the aspirations of the current generation without compromising the capacity of future generations to do the same. In essence, it deals with inter-generational equity of human use of environmental resources. Sri Lanka is blessed with a habitable tropical environment all over the country that offers many eco-system services for the well-being of people. The rich stock of natural resources provides the essential launching pad for Sri Lanka's post-conflict drive towards fast-track growth. Whether this endowment could bring in desired improvements to living standards of people, and more importantly, could it be maintained for the well-being of future generations, is largely a matter of how sensibly it is put into use. Recently, the idea of sustainability has given rise to more operational concepts such as 'green growth'. Green growth advocates exploring new avenues of growth that ensure continuity of the natural capital stock. However, there is overwhelming evidence to believe that the present use of natural capital in Sri Lanka is not fulfilling the conditions necessary for green growth. The policies/strategies for green growth cover three broad areas of interest: (i) innovation and adoption of right technical solutions; (ii) policies for getting structure of incentives right; and (iii) policies for setting up right institutions.

The Team:

Athula Senaratne

Research Fellow

BSc, MPhil (Peradeniya), PhD (Deakin)

Chatura Rodrigo

Research Economist

BSc (Peradeniya), MSc (Peradeniya), MSc (Colombo), MSc (Guelph)

Kanchana Wickramasinghe

Research Economist

BSc (Peradeniya) MEcon (Colombo)

Manoj Thibbotuwawa

Research Economist

BSc (Peradeniya), MSc (Peradeniya)

Dilani Hirimuthugodage

Research Officer

BA (Colombo), MEcon (Colombo)

Charmaine Wijesinghe

Manager Publications & Events

INSTITUTE OF POLICY STUDIES OF SRI LANKA

100/20, Independence Avenue, Colombo 07, Sri Lanka.

Tel: 94 11 2143100, 94 11 2555068

Fax: 94 11 2665065

URL: <http://www.ips.lk>

Blog: <http://climatenet.blogspot.com>

climatenet@ips.lk

www.facebook.com/instituteofpolicystudies

Printing

EPA Advertising

835/2, New Parliament Road, Pelawatte, Battaramulla.

Tel/Fax: 112 177171

Images

Courtesy Google

Contributors to the IPS Climatenet Blog:



Athula Senaratne is currently a Research Fellow and Head of Environmental Economic Policy research at the IPS. Prior to joining the IPS in 2006, he has gathered considerable experience on the management of environmental resources and economic policy in Sri Lanka serving in the government sector. He holds a PhD from the Deakin University, Australia. (Talk to Athula - athula@ips.lk)



Chatura Rodrigo is a Research Economist at IPS with research interests in environment and natural resource economics, food and agriculture economics, and international trade. He holds a BSc in Agricultural Economics and an MSc in Environment Economics from the University of Peradeniya, an MSc in Financial Economics from the University of Colombo, an MSc in Food Agriculture and Resource Economics from the University of Guelph, Canada. He is a PhD candidate (Joint PhD) from the Universities of Colombo and Guelph, Canada. (Talk with Chatura - chatura@ips.lk)



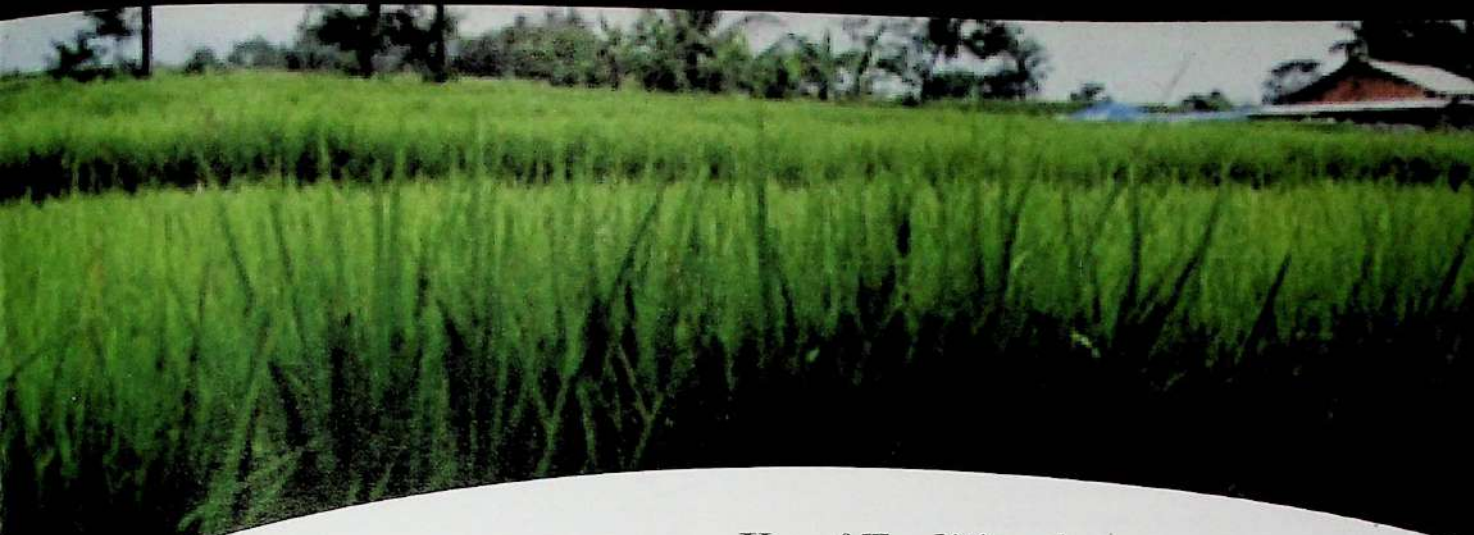
Kanchana Wickramasinghe is a Research Economist at the IPS, with a focus on environment and natural resource management policy research. Her research areas include sustainable tourism, disaster management, natural resource management, green jobs and climate change. She holds a Masters degree in Economics from the University of Colombo and a BSc in Agriculture from the University of Peradeniya. She also completed a post-graduate diploma at the Institute of Social Studies, The Hague, Netherlands. (Talk with Kanchana - kanchana@ips.lk)



Lal Muthuwatta is a Regional Researcher in hydrology and remote sensing, International Water Management Institute, Colombo. E-mail: l.muthuwatte@cgiar.org



Nimal Gunatilleke is Professor of Botany at the University of Peradeniya, and counts over 35 years of research and teaching experience, relating to biology of natural and plantation forests in Sri Lanka. His research interests cover soil biology and nutrient dynamics, plant reproductive biology and population genetics, spatial distribution and species co-existence in lowland rain forests, and ecological restoration of degraded lands. Most of his long-term research has been in Sinharaja World Heritage Site and the Knuckles Forest Reserve. He has been a co-recipient of the prestigious Sultan Qaboos prize of UNESCO in 1997 for environmental preservation, given in recognition of their outstanding contribution to the management/preservation of the environment.



Use of Traditional Paddy Cultivation as a Means of Climate Change Adaptation in Sri Lanka

by
Chatura Rodrigo

Introduction

Paddy occupies approximately 37 per cent (0.77 million ha) of the cultivated land area of Sri Lanka. It is cultivated during two major seasons; Yala and Maha, where a majority is cultivated during the latter. Close to 1.8 million farm families are dependent on paddy farming throughout the country. The demand for paddy in Sri Lanka will increase at a rate of 1.1 per cent per year, which requires production also to increase at a rate of 2.9 per cent per year. Therefore not only is paddy the staple food of the country, but its cultivation is the livelihood of a significant portion of people (DSC, 2013).

The 'green revolution' of the early 1960s, supported by agricultural policies such as fertilizer subsidies, placed Sri Lanka on the fast track to becoming a production economy. With subsidized fertilizer and the establishment of irrigation schemes, farmers were given the motivation to be more production oriented. These heavy production agricultural methods in the paddy sector were supported by the new and improved high yielding varieties. Even though these new improved paddy varieties were short termed and high yielding, they were chemical fertilizer and labour intensive and posed a negative externality to the environment (Wiggins and Brooks, 2010). Most importantly, these new improved production incentive paddy varieties and agricultural practices were not resilient towards climate change impacts.

The paddy sector is extremely vulnerable to climate change impacts. Over the years, on many occasions, farm lands were heavily damaged due to floods and droughts. Traditional agriculture practices coupled with endogenous paddy varieties have proven to be more successful in facing climate change events such as droughts and floods, through continuous rigorous research. In light of this, a discussion was initiated on whether paddy cultivation should focus more on a traditional avenue, as opposed to one that is chemical intensive (Sharma and Rai, 2010).

There are only a handful of traditional paddy varieties in existence today in Sri Lanka. These are: Suwandel, Rathdel, Kaluheenati, Ma-Wee, Kuruluthuda, Pachchaperumal, Madathawalu, Hetadha Wee, Hondarawalu, Girisa, and Heenati. These traditional paddy varieties have strong characteristics that help them survive climate change impacts such as droughts, heavy rains, and floods,

compared to newer varieties used in chemical intensive paddy cultivation. This vigour is based on certain characteristics unique to traditional paddy varieties.

While new improved varieties only can be raised in a nursery for 3-4 weeks, traditional varieties can be held back for 2-3 months. Therefore in a case of drought, heavy rainfall, or floods, the traditional varieties are capable of surviving in the nursery until the field conditions are favourable for planting. Traditional varieties are tall. They have a strong stem compared to the new improved varieties. This factor helps traditional varieties to withstand heavy rains, winds, and droughts with heavy evaporations. Furthermore, even if the stem bends during heavy winds, rains, and floods, the plant still has a higher probability of survival. The seeds of traditional varieties are also more vigorous. The shell of the seed can withstand water logging and drought conditions. Therefore overall, traditional varieties have been found to be better suited for climate change impacts such as heavy rains, floods, winds, and droughts (Rathnabharathi, 2009).

There are many traditional paddy cultivation practices in Sri Lanka. These traditional practices are concentrated around land preparation, water management, and fertilizer applications, and combined with the traditional paddy varieties and would be ideal for withstanding the climate change impacts. Among many, one such traditional practice is the 'Nava Kekulan' method, or the dry sowing system, practiced in the dry zone of Sri Lanka. The next section will describe in detail the special features of the dry sowing method, highlighting how these features increase the endurance of the paddy land to the impacts of climate change.

Dry Sowing System:

The dry sowing system has been in existence for many generations. The dry sowing method does not clear bunds, and does not involve re-plastering when the cultivation season starts. This initiative will boost the flora and fauna population around the field, making the bunds resistant to dry conditions, as well as heavy rain conditions. Also it involves little to no tillage. This practice will preserve the soil fertility by facilitating the microbes while preserving soil moisture. Therefore, paddy fields can preserve its fertility during dry spells. Furthermore, since the biological, physical, and chemical properties are preserved, the soil can get back to its normal stage once the rainy season starts.



Furthermore, mulching acts as a protector against evaporation, therefore the soil moisture is protected during dry seasons, and crops can tolerate water stress to a greater degree. Mulching matter degrades in to organic particles and will increase the water retention capacity of the paddy field. Therefore when the rains do come, the fields are capable of storing much of the water. Finally, water management practices in the dry sowing method are unique and important for adaptation to climate change impacts. Water management practices are specific in keeping the soil at filled capacity and avoid inundation situations. The dry conditions are maintained until the panicle initiation starts, which occurs approximately two months before the expected time of harvest. These water management activities result in extensive growth of the root system. An extensive root system will help the paddy plant to survive during heavy winds, rains, and even in droughts since deep root systems hold the plants upright in heavy rains and winds, and are better capable of reaching ground water (Upawansa, 2013).

As mentioned earlier, traditional paddy cultivation and traditional varieties go hand-in-hand. Upon reviewing the attributes of traditional varieties and traditional farming systems such as dry sowing, which discussed above; it is clear that climate change impacts can be successfully fought against, once these methods are adopted. In addition to being climate resilient, traditional paddy farming has further environmental, economic, and social sustainability potential. The next section will focus on highlighting several of those significant benefits.

Environment, Economic and Social Sustainability Potentials

Traditional paddy cultivation is environmental friendly and is the result of natural selection – evolved over many years resisting many climatic and environmental changes. Application of organic fertilizer and environmentally friendly land preparation methods increases the population of macro and microorganisms, in and surrounding paddy fields. All these activities in turn are capable of keeping the natural food chains surrounding the paddy field intact. Furthermore, the natural food chains manage the pest problems in the fields without harming any of the important fauna and flora in the surrounding environment (Killebrew and Wolff, 2010). Therefore in the end, traditional paddy farming will preserve and improve the natural environment and the aesthetic appeal of the fields, in addition to making it more resilient to climate change impacts.

It is also fair to say that there are possible economic gains from traditional paddy cultivations. Firstly, farmers gain economic savings when crop damages and yield losses are minimized as a result of climate change resilient, traditional paddy cultivation. However, there are other avenues through which traditional agriculture generates economic benefits. In the market place,

traditional paddy varieties, cultivated using traditional methods, draws a higher price. This price is close to three times higher than the price of other paddy varieties cultivated under chemical intensive paddy farming. Hence, farmers have a price incentive to supply traditional rice to consumers.

Furthermore, in realizing the importance of traditional paddy farming in the preservation and promotion of the natural environment, the government of Sri Lanka recently decided to cut down the fertilizer subsidy by 25 per cent, and requested that farmers adopt organic fertilizers (Sunday Times, 30th June, 2013). Whether farmers would actually adopt traditional paddy cultivation to account for the reduction in the fertilizer subsidy, or whether they would cut down the current cultivation extent to suite the fertilizer subsidy, is yet to be seen. In addition, some even argue that traditional paddy could have the potential to become an export commodity. While paddy exports in bulk is not a viable enterprise for Sri Lanka at the moment, identifying niche markets and targeting them is an established practice (Samaratunga, 2011). Therefore, these niche markets can, and should, be targeted with traditional paddy varieties. One additional factor that could promote traditional paddy exports is the availability of procuring fair trade certifications. Organic products are eligible to obtain fair trade certificates, and hence become eligible to receive tax concessions from the government. Therefore, by focusing on the export market, the government has created a favourable environment for traditional paddy cultivations. At the same time, consumers today (both locally and globally) are more health conscious and more interested in consuming traditional rice, as opposed to genetically modified varieties. Therefore, at the moment, there is motivation and incentives for farmers to engage in traditional paddy cultivations, while demand from the consumers is also rapidly increasing.

The social benefits of traditional agriculture can come in several avenues. One of the most important avenues is the preservation of traditional knowledge and experience. Traditional farming systems are practiced over many generations and are mastered to perfection. With chemical intensive paddy farming, these practices can disappear in to the annals of history. Adaptation of these methods will preserve the knowledge for the next generation. At the same time, traditional agriculture will promote a healthy and financially sound community. It is commonly observed that most farmers who engage in traditional paddy cultivation are healthier than their peers engaged in chemical intensive paddy cultivation. These farmers and their families have been consuming traditional rice for many generations (Altieri, 2008). Interestingly all these farmers live well in to their 80s, while the life expectancy in Sri Lanka today is 74.9. Therefore, traditional paddy farming is capable of preserving very important traditional knowledge, while ensuring a healthy and wealthy community.

Challenges

Even though traditional paddy farming has many benefits which are environmental, economic, and social, there are several key challenges when promoting and implementing this in Sri Lanka. To start with, farmers are used to fertilizer subsidies, chemical pesticides, and short term production and efficiency oriented paddy cultivation. Therefore, merely reducing the fertilizer subsidy will not guarantee that farmers would adopt traditional paddy cultivation. As mentioned earlier, there is a possibility that these farmers may well cut down the current extent of cultivation, and aim for a guaranteed price, rather than adopt traditional agriculture.



At the same time, it is accepted that traditional paddy cultivation yields less than chemical intensive paddy cultivation and takes a longer time to harvest. Therefore unless proper markets are established, traditional paddy farming will not generate enough income to encourage farmers to switch. Ensuring a market place is a difficult task, since traditional paddy varieties are attractive only to niche markets, both locally and internationally. Therefore, unless sufficient demand is created at least locally, farmers will not be effectively persuaded to adopt traditional paddy farming.

This article highlighted a handful of traditional varieties in Sri Lanka. History has recorded more varieties, but throughout the generations, Sri Lanka has lost many of these since they were not cultivated. Therefore, while the available traditional varieties are minimal, there is a danger of losing these as well. Tackling this issue is very important especially if Sri Lanka is to promote traditional paddy as an export commodity. Hence the challenge is to preserve the varieties available at the moment and then to rediscover more which are suitable for Sri Lanka's climatic and soil conditions.

In addition to traditional varieties, knowledge of traditional farming methods is on the verge of extinction as well. The knowledge of traditional farming, similar to traditional varieties, was handed down from generation to generation. There is a growing issue in the agriculture sector as a whole, where the younger generation is moving out in search of other livelihood opportunities. This problem is much more prominent in traditional paddy cultivation. Farmers' estimate that traditional farming knowledge will disappear within next 5-10 years, unless the younger generation can be motivated to engage in traditional paddy cultivation. While efforts such as documenting the traditional knowledge are quite important, motivating and providing an incentive for youth to engage in traditional agriculture is a major challenge.

Discussing challenges is not complete unless an attempt is made to identify steps to overcome them. Taking this responsibility, the Departments of Agriculture, through its regional offices, has started programmes to create awareness among farmers on the importance of adopting traditional paddy cultivation. More emphasis is placed on the promotion of traditional paddy cultivation as a health commodity. However, attempts are made to farmers on the environmental, and especially, the climate change resilience aspects of this. In order to promote traditional paddy cultivation as a potential business opportunity among farmers, the Department of Agriculture has implemented an educational programme to teach traditional farmers on how to identify markets and develop their cultivation as a profit oriented business. At the same time, it is making attempts to establish partnerships among traditional farmers and private businesses, so that farmers can sell their produce for a guaranteed price at their locality. Finally, the Department of Agriculture, in collaboration with Vocational Training Authority (VTA) of Sri Lanka, has established a National Vocational Qualification (NVQ) on traditional farming

practices for the younger generation as a way of motivating them to adapt traditional paddy cultivation. Furthermore, in addition to the Department of Agriculture, there are many NGO/INGOs that are working with farmers to promote traditional paddy cultivation, as a means of Community Based Adaptation (CBA) programmes.

Scope and Possibilities for Regional Cooperation and Information Sharing

Regional cooperation and information sharing is essential when promoting traditional paddy cultivation in Sri Lanka due to several reasons. The South Asian region is predominantly based on agriculture, while paddy cultivation is an important aspect of livelihood. Hence there is an accumulated knowledge in these countries which could be effectively shared. Agro-climatic condition of the region is more or less similar, therefore there is a great possibility that traditional practices in these countries can be transferred and adapted to suit particular country situations. For example, there could be well established traditional paddy cultivation methods in countries such as India and Bangladesh that could be adapted by Sri Lanka, in order to address the impacts of climate change. Apart from cultivation methods, there are many traditional varieties that could be shared among the region, especially as Sri Lanka has limited numbers of traditional varieties and is fast losing the current stock. Furthermore, the South Asian region is rich with many institutes that focus on promoting traditional agriculture. Regardless of whether these organizations are government, private, NGO/INGO, there is a greater possibility of collaborative research and information sharing. Information sharing is possible in many ways. One main avenue is to hold regional workshops and conferences to share and disseminate knowledge on traditional agriculture. Publishing the regional lessons learnt is also a possibility.

Conclusions

Traditional paddy farming is resilient to climate change. It is environmentally friendly, has a smaller carbon foot print and preserves bio-diversity. There is an increasing consumer demand for traditional rice and a huge potential for regional collaboration through research and transfer of technologies and paddy varieties. The government has identified the importance traditional farming and is encouraging practices with the aim of achieving environmentally friendly sustainable development. However, knowledge on traditional farming is limited to older generations and it is on the verge of extinction. Furthermore, these farmers only have access to the handful of varieties which are available today. Therefore, Sri Lanka needs to preserve, document, and disseminate, the knowledge on traditional paddy farming while making youth interested and encouraged to adopt these measures. Through this, it is quite possible to fight climate change impacts, preserve the environment, and produce a healthy staple food, while bringing lost traditions back to life.

References

Department of Census and Statistics, 2013, [http://www. statistics. gov.lk/ agriculture/ Paddy% 20Statistics/ PaddyStats.htm](http://www.statistics.gov.lk/agriculture/Paddy%20Statistics/PaddyStats.htm), visited online 15th July 2013.

S. Wiggins and J Brooks, 2010, "The Use of Input Subsidies in Developing Countries", Global Forum on Agriculture, OECD, Paris.

G Sharma and L,K Rai, 2010, "Climate Change and Sustainability of Agrodiversity in Traditional Farming of the Sikkim Himalaya, Mountain Institute of India, United Nations University, Tokyo and MacArthur Foundation.

G.K, Upawansa, 2013, "Nava Kekulam Method for Paddy Cultivation", <http://goviya.com/nava-kekulam.htm>, visited online, 15th July 2013.

W. Rathnabharathi, 2009, "Role of Traditional Paddy in Adaptation to Climate Change Impacts", Proceedings of the Role of Community in Adaptation to the Climate Change Crisis Workshop, pp 67-80.

P. Samaratunga, 2011,"If Exporting Rice in the short run is a Pressing Political Priority it could be done at Positive Private Profits but not Social Profits", Talking Economics, Institute of Policy Studies, Sri Lanka.

Sunday Times, 2013, "Government Slashes Supply of Subsidized Fertilizer", [http://www.sundaytimes.lk/ 130630/news/govt-slashes-supply- of-subsidised-fertiliser-51029.html](http://www.sundaytimes.lk/130630/news/govt-slashes-supply-of-subsidised-fertiliser-51029.html), visited online 14th July 2013.

K. Killebrew and H. Wolff, 2010, "Environmental Impacts of Agricultural Technologies", Evans Schools of Public Affairs, University of Washington.

M.A. Altieri, 2008, "Agroecology: Environmentally Sound and Socially Just Alternatives to the Industrial Farming Model", University of California, Berkeley, USA.



Policy Challenges

in Climate Adaptation in Sri Lanka: Identifying Major Gaps

by
Athula Senaratne

Being a tropical island located in a disaster prone region, Sri Lanka is vulnerable to impacts of climate change. The 2004 tsunami has indicated that a large extent of densely populated low lying coastal areas is vulnerable to a future rise in the sea level. The country has frequently been experiencing disaster prone weather extremes such as droughts, floods and cyclones. Predictions by global studies on climate change suggest that both intensity and frequency of such extreme events are likely to increase in the future. As a significant population of the country is directly dependent on weather-reliant livelihoods such as agriculture and fisheries, adverse changes in weather patterns could lead to chaotic conditions. Among the community groups that are more vulnerable to climate change impacts are residents in coastal areas, rain-fed farmers in the dry zone, fishing community, workers in the estate sector and small-scale producers of export crops.

Climate change is a complex challenge and well-designed policies for adaptation are necessary to face the impacts of it. Adaptation is a dynamic process of adjustment in response to changing conditions of climate. A pragmatic approach towards adaptation policy has to fulfil a few essential steps. They are: identify and evaluate likely impacts of climate change; assess vulnerability/adaptive capacity of key stakeholders; identify major gaps that affect effective actions against impacts; and, appraise alternative strategies for overcoming gaps so that the country can adapt to impacts in a successful manner.

Whereas some work has already been done to identify/evaluate impacts on at least a few sectors and assess the vulnerability of some key stakeholders, assessment and evaluation of gaps that could impede national efforts for adaptation appears to be poor so far. This article attempts to fill this void by exploring the major gaps that could affect climate adaptation in Sri Lanka.

Information from different sources indicates that five major gaps act as barriers to make effective adaptations against climate change impacts, namely:

- information gap,
- technological gap,
- policy and governance gap,
- institutional and coordination gap, and
- resource mobilization gap

A brief discussion of the nature and importance of these gaps is presented in the article. It argues that national agenda on climate adaptation should focus on overcoming these gaps at macro level policies as well as in sector level policies/strategies so that the country can face the threat of climate change successfully.

Information gap

Climate is an inherently uncertain phenomenon and anthropogenic causes of global warming increase the uncertainty even further. Uncertainty lies with real impacts of climate change at global, regional, national and local levels and successful adaptation needs information that could reduce uncertainty associated with impacts. Hence, Adaptation to climate change is essentially an information-driven process. Climate information could range from advanced information products and from sophisticated forecast models to laymen's practical experience about local weather conditions. Scientific climate forecasts and projections have a major role to play in bridging the climate information gap. The value of reliable climate forecasts is best illustrated in the recent event of cyclone Phailin—the second strongest cyclone to strike India. Improved forecasts helped the government to organize one of the largest evacuation operations saving many lives. On the other hand, a high loss of fishermen's lives due to poor communication of forecast information in Sri Lanka in June 2013 underscores the necessity of a reliable system of climate information.

As far as the situation in climate information is concerned, the Department of Meteorology (DM)—the nationally mandated climate information provider in Sri Lanka—offers a limited portfolio of climate information products (CIPs) which are channelled via different public media including its own website. It includes routine short-term weather forecasts on a daily basis and warnings/advisories on bad weather situations such as cyclones, heavy rains, lightning and high wind. DM has also recently launched the 'Monsoon Forum' with the aim of providing a seasonal outlook for a lead time around 3-6 months period in two monsoons, south-west monsoon and north-east monsoon. Those products are based on information from satellites, a network of weather stations around the country and global forecasts issued by international weather/climate research centres. In addition, some complementary products such as classification of agro-metrological zones published by the Department of Agriculture (DA) also exist. According to that, the country has been divided into a number of agro climatic zones based on long-term records of local rainfall and elevation classes (MSL). As far as scientific projections on long-term impacts of climate change are concerned, information so far available is based on basic level analysis of local meteorological data and intellectual speculation. Generation of more reliable projections is hampered by limited scientific capacity for developing locally applied models or downscaling local effects from global models. Even the few attempts made to downscale information from global models have limitations in terms of reliability and applicability of information for practical decision-making.

Given the scale of future challenges associated with climate change, this level of climate information availability can hardly be considered as adequate and there are major gaps in the existing

system of climate information and communication. Not only is the availability, but the quality of information is a major issue since the credibility of the existing information has been challenged on many occasions. This situation warrants little room for designing effective adaptation activities against impacts of climate change. Hence, major improvements in supply of climate information products (CIPs) are necessary to provide effective guidance to adaptive actions in different sectors.

Technological gap

It is widely acknowledged that innovative technological options are essential for successful adaptation. Except for a few developments in areas such as agricultural technologies, water management methods and sources of renewable energy, technological improvements for adaptation in many other areas remain largely unexplored. Even the existing technologies such as drought/flood resistant crop varieties cannot be considered as highly dependable to meet the demands that will be placed upon by uncertainties of climate change in the future. Considering this gap, the Climate Change Secretariat (CCS) of the Ministry of Environment and Renewable Energy (MERE) has initiated a project to undertake technology needs assessment (TNA) for adaptation and mitigation with the support of United Nations Environmental Programmes (UNEP) to identify measures and practices to decrease GHG emissions and to reduce vulnerability to climate change in different sectors. It focussed on identifying priority sectors that need technology improvements, removing barriers for deployment and diffusion of technologies, increasing the capacity of local institutions/experts and raising public awareness of climate change issues. The project has identified five sectors—food sector, health sector, water sector, coastal sector and bio-diversity sector—as priority areas of adaptation and three sectors—energy sector, transport sector and industry sector—as priority areas of mitigation to undertake technology development activities. Based on the findings of TNA and barrier analysis, the project has developed technology development action plans for adaptation and mitigation separately. While the outcome of the project may help to fill the existing technological gap to a certain extent by identifying necessary actions to improve the situation, developing a sound technological base may need time and resources. Hence, developing climate resilient technologies deserves priority attention of all stakeholders that includes public, private, community and non-government agencies.

Policy and governance gap

Recent efforts initiated by the Ministry of Environment and Renewable Energy (MERE) have helped to fill some gaps in policy on climate change at the national level. MERE introduced the National Climate Change Policy (NCCP) in 2012 that declared the national vision and policy principles on climate change. In addition, in 2010, the Ministry prepared the National Climate Change Adaptation Strategy (NCCAS: 2011-16) that identified strategic priorities and broad interventions to address them. Currently it is working towards preparing the National Adaptation Action Plan (NAAP). Beyond the purview of MERE, however, climate change issues are yet to receive the due attention of policy makers at macro as well as sector level policies. Even the activities of interested researchers, academics, development workers have somewhat been restrained due to poor policy recognition of the matter. No priority has been assigned to identify the impacts of climate change on many sectors of the economy or to initiate necessary policy actions to overcome them. This cannot be considered as a favourable situation for a vulnerable country like Sri Lanka. Overall, despite some recent efforts by MERE, a significant gap exists in policy and governance

of climate change issues in Sri Lanka that needs to be addressed through carefully designed policies with the participation of public sector as well as non-state actors such as community organizations, private sector, and civil society organizations.

Institutional and coordination gap

A decision-making framework on climate change is slowly emerging in Sri Lanka with the initiation of limited policy developments mentioned earlier. The Ministry of Environment and Renewable Energy (MERE) plays the leading role here. The Ministry's activities are spearheaded by the Climate Change Secretariat (CCS)—the national focal point for coordinating climate related actions at all levels including international negotiations. However, climate change is a complex problem that cannot be governed through efforts of a single ministry or a line agency alone. Impacts of climate change are spread over multiple sectors as well as different regions across the country. The multi-sector, multi-regional impacts imply that no single ministry, department, authority or provincial/local government body can take the burden singlehandedly without the cooperation of other stakeholders. Currently, different activities are undertaken by various agencies in an ad-hoc manner without proper coordination. Not only government agencies, but a significant number of non-state actors are also undertaking various initiatives on climate change. These efforts need to be coordinated so that the desired policy outcomes are achieved. Government organizations and non-state actors should work together as a broad strategic alliance against climate change impacts through a coordinated effort. The gaps identified above—especially, information and policy gaps are also contributing to some extent apart from the coordination gap that exists between relevant organizations and stakeholders. Currently, CCS is trying to achieve some level of coordination through a system of inter-agency committees on adaptation and mitigation which is participated by different stakeholders including academics. This situation needs to be improved further and a proper institutional mechanism that can coordinate numerous individual initiatives has to be developed.

Resource mobilization gap

A major constraint faced by developing countries such as Sri Lanka when taking adaptive actions against climate change is the scarcity of resources. The government is burdened with numerous fiscal and monetary difficulties to find extra resources for facing climate change issues. Therefore, conventional channels of public finance alone cannot be relied upon to meet the resource needs of adaptation and mitigation. In this connection, innovative strategies of resource mobilization should be identified for mobilizing resources from sources other than public funds—i.e. international and non-state local sources such as the private sector. Particular attention should be given to utilizing opportunities available at international sources of funding available to support adaptation activities. Currently, international mechanisms have been developed to support migratory measures that reduce GHG emissions such as Clean Development Mechanism (CDM) and program for Reducing Emissions from Deforestation and Degradation of Forests (REDD+). Although efforts are being taken to establish multi-lateral funding facilities for supporting adaptation in developing countries, they are not successful yet. However, many existing multi-lateral and bi-lateral donors have identified adaptation as a priority area of development support and therefore international sources for mobilizing resources are gradually rising. Hence, the country should be alert on such sources and develop strategies and sound proposals to capture opportunities made available by such sources. Such funding are becoming available in areas such as research on adaptation, livelihood support for adaptation,

technical support for developing adaptive technologies and institutional capacity building. In addition, established funding facilities such as Global Environment Facility (GEF) also provide support for adaptation. Besides, public-private partnership activities, community-based initiatives, programmes of civil society organizations and corporate funding from the private sector are other alternative sources for channeling resources for adaptation. Lack of necessary resources is fundamental to all other gaps mentioned above and without sufficient resources none of the desired improvements are possible. On the other hand, gaps created by poor information, lack of policy focus and absence of institutional mechanisms could hamper the chances of mobilizing resources too.

Overcoming the gaps

Overall, despite the high vulnerability, the present readiness of the country to face the climate change impacts can hardly be considered adequate. The major gaps concerning information, technology, policy/governance, institutions and resource mobilization can be considered as major barriers that act against the successful adaptation to climate change impacts. They reduce the adaptive capacity and increase the vulnerability of individual citizens as well as the nation as a whole. Hence, overcoming them is an essential condition for facing the threat of climate change. Therefore, all national and local initiatives on climate change should focus on creating conditions necessary to overcome these gaps. Overcoming these gaps in a successful manner would enhance the prospects for facing the challenge of climate change in an effective manner thereby helping to achieve the long-term goals of sustainable development of the country too. In essence, this situation implies that the national agenda on climate change should be built upon five major pillars—a climate information system, programme for development of adaptive technologies, policy and governance of adaptation, well-coordinated institutions and a mechanism for resource mobilization. Such an agenda should be aimed at mainstreaming climate change issues within the overall national goals of sustainable development. The success of a national agenda would largely be determined by the effectiveness of measures taken to overcome the major gaps highlighted in this article.

References

- Climate Change Secretariat (2011), Second National Communication on Climate Change, Ministry of Environment, Colombo, Sri Lanka.
- Institute of Policy Studies of Sri Lanka (2013) Chapter 8: Facing Climate Change Threats: The Importance of Better Information. Sri Lanka State of the Economy 2013, Colombo, Sri Lanka
- Institute of Policy Studies (2013) Climate Change Issues in Sri Lanka. A compilation of articles published in CLIMATEnet blog from Jan-Dec. 2013, Colombo, Sri Lanka
- Ministry of Environment (2012) National Climate Change Adaptation Strategy for Sri Lanka 2011-2016, Colombo, Sri Lanka
- Ministry of Environment (2012) The National Climate Change Policy of Sri Lanka, Colombo, Sri Lanka
- Ministry of Environment and Renewable Energy (2012) Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation: Technology Action Plan, Colombo, Sri Lanka
- Ministry of Environment and Renewable Energy (2012) Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation: Technology Action Plan, Colombo, Sri Lanka
- Senaratne, A., N. Perera and K. Wickramasinghe (2009) Mainstreaming Climate Change for Sustainable Development in Sri Lanka: Towards a National Agenda for Action. Working Paper Series No.14, Institute of Policy Studies, Colombo, Sri Lanka
- World Meteorological Organization (2013) Statement on the Status of the Global Climate in 2013, Geneva, Switzerland



Sri Lankan Perspective of the Clean Development Mechanism (CDM): Approach towards Climate Change Mitigation

by
Chatura Rodrigo

Background: Introducing the CDM

As defined by Article 12 in the Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC), the Clean Development Mechanisms (CDMs) are one of three flexible mechanisms established with the purpose of assisting Annex I countries of the UNFCCC to archive their committed amount of emission reduction in cost effective ways. It also allows contributions for the sustainable development of Non Annex I countries such as Sri Lanka.

The CDM is one of the Protocol's "project-based" mechanisms; in that the CDM is designed to promote projects that reduce emissions. The CDM is based on the idea of emission reduction "production". These reductions are "produced" and then subtracted against a hypothetical "baseline" of emissions. The emissions baselines are the emissions that are predicted to occur in the absence of a particular CDM project. CDM projects are "credited" against this baseline, in the sense that developing countries gain credit for producing these emission cuts.

Since 2001, the CDM projects have issued 1 billion Certified Emission Reduction (CER) units. Approximately, 63% of all CERs had been issued for projects based on destroying either Hydrofluorocarbons (42%) or Nitrous Oxide (21%), which is a conventional way of creating CERs. However, at the moment, the European Commission is proposing a full ban on CER's from industrial gas projects. More than 1,000 CDM projects have qualified for carbon credits. Most of these are large-scale activities in the energy sector; in the waste sector, subsidized technologies include landfill gas, incineration, and cement kilns. India and China are the biggest takers, with a combined share of more than 50% of the projects. With some 3000 more projects awaiting registration, the CDM expects to generate nearly 3 billion CERs by 2012. Trade in CERs currently runs to an estimated US\$ 10 bn a year. This has fueled a gigantic, global carbon trading market that is raking in huge profits for financing companies, consulting firms, brokers, and other market players. Currently there are five exchanges trading in carbon allowances: the European Climate Exchange, NASDAQ OMX Commodities Europe, PowerNext, Commodity Exchange Bratislava, and the European Energy Exchange.

The economic basis for including developing countries in efforts to reduce emissions is that the emission cuts are thought to be less expensive in developing countries than developed countries. The main official condition for a developing nation to be a part of this is: (1) developing countries have ratified the Kyoto Protocol, and (2) developing countries have established the Designated National

Authority (DNA). There are some unofficial conditions also: holds the minimum annual Carbon dioxide emissions, exultance of baseline data, local capacity as a condition for effective CDM market participation, capacity of the DNA and possess a strong network of all the stakeholders. Among the developing nations, only 67% are able to satisfy both the official conditions. Therefore, despite the cost benefits, the official and unofficial conditions create limitations for developing countries to take part in CDM initiatives. Sri Lanka in this respect is no exception, and a sound CDM policy and a well-established DNA is absolutely essential if it is to take full advantage of CDM initiatives.

Sri Lankan Context

In February 2009, the Ministry of Environment and Natural Resources as the focal point, or the DNA, to the UNFCCC and Kyoto protocol, developed the draft national policy on CDM and published it for public comments. After several amendments, the national CDM policy was developed as an interim policy. The objective of the national CDM policy is to "contribute to sustainable development through developing and establishing the institutional, financial, human resources, and legislative framework necessary to participate in Clean Development Mechanism (CDM) activities under the Kyoto Protocol while developing a mechanism for trading "Certified Emissions Reductions" (CER) and "Removal Units" (RMU) earned through CDM activities". How far these objectives are close to being achieved remains to be evaluated.

For Sri Lanka, the projects suitable for emission trading opportunities fall in to the power, agriculture, waste, and transport sectors. Among these, the energy sector has been identified as having the highest potential. The current electricity consumption in Sri Lanka stands at 9.268 billion kWh. There is a potential for some of this energy requirement to be produced as CDM projects. Studies have suggested that the abatement cost of greenhouse gasses under CDM projects in Sri Lanka is very high for the options of solar and wind as energy alternatives; therefore making them impractical options for CDM projects. However, other renewable energy options such as hydro power and bio mass power projects have proven to be viable as CDM projects. There is a possibility that the 1.7 million hectares of scrub and chena lands of the country could be used for reforestation and energy plantations, making them ideal for CDM projects. Research suggests that Sri Lanka could earn Rs. 5740 per ton of carbon, by using only 10% of the 1.7 million hectares of the above mentioned land for reforestation.

Up to now, several initiatives have already been taken up by Sri Lanka to implement CDM projects. There are seven CDM projects in Sri Lanka that have been registered at UNFCCC as of September 2011. The Table below summarizes the details of the CDM projects, in addition to those already registered, in Sri Lanka at the moment.

Status	Number of projects	Sector
Registered : registered at UNFCCC as of September 2011	7	Hydro power and biomass
Validation: stage where the CDM projects are being validated by the Designated Operational Entity (DOE).	9	biomass, dydro power, methane avoidance/recovery/utilization and wind power
Project Design Document (PDD)	12	biomass, energy efficiency and dydro power
PIN: approved in principle by the DAN	20	afforestation and reforestation, biomass, dydro power and wind power
Project idea	2	represent energy efficiency and methane avoidance/recovery/utilization in

Issues in the CDM Sector

In Sri Lanka, complexities in the processes and methodologies combined with insufficient guidance have created constraints for the DNA when attempting to bundle small projects as well as when identifying the bundling sizes. This has also led to an inability to use donor funds efficiently. Sri Lanka lacks baseline data and this has limited the validation capacities of the CDM projects. It is important that Sri Lanka attracts investors of CDM projects through the effective communication of the potential. However, Sri Lanka has limited strengths in this aspect.

Large hydro power and energy efficiency projects are a good prospect for Sri Lanka, but they have been constrained by high investment costs. This is fueled by the limited availability of public and private sector organizations that have suitable investment and financial frameworks, with associated incentives and fiscal instruments. Even though the Sri Lanka Carbon Fund (SLCF) was established to assist the developed of CDM projects through technical and financial interventions, the implementation of the SLCF is constrained by the lack of financial resources and man power. While commercial banks are keen on financing CDM projects, the use of traditional evaluation methods lacks the ability to account for the high risks associate with CDM projects.

Sri Lanka is also comprised of relatively small CDM projects, and is therefore, less attractive to the global carbon market. Even though most of the time these projects have many environmental and social benefits compared to larger projects, high transaction costs against small returns from CERs are a major limitation. The attraction of potential developers could be hindered by the rejection of projects, especially from countries that have less than 10 projects.

Suggestions to Improve the CDM Sector

Over the past several years, many suggestions have surfaced that could potentially eliminate majority of the issues related to CDM initiatives. However, the practicality of these suggestions needs to be evaluated carefully. Among the many, following are some of the suggestions that proved to be viable:

The programmatic CDM projects are extremely beneficial for the sustainable development of the country. A programmatic CDM project activity is one where the emission reductions are achieved by multiple actions executed over time, as a result of a government measure or a private sector initiative. Examples include grants or soft loan programmes to promote energy efficiency; such as, fuel switching activities or the use of renewable energies by private households, in the transportation sector or by small enterprises; as well as voluntary or mandatory efficiency standards for equipment or facilities. Additionally, the capacities of the DNA staff needs to be developed in the methodologies and procedures of CDM, and both China and India have very strong resource pools to support this. In the end, both capacity development and programmatic CDM projects can address the issue of the high transaction costs faced by Sri Lanka.

A clear understanding of the sector is essential for a CDM project to be initiated; therefore baseline studies are essential. Additionally, information is required on the priority areas of the country as well as on the non-eligible activities. Even though the Environment Impact Assessments (EIAs) and Social Impact Assessments (SIAs) are done where necessary, it is essential to conduct on-going and post assessments of the social, environmental, and economic impacts of the CDM interventions. Additionally, the DNA should establish CDM catalogues and investor guides. Therefore, a strong research component is needed within the DNA. Project developers should be encouraged to link with initiatives such as the CDM Bazaar. These initiatives can play an important role in matching the parties with regards to establishing insurance schemes for financial institutions that fund CDM projects.

It is of the utmost importance that the approval procedures of the DNA are clear and transparent and there ought to be a well-established mechanism for the monitoring of the project approval process. Documenting successful projects and the dissemination of this information also then becomes an important way of attracting more developers of CDM projects.

Conclusion

Sri Lanka has a high potential to implement CDM projects. Being a developing country with many opportunities for CDM projects in many areas, Sri Lanka is under the careful watch of the CDM project implementers. Sri Lanka has a sound CDM policy, developed through public participation and several careful amendments. In accordance with the key policy statement of the incumbent government, "The Mahinda Chinthana", the necessary institutional background is formed for CDM operations and one would expect more CDM projects to have been implemented in the country by now. As discussed here, many of the constraints were only discovered once the operations began, with the establishment of the DNA and formulation of the policy. Therefore, Sri Lanka needs technical support and guidance, more capacity building and sound ways of attracting potential investors in order for the CDM sector to grow.

The UNFCC Doha conventions of December 2012 possess more challenges for the CDM sector globally. Latest findings have shown that larger scale hydro and coal power projects are not efficient in a CDM context. Additionally, potentially expanding sectors like rubber industries were heavily discouraged. At the same time, among several others, suggestions to enhance the contribution of the CDM projects towards sustainable development were also rejected during the discussion. However, agreements were made to carefully review the modalities and procedures of the CDM during 2013. The CDM sector of Sri Lanka will also definitely be affected by these decisions; therefore, it is essential that a fruitful dialogue is developed with all the stakeholders, to address the local as well as global issues related to CDM projects.

References

Batagoda, B.M.S. (2006), "National Carbon Finance Strategy of Sri Lanka: Final Draft for Discussions" Ministry of Environment and Caron Finance Program of the World Bank, accessed on line 2nd January 2013

Batagoda, B.M.S. (2002), "Sri Lankan policy perspectives on the Clean Development Mechanism (CDM) and the Kyoto Protocol", in *Journal of Energy for Sustainable Development*, Volume 6, Issue 1, pp. 21-29

United Nations Environment Program (UNEP) Risoe Center (2009) Developing Programmatic CDM Activities in Sri Lanka, A report on Technical Assistance Submitted to Sri Lanka Carbon Fund , accessed online 2nd January 2013.

Kasturiarachchi K.A.K. (2013), Clean Development Mechanisms, Global Affairs Division, Ministry of Environment and Natural Resources, Sri Lanka, Power Point Presentation, accessed On line , 3rd January 2013.

Ministry of Environment and Natural Resources, Sri Lanka, http://www.climatechange.lk/ccs_index.html, visited 4th January 2013.

United Nations Framework Convention on Climate Change, <HTTP://http://cdm.unfccc.int>, visited on 4th January 2013

Yogarathnum N. (2013), Global Warming & climate change issues remain unresolved, http://www.dailynews.lk/2013/01/30/main_News.asp, visited on 2nd January 2013

Ministry of Environment, Sri Lanka and Japan International Cooperation Agency (2012), CDM Portfolio, Sri Lanka: The Projects for Capacity Development of CDM, accessed Online 3rd January 2013

Alan Silayan (2005), Equitable Distribution of CD Projects Among Developing Countries, Hamburg Institute of International Economics, accessed Online 3rd January 2013

United Nations Environment Program (2011), HFCs: A Critical Link in Protecting Climate and the Ozone Layer, A UNEP Synthesis Report, accessed Online 6th January 2013

Department of National Planning, Government of Sri Lanka (2010), "Sri Lanka the Emerging Wonder of Asia, Mahinda Chinthana: Vision for the Future, accessed Online 6th January 2013.



Certified Emission Reduction (CERs) Trading with EU Emission Trading System (EU-ETS): Are Developing Countries in a Crisis?

by
Chatura Rodrigo

Introduction

Emission Trading Systems (ETSs) allow economies to trade the Certified Emission Reductions (CERs) through an open market mechanism. Countries engaging in Clean Development Mechanisms (CDM) projects generate CERs and then trade them, allowing project implementers to make profits while reducing carbon dioxide (CO₂) and other greenhouse gas emissions. The European Union's Emission Trading System (EU-ETS) was the main market place to trade the CERs generated through these CDM projects.

However, in their 2013-2020 agenda, the EU-ETS decided to only allow the trading of CERs that are being generated through CDM projects implemented in Least Developing Countries (LDCs). Currently China and India are the main traders at the EU-ETS, and will definitely be affected by this decision. The first part of the article will provide a glimpse of the history of CERs, and how that developed into a market mechanism. Next section will briefly introduce the EU-ETS and its importance to developing countries as a means of trading CERs. The latter part of this article will look at two decisions that the EU-ETS had taken, and how they will affect developing countries that are engaged in CDM projects particularly from a Sri Lankan perspective, as a country that is increasingly encouraging CDM projects.

Trading Certified Emission Reductions (CERs) from CDMs: Background

The Annex B countries of Kyoto protocol, have committed to limit emissions of greenhouse gases within their borders. The limits that these countries are allowed are identified as "Assign Amount Units (AAU)". Initially these targets were set for 2008-2012, and new targets are being proposed for the 2013-2020 period. Countries exceeding their AAUs are allowed to trade these with

other countries that are behind their AAU limits. In order to make this a working market mechanism, market commodities focused on CO₂ (since it is a principle greenhouse gas) were created, and are referred to as CERs. In addition, there are other trading units such as Removable Units (RMUs) and Emission Reduction Units (ERUs). These units are created through land use change, forestry projects, and joint implementation projects. The EU-ETS is the largest platform in operation in which countries can trade CERs. However, there are other places that CERs can be traded apart from EU-ETS, such as the European Climate Exchange, Chicago Climate Exchange, Commodity Exchange Bratislava, European Energy Exchange, NASDAQ OMX Commodities Europe, and PowerNext.



In CER trade, one trading unit is the equivalent of one metric ton of CO₂ emissions. This in turn is equivalent to one CER unit, or one permit. Units can be traded between countries on a one-to-one basis or in a market system such as in the EU-ETS, which is the most favored method. These transactions happen under the purview and regulation of the United Nations Framework Convention on Climate Change (UNFCCC). In addition, when these CERs are being traded under the EU-ETS, they will be validated separately by the European Union. In the EU-ETS, the price of a permit is quoted in Euros.

The EU's Emission Trading Scheme (ETS)

EU-ETS is operational during certain trading periods. The first period of trade started in January 2005, and went up to December 2007. The next was from 2008-2012. The third and current trading period will start from 2013 and go up to 2020. Approximately 30 countries and around 12,000 installations are covered by the EU-ETS and it accounts for the trading of 41% of the EU's CO₂ emissions. The installations cover many areas such as steel plants, factories that manufacture cement, glass, lime, brick and ceramics, power and heat generators, and also combustion plants and oil refineries.

In their 2013-2020 agenda, EU-ETS expects to further reduce their emissions by 21%, which means that there will be more opportunities for CERs generated through CDM projects. However, among other changes, the EU-ETS has announced that these CERs should specifically come from LDCs.

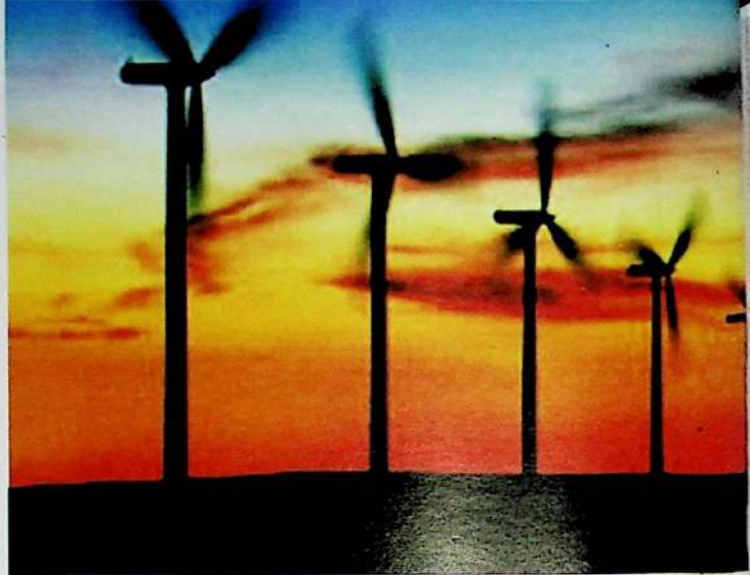
The argument put forth by the EU-ETS is that while majority of CDM projects were undertaken by fast developing countries, such as India and China, they prevented the LDCs from developing sustainable CDM portfolios. This was a heavily debated point of the 2013-2020 agenda of the EU-ETS, where they stressed upon the importance of providing equal access to LDCs. At this point, it is too early to settle on one camp of argument; however, it is not too early to begin the discussion on the consequences these changes will have on other developing countries, such as Sri Lanka.

While the steps taken by the EU-ETS is a noble effort in creating equitable opportunities for LDCs, some have put forth a rather sinister alternative explanation. Critics of the new EU-ETS agenda argue that the new regulations are specifically to eliminate countries, such as India and China, with impressive growth rates, from the CDM equation altogether.

Impact of EU-ETS Decision: Future for Developing Countries

Almost all developing countries trade their CERs through EU-ETS. Therefore, for developing countries like Sri Lanka, this poses a very real problem.

It is important to look at the situation in context. Almost 80% of CDM projects are located in India, Mexico, China, and Brazil. If we look at Africa, it is home only to 2.9% of the total CDM projects equal to roughly, 260 out of more than 4,000 projects. Of that number, more than 100 CDM projects are located in South Africa, Nigeria, Kenya, Egypt, and Morocco – and none of these countries qualify for LDC status. Therefore, for CDMs registered from January 2013, a new market place is needed.



Experts opine that the CER trade of developing countries will move on to other places, such as Australia and New Zealand. Some even argue that fast developing countries like China and India might open up their own markets. However, the fact remains that economies have failed to invent or create new markets. Therefore, the alternatives that economists are suggesting at the moment might not come to fruition in the near future. On a positive note though, China and India have already made some interesting progress. China is to establish a trading scheme, which could allow its own increasing greenhouse gas emission targets, based on emission intensity targets. Furthermore, India put forward an energy efficiency scheme that operates on Performance, Achievements and Trade (PAT) systems. In addition, South Korea is also planning to establish a CER trading system which could be a potential market place for developing countries.

It is conceivable that China and India would not let the EU-ETS decision damage their market potential, and likely to provide developing countries, such as Sri Lanka a lifeline. What was once a concept has now developed into a 100 billion Euro market, therefore the outlook for developing countries remains positive and optimistic.

Sri Lankan Scenario

At the moment, there are 7 registered CDM projects implemented in Sri Lanka. Five of them are mini-hydro projects, one is a biomass power generation project, and the other is a coconut shell charcoaling and power generation project. These projects are classified under the category of "small scale projects". The amounts of reductions vary from 5000 metric tons of carbon dioxide to 45,000. The other parties involved in these projects are mainly Japan, Switzerland, and Netherlands. What is being generated is mainly being traded through the EU-ETS.



With regards to the recent changes in the EU-ETS, one possible argument is that as Sri Lanka's CDM industry is still in its infancy – adaptation will come relatively painlessly. India and China will have established markets by the time the industry is fully grown, hence, Sri Lanka's future CERs will have a trading platform. However, from an economic perspective it is difficult to find favour with this argument, mainly on the grounds of opportunity cost. What is the opportunity cost of a CDM implementer in Sri Lanka, to forgo the possibility of shutting down when the CERs were not traded as planned? Furthermore, what would be the risk premium of a new CDM implementer, who now has to look for a new market place to trade the CERs?

While our CDM industry is still at an infant stage, the investment costs are huge for us. There are more than 40 projects in the pipeline to be approved, which means that they will commence after January 2013 and will face the challenge of trading the CERs. Sri Lanka has already compiled an interim policy on CDM implementation. The Ministry of Environment and Renewable Resources of Sri Lanka has established a Climate Change Secretariat that is increasingly engaged in the CDM industry. The government has invested a great deal in terms of establishing a DNA (Designated National Authority) for CDM approvals with infrastructure and staff. Therefore, in terms of public spending, the government would not want these investments to be classified as a sunk cost.

Sri Lanka needs to worry about the possibility of losing a market place for CER trading and it needs to be proactive in avoiding losses. Possible negotiations and close contacts with potential economies that would start CER trading markets would be a good place to start. Further, a dialog has to be initiated among the policy makers as well as potential and current CDM implementers, to discuss these matters more deeply, and to formulate strategies collectively.

References

The Environment Defense Fund, 2012, Report: The EU Emission Trading System, <http://www.edf.org/climate/eu-emissions-trading-system-report>, last accessed 1st March 2013

The European Union Climate Action, 2013, What is EU Doing about Climate Change, http://ec.europa.eu/clima/policies/brief/eu/index_en.htm, last accessed 1st March 2013

Center for European Policy Studies, 2013, CDM and Post 2012 Flexible Mechanisms, <http://www.ceps.eu/taskforce/cdm-and-post-2012-flexible-mechanisms>, last accessed 2nd March 2013

Chris, Lang, The REDD-Monitor.org, 2013, EU Carbon Trading Scheme in Crisis: Save it or Scrap it? <http://www.redd-monitor.org/2013/02/15/the-eu-carbon-trading-scheme-in-crisis-save-it-or-scrap-it/>, last accessed 2nd March 2013

United Nations Environment Programme, 2012, Certified Emission Reductions, http://www.dehst.de/SharedDocs/Downloads/EN/Publications/Fact_Sheet_CER.pdf?__blob=publication-File, accessed on line 1st March 2013.

Sipho King, Mail and Guardian, 2013, South Africa in the Red on Carbon Offset Credits, <http://mg.co.za/article/2012-11-02-sa-in-the-red-on-carbon-offset-credits>, last accessed 3rd March 2013

International Emissions Trading Association, 2012, the EU's Emission Trading System, http://www.ieta.org/assets/3-Minute-Briefings/phase%203%20eu%20ets_final.pdf, accessed online 3rd March 2013

Climatico, Independent Analysis of Climate Policy, 2013, The Future of International Emissions Credits in the EU-ETS, <http://www.climaticoanalysis.org/post/the-future-of-international-emissions-credits-in-the-eu-ets/>, last accessed 3rd March 2013

Sam Fankhauser, The European Financial Review, 2013, Carbon Trading: A Good Idea is Going through Bad Pitch, <http://www.europeanfinancialreview.com/?p=2854>, last accessed 3rd March 2013

Europa Press Releases, 2011, Emission Trading: Commission Welcomes Vote to Ban Certain Industrial Gas Credits, http://europa.eu/rapid/press-release_IP-11-56_en.htm, last accessed 1st March 2013

Ministry of Environment and Renewable Energy, 2013, Climate Change Secretariat, Sri Lanka, http://www.climatechange.lk/ccs_index.html, last accessed 1st March 2013

Ministry of Environment and Renewable Energy, 2013, Clean Development Mechanisms, http://www.climatechange.lk/DNA/index_dna.html, last accessed 3rd March 2013.

posted by nalaka_ips_blogger at 2:08 PM



TOWARDS A GREEN ECONOMY IN SRI LANKA: A FORESTRY PERSPECTIVE

by
Nimal Gunatilleke

Sri Lanka, having been elevated to a 'Middle Income Emerging Market' by the International Monetary Fund in 2010, is steadfastly striving further to enjoy even a higher level of growth, and human well-being. However, at this crucial juncture in its accelerated development drive, the economic growth of Sri Lanka need to be steered along an economically as well as ecologically sustainable path incorporating the ideals of Green Economy advocated by the United Nations Conference on Sustainable Development (Rio + 20, 2012). At this global summit, the member states including Sri Lanka decided to launch a process to build a green economy to achieve sustainable development goals and converge with the post-2015 development agenda (<http://www.uncsd2012.org>).

UNEP defines a green economy as one that is low-carbon, resource efficient, and socially inclusive which would result in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. This means that in a green economy, growth and employment are driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and minimize the loss of biodiversity and ecosystem services. The strategic objective in transition to a green economy is therefore, to facilitate economic growth and investment while at the same time taking measures to enhance environmental quality and social inclusiveness leading to sustainable development. According to an IMF report in 2006, the world economy has quadrupled over the last quarter century, but at the same time on the flip side, 60 per cent of the world's major ecosystem goods and services that

underpin livelihoods have been degraded or used unsustainably. (Millennium Ecosystem Assessment, 2005).

The common perception that the greening of economies inhibits wealth creation and employment opportunities, and that it is a luxury that only wealthy countries could afford, is changing rapidly. Developing countries like Sri Lanka are facing major challenges like increasing climate change impacts, energy insecurity and ecological scarcity. A green economy can address these challenges by opening up development paths that are increasingly carbon neutral, promoting resource and energy efficiency and lessening environmental degradation. Many green sectors could provide significant opportunities for innovative research on sustainable development, incorporating traditional wisdom and indigenous knowledge with modern science in meeting the above challenges. This is especially significant for a small country like Sri Lanka with a proven history of sustainable development over centuries while conserving our richly endowed natural capital. Greening of economy of Sri Lanka has the potential to be a new engine of growth, a new generation of green employment opportunities and a vital strategy to eliminate persistent poverty in a range of important sectors viz., agriculture, forestry, fisheries, fresh water and energy.

Forests are a foundation of the green economy pillaring much of the earth's ecological infrastructure. Forest goods and services are important components of a green economy supporting the economic livelihoods of over one billion people globally, most of whom are in developing countries. Natural forests of Sri Lanka

are not utilized for timber extraction any more, having reached a critical minimum of natural forest cover. However, they are still a home to important non-wood forest products (NWFPs) that make a significant contribution to local economies and livelihoods by provisioning food, medicinal and/or health-care resources which are also emerging as export commodities. In addition to these

forests being a key component of our natural capital, they also make a vital contribution to ecological service infrastructure (such as carbon sequestration, biodiversity, water and soil conservation, pollination etc.) and also, in no small measure, to nature-based tourism for which Sri Lanka has already gained global recognition.

In an emerging greener economic climate in the forestry sector of Sri Lanka, the apparent failures in policies, governance and markets while moving towards unplanned rapid development could eventually affect the very resource base that has the potential for innovative sustainable development that is inherently unique to Sri Lanka. The increasing loss of forests for competing land uses for such unplanned development projects is the result of such policy and governance failures that render forest degradation and eventual deforestation. These are compounded by market failures, as not all of the vital ecosystem services provided by natural forests are captured in markets and hence in the national accounting systems, thus risking future investments in green economic initiatives.

At a global level, there is a significant paradigm shift to include ecosystem goods and environmental services in to national accounting systems. At the 2010 Biodiversity Summit held in Nagoya, Japan, 193 countries agreed to a strategic target to incorporate the values of biodiversity into national accounting and reporting systems by 2020. A major step towards achieving this vision was taken recently with the adoption by the UN Statistical Commission of the System for Environmental-Economic Accounts (SEEA). The SEEA provides an internationally agreed method, on par with the current System of National Accounts (SNA), to account for natural resources like minerals, timber, and fisheries. This was followed by the UN led study, *The Economics of Ecosystems and Biodiversity* (TEEB, 2010), which called for national accounts to be upgraded to include the value of changes in natural capital stocks and ecosystem service flows. The Rio+20 agreement calls for taking steps to go beyond Gross Domestic Product (GDP) to assess the well-being of a country. In traditional market economics, the macro-economic policies are largely based on information flowing from the System of National Accounts often measured by the GDP. The GDP looks only at one part of the economic performance – national income and output – but does not take into account the sustainability of its wealth or growth. For example, when a country exploits its non-renewable natural capital like mineral resources or fossil fuels, it is actually depleting its wealth which is not captured in conventional GDP measures. Similarly, pollution and declining of ecosystem services resulting from such activities have thus far been treated as 'environmental externalities' and not appearing anywhere in national accounts. In a green economy, the world is aiming to move beyond traditional GDP and initiate incorporating their natural capital into their national accounts to make better informed decisions.

A recent report by the TEEB for Business Coalition estimates that the global top 100 environmental externalities (= impacts) are costing the economy world-wide around US\$4.7 trillion a year in terms of the economic costs of greenhouse gas emissions, loss of natural resources, loss of nature-based services such as carbon

storage by forests, climate change and air pollution-related health costs (Trucost, 2013).

Taking all these emerging scenarios into account, there are both challenges and opportunities for greening the forestry sector further in Sri Lanka by moving towards i) the re-establishment of connectivity among remaining fragmented protected areas through forest restoration to improve the quality of natural forest capital, ii.) the establishment of economically and ecologically sustainable forest management criteria and indicators based on green economic criteria for certification (including forest plantations, mixed forest gardens and agroforestry systems), iii) the implementation of the concept of reducing emissions from forest degradation and deforestation (REDD+), iv) capturing the true contributions of forests in national accounting systems and v) consideration of payments for ecosystem services (PES).

The PES system is currently gaining wide acceptance (but not without a share of its critics) in both developed and developing countries where forest land owners are paid annually for providing watershed protection, carbon storage, recreation, biodiversity conservation etc. For example, the New York City water utility, faced with the need to improve water quality, provides incentives to farmers and owners of forest lands in the catchment areas to conserve the forest and adopt environmentally friendly management measures. This has apparently proved far less costly than building water-filtration systems (Landell Mills and Porras, 2002). Similarly, in north-east France, the mineral water producer, Vittel, has paid local land-owners for conserving the watershed (Perrot-Maitre, 2006). There are similar sustainable examples from developing countries like Ecuador and Costa Rica. In Sri Lanka too, there are ample opportunities for researchers to critically examine the feasibility of implementing REDD+ and PES schemes at the levels of village, district, province and the entire country which will capture their true contribution to accounting at each respective level and eventually at the national accounting system. This would help to internalize the wholesome value of forest ecosystem services for forest land owners (including mixed-species forest garden owners) and ensure that the forests are worth more standing than cleared for alternative land use (Viana, 2009). In Sri Lanka, we already have excellent historical examples like the Ellangawa – the cascade system of irrigation water management – with due consideration given for their watershed conservation. In a more recent development, over 70 per cent of tea cultivation is in the hands of small-holders owning less than two hectares per family mostly in the lowlands. They are interspersed among the mixed-species homesteads forming a landscape mosaic of forest and tea gardens. Some of these have diversified further by incorporating economically important tree crops as shade trees, spice plants etc. A wholesome environmental economic valuation may find that the ecosystem services and goods provided by such a landscape mosaic may be greater than the conventional monoculture tea plantations, exotic timber plantations or expanding vegetable cultivation in environmentally sensitive mountain areas of Sri Lanka.

The social impacts of reforestation involving large scale monoculture exotic cash-crop plantations in critical watersheds is very controversial in many countries and Sri Lanka is no exception. There is increasing evidence from countries like South Africa, where over 1.5 million ha of fast growing and high yielding monoculture plantations mostly of exotic tree species like those of Eucalyptus are spread over into watersheds, that these do affect stream flow and catchment water yield. The National Water Act 1998 of South Africa based on long-term hydrological

research has taken measures to regulate the stream-flow reduction activities and limit the spread of further afforestation in critical catchments where available water resources are fully or over-committed (Dye and Versfield, 2007).

In the Sri Lankan context, the National Physical Plan for Sri Lanka from 2011- 2030, proposes reforestation of areas in the 'central fragile area' having slopes with a gradient over 60% in four districts viz. NuwaraEliya, Ratnapura, Kandy and Kegalle totalling 133,630 ha that are currently under cultivation (Anon., 2008). This being the main catchment area of almost all major rivers of Sri Lanka, the choice of species for reforestation needs critical scientific evaluation with emerging evidence from other countries as to raising fast-growing exotic monoculture tree plantations in the prime watersheds. The FAO underscores the significance of maintaining cloud forests for production of water, erosion control and biodiversity by stating that conservation of such forests designated as protected areas should be a national priority (Hamilton, 2008). There exists a huge void in research on restoration of degraded montane cloud forests of Sri Lanka with native species and their economic valuation. Therefore, it is of vital importance that restoration research in mountain areas be given the highest priority in forestry research and development.

The biofuel plantations are also promoted as a green energy source in Sri Lanka as in many other countries in the world. However, some of the species used are known to be heavy water users and as such, establishing such plantations in the watersheds without site-specific research would lead to both ecological and economic consequences (de Fraiture, 2008). These biofuel crops, if selected for reforestation in 'Central Fragile Region' of Sri Lanka, will escalate competition for both land and water with other environmentally friendlier land uses such as restored native forests and mixed species forest gardens, especially in areas where water is already scarce as in some areas of NuwaraEliya and Kandy districts.

It is indeed, a challenge facing Sri Lanka at this crucial phase of rapid development outlined in the National Physical Plan 2011-2030 to engage, at the same time, in an emerging global initiative to drive towards a green economy. Nonetheless, it opens up many opportunities for both research and development in order to be aligned and repositioned with the evolving global scenarios in the forestry sector as well as in other sectors, so that costly remedial measures in the future could be avoided by visionary planning. Sri Lanka is richly endowed with a religio-cultural heritage that is inextricably linked with its equally rich natural heritage. To move towards a greener economy while learning from past experiences and judiciously blending them with innovative thinking to suit modern situations is the need of the hour. We do have the potential to develop models in appropriately greening the forestry as well as other related sectors towards meeting our own sustainable development goals. The challenge now is to redefine the vision for forests of Sri Lanka in the light of the emerging sustainable development goals and build the necessary in-country capacity to demonstrate its benefits to policy makers in our move towards a greener economy.

References

- Anon., (2010), National Physical Planning Policy and Plan, Sri Lanka-2030, 104 pp.
- Dye, P. and D. Versfeld, (2007). "Managing the Hydrological Impacts of South African Plantation forests: An Overview," *Forest Ecology and Management* 251:121-128.
- Hamilton, L. S. (Ed.) (2008), *Forests and Water*, FAO Forestry Paper No.155.
- deFraiture, C. , M. Giordano, and Y. Liao, (2008), "Biofuels and Implications for Agricultural Water Use: blue impacts of green energy," *Water Policy* 10 Supplement 1: 67-81.
- Landell Mills and Porras, 2002. *Silver bullet or fool's gold? A global review of markets for forest environmental services and their impact on the poor*. International Institute for Environment and Development, London, UK.P. 138.
- MA (2005), "Millennium Ecosystem Assessment. Ecosystems and Human Well-being: Synthesis" Island Press, Washington, DC.137 pp.
- Perrot-Maitre, D. (2006), *The 'Vittel payments for ecosystem services: a "perfect" PES case?* International Institute for Environment and Development, London, UK.24 pp.
- Rio+20 (2012), "The Future We Want" www.un.org/futurewewant
- TEEB (2010), "The Economics of Ecosystems and Biodiversity Report for Business - Executive Summary".
- Trucost (2013), "Natural Capital at Risk – The Top 100 Externalities for Business" <http://www.teebforbusiness.org>.
- UNEP (2011), "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers", www.unep.org/greeneconomy. 45 pp.
- Viana, V.M. (2009), "Financing REDD: Meshing markets with government funds". IIED briefing, March. International Institute for Environment and Development, London 4 pp.



The Need for Climate Change Resilience in Urban Infrastructure: A Closer Look at Sri Lanka

by
Chatura Rodrigo



Introduction

Rapid urbanization has aggravated the deficiencies of basic services and infrastructure in the developing world, particularly in the Asia and Pacific. In many of these countries, evolving infrastructure can be particularly climate-sensitive and therefore highly vulnerable to natural disasters. Because climate-related events cut across socio-economic sectors and administrative jurisdictions, they can jeopardize development objectives in distant places. Public infrastructure tends to be multifunctional in nature and serves a range of diverse stakeholders spread over a wide geographic area; directly or indirectly providing critical services to the areas they cover. Interruptions in services can cause negative economic impacts over a large territory. The lack of reliable services impedes a country's ability to pursue development goals. For this reason, it is vital that development strategies incorporate efforts to increase the climate resilience of infrastructure, especially taking into consideration the risks of climate change.

Expanding urban settlements in the developing world will continue to face severe climatic risks in light of climate change. Urban populations will increasingly be forced to cope with rising incidents of flooding, air and water pollution, heat stress and vector-borne diseases, as a result of overcrowding, inadequate drainage channels, expanding informal settlements, and urban expansion in to risky sites. In addition, increased climate hazards, coupled with rapid urbanization, are likely to put an increased strain on the capacity of local governments as they attempt to respond to the vulnerabilities of the urban population – particularly the urban poor.

Despite these challenges, present climate change adaptation projects largely ignore urban areas in favor of rural livelihood focused activities. Rural livelihoods are seen to be more dependent on climate sensitive, natural resource based livelihoods, while having less protective infrastructure for climatic extremes. This has meant that poor urban populations have not commonly been considered to be priorities in climate change adaptation planning, and interventions. Therefore, they do not benefit from climate-related infrastructure investments in the rural areas and/or are made more vulnerable because of their dependence on faulty infrastructures, such as substandard housing. Recent research highlights an urgent need to improve our understanding and action on climate vulnerability, particularly for adaptation in urban areas where poverty levels and population growth rates are highest.

salination of water resources, storm surges, floods, landslides and malaria/dengue epidemics; all of which negatively impact human settlements, city productivity and service delivery – especially for the poor.

Frequent natural disasters have directly contributed to constraining the country's efforts to achieve the Millennium Development Goals, specifically at a local level. The increase in the frequency and intensity of natural disasters over the past few years has resulted in major socio-economic impacts on townships and human settlements, especially in disaster prone provinces. Frequent flooding in the Eastern Province and landslides in the Sabaragamuwa Province have resulted in displacement, loss of livelihoods and loss of life. Despite this vulnerability, there is an increasing trend to expand built-up areas



Significant Change Before and After

As developing economies, there is an immense pressure for countries like Sri Lanka to target its infrastructure development to rural areas. Despite this, studies show that the urban poverty is also considerably high and on par with rural poverty. To make things worse, majority of the urban infrastructure in Sri Lanka is not in a state to withstand impacts of climate change, such as heavy rains and floods. It has been a constant struggle for urban cities like Colombo to withstand the adverse effects, which sometimes shuts down the functionality of the metropolitan for several days. Infrastructure policy makers had enough evidence to address these issues yet, lack of proper planning and funds were often holding them back. Fortunately, with the post-conflict development boom, opportunities were presented, policies were drafted and projects were initiated to make urban cities more resilient to climate change.

Sri Lankan Context

Sri Lanka is urbanizing rapidly, with at least 50% of its projected 22 million population expected to be living in urban local authorities by 2020. The estimated urban growth is 3% annually and the urbanization trends show a rapid transformation of rural areas to urban. The influx of migrants into cities and towns has overwhelmed infrastructure systems originally designed for much smaller numbers. The infrastructure and services in urban areas cannot cope with the rapid pace of expansion of the urban areas. Whilst the government's Mid-Term Development Framework recognizes the positive impacts of urbanization, around 70% of this population and 80% of national economic infrastructure are concentrated in coastal cities and cities in disaster prone hilly areas. These cities are highly vulnerable to disasters and predicted climate change impacts including sea level rise,

through unplanned development activities. To increase the resilience of both new and existing infrastructure, we must be prepared to plan ahead and manage the impacts of climate change.

As infrastructure assets have long operational lifetimes they are sensitive not only to the existing climate at the time of their construction, but also to climate variations over the decades of their use. For example, a substantial proportion of infrastructure built in the next five years will still be in use long after 2030. New infrastructure can be made climate resilient by ensuring that an asset is located, designed, built, and operated, with the current and future climate in mind. Existing infrastructure can be made climate resilient by ensuring that maintenance regimes incorporate resilience to the impacts of climate change over an asset's lifetime. To achieve this, possible adaptation measures include: (1) ensuring infrastructure is resilient to potential increases in extreme weather events such as storms, floods, and heat waves; (2) ensuring investment decisions take account of changing patterns of consumer demand as a result of climate change; (3) building in flexibility so infrastructure assets can be modified in the future without incurring excessive cost; and (4) ensuring that infrastructure organizations and professionals have the right skills and capacity to implement adaptation measures. The result of all this will be a more resilient and robust infrastructure network that is able to cope with projected climate impacts, for example, increased flexibility to cope with uncertainty without massive failure and economic cost.

The Metro Colombo Urban Development Project (MCUDP), implemented under the Ministry of Defense and Urban Development of Sri Lanka aims to provide early and timely support to the government of Sri Lanka's long-term urban development programme for Metro Colombo. This will be done by focusing on high-priority catalytic metropolitan investments aiming to reduce the physical and socio-economic impacts of flooding and heavy rains in the capital city area, and long-term capacity building for metropolitan management, local service delivery, and implementation support. The proposed project will consist of two main components: (1) Flood and Drainage Management, and (2) Urban Development and Infrastructure Rehabilitation for Metro Colombo Local. Under the first component, it is expected that the project would finance both structural and non-structural activities related to flood control and drainage investments identified as a priority by the inter-agency Flood Mitigation Task Force, chaired by the Sri Lanka Land Reclamation and Development Corporation (SLLRDC).

It is proposed that the bulk of the structural investments will be aimed at improving the system of primary and secondary canals, lakes, retention areas of the Colombo Basin, and the micro drainage system within the Colombo Municipal Council (CMC) areas. These developments have factored in climate change impacts that could occur in the future through proper stakeholder consultation, Environment Impact Assessments (EIAs), and Strategic Environment Assessments (SEAs). Under the second component, the project would support institutional strengthening for sustainable metropolitan and local infrastructure and service provision, and implementation support.

The concept of climate resilient cities has now spread beyond the metropolitan city of Colombo, and there are new initiatives focusing on other townships as well, which are disaster prone and highly urbanized. One such initiative is the "Disaster Resilient City Development Strategies for Sri Lanka Cities". The project is implemented by UNHABITAT in partnership with the Urban Development Authority (UDA), Ministry of Local Government and Provincial Councils, and the Disaster Management Centre is responsible to prepare land use plans and development plans incorporating Disaster Risk Reduction (DRR) features. This project aims to establish sustainable disaster resilient, healthy cities and townships in disaster prone regions of Sri Lanka. It will be implemented in four municipal council/local authorities (MC/LAs) – Kalmunai, Batticaloa, Ratnapura, and Balangoda, which are vulnerable to disasters. These cities are situated in two lagging regions – the Eastern and Sabaragamuwa provinces of Sri Lanka. These four cities/townships have been selected based on their vulnerability to multiple disasters, them being declared urban development areas under the UDA law – which indicates potential for urban growth, and the unavailability of development and land use plans.



The Policy Outlook for Sri Lanka

Effective, reliable infrastructure underpins economic activity. Recent impacts from flooding and severe weather events emphasize the risks that national infrastructure could face and the significant economic damage such events bring. If today's extreme weather events become both more frequent and extreme; so too will the level of disruption that they cause, unless appropriate adaptation action is taken. To reduce the risk infrastructure faces from climate change, planned but flexible adaptation responses are required. It is not about eliminating all risks from climate change or extreme weather. It is about making the necessary interventions to the development plans and practices to make sure what is being built will withstand the adverse effects of any future event. With a higher migration rate from rural to urban, Sri Lanka's metropolitan cities will soon become over populated, centres of economic growth – not to mention that some cities have already crossed their population thresholds. The significance of climate change resilient infrastructure is, therefore, more important now than before. In order to overcome inevitable climate change effects and to prevent any economic losses, these cities must have infrastructure that is able to withstand a hard hit. The policy outlook in this perspective is positive for Sri Lanka. While Sri Lanka has not yet published a separate policy on climate resilient infrastructure, elements of it are appearing in the national discussions and in the development initiatives, with respect to urban areas. Most importantly, the government's vision document, the "Mahinda Chinthana", has also put a considerable emphasis on the importance of building cities that are sustainable and are able to withstand the effects of climate change. With the Ministry of Defense and Urban Development leading the way forward, international organizations such as the World Bank, Asian Development Bank, United Nations Office for Project Services (UNOPS), UNHABITAT, and United Nations Development Programme (UNDP), are also increasingly making climate resilience infrastructure in Sri Lanka a priority.

References

1. Tomas Tanner, Tom Mitchell, Emily Polack and Bruce Guenther, 2009, "Urban Governance for Adaptation: Assessing Climate Change Resilience in Ten Asian Cities", Institute of Development Studies, Working Paper, 315.
2. Ranjith Perera and Ariva Sugandi Permana, 2009, "Review of Current Practices and Criteria Used to Integrate Environmental and Social Aspects into Urban Infrastructure Development Processes in Cities in Asia and the Pacific", Urban Environmental Management Programme, School of Environment Resource Development, Asia Institute of Development, Bangkok, accessed on line 30th January 2013.
3. United Nations Development Programme (UNDP), 2011, "Paving the Way for Climate Resilient Infrastructure: Guidance for Practitioners and Planners", UNDP, accessed online 4th February 2013.
4. Ministry of Defense and Urban Development, Sri Lanka, <http://www.defence.lk> visited on 6th February 2013.
5. United Nations Human Settlement Programme (UNHABITAT), <http://www.unhabitat.lk> visited on 6th February 2013.
6. World Bank, Sri Lanka, <http://www.worldbank.lk> visited on 6th February 2013.
7. United Nations Office for Project Services (UNOPS), Sri Lanka, <http://www.unops.org> visited on 6th February 2013.
8. Department of National Planning, Sri Lanka, 2010, "Government of Sri Lanka, Mahinda Chinthana", accessed on line 30th January 2013.

Multiple Actors: The Challenge of Building Adaptive Capacity to Climate Change in Sri Lanka

Centre for Poverty Analysis[1]

Introduction

Climate change is a global phenomenon that is predicted to disproportionately impact low and middle income nations who have less economic stability and greater levels of poverty. Poor communities within these societies who are least able to withstand external shocks will face the brunt of the impact. They will need support from the state and non-state actors to be better prepared, protected and enabled to recover from these shocks. This situation challenges developing countries to meet economic and social development agendas while reducing or minimizing the impact on the natural environment. It is challenging developing countries to adopt sustainable pathways to development that try to achieve a sustainable balance between human and environmental wellbeing. In Sri Lanka, efforts to put in place more sustainable practices and to address climate change are taking shape. Various interventions are advocated and are being tested from policy to practice, involving a range of stakeholders or "actors". This essay examines how different levels of actors attempt to address climate change. It uses an actor-based approach to analyze what enables or impedes adaptation for different levels of actors and draws from a study carried out within the context of agriculture, fisheries, and tourism livelihoods in coastal areas of Sri Lanka.

Building Adaptive Capacity

Development in a climate conscious way requires integration of environmental safeguards into development policy, programmes and more importantly, practice. This entails building "adaptive capacity" which means the ability of a country to offset the effects of climate change. The ease at which a country can do this depends on its capacity, the resources and institutions. While the uncertainties and technical aspect of earth sciences increases the level of difficulty to build adaptive capacity, getting buy in from a range of stakeholders to commit to and take action further heightens the complexity of the task.

The stakeholders that have to be considered in this instance are vast and range from the government, non-government and private sector to community groups and individuals. Their interactions cascade through local, national and international dimensions as well as from policy to practice. Different stakeholders will also respond to same climate stimuli with different perspectives, depending on their capacities, experiences, social interactions, agendas and power dynamics. Hence the cooperation and commitment of many different actors at different levels determines how decisions and actions are taken to adapt to climate change.

This essay looks at four levels of actors - policy makers, sectoral/institutional actors, civil society and the community/individuals, who were identified in order to understand positive

[1] This paper is based on a study entitled: Exploratory study on adapting to climate change in coastal areas of Sri Lanka, by Shanila Athulathmudali, Amila Balasuriya and Karin Fernando, published by CEPA, working paper series No 18 (2011).

and negative drivers and pressures that influence their roles and positions towards building adaptive capacity.

Enablers and Hurdles among Levels of Actors

The factors within each actor level that enable or hinder adaptive capacity are presented in two columns below:

At the Policy Level

Climate change is recognized as an important national issue and attempts have been made to set the frame conditions for sustainable development and institutional greening that is reflected in the establishment of the National Council for Sustainable Development and its Action Plan (Haritha Lanka). Commitment to climate change can also be seen through the initiatives to set up national policies and strategies specifically for climate change. The use and acceptance of consultative approaches to develop these policies can also be seen as an enabler that can influence sectoral/institutional policies.

Despite the favorable frame conditions set, adopting and applying the principles of these policies and strategies are not mandatory. The Ministry of Environment that oversees these policies cannot directly implement a large part of the interventions needed and can only promote and lobby for these changes amongst a large number of Ministries. This is further hindered with a lack of incentives and financial resources specifically for climate change adaptation that can be provided to encourage sectoral structures to undertake climate change related actions.

At the sectoral level

At the sectoral/institutional level some sectors (i.e., agriculture and fisheries) have incorporated the principles of sustainable development into their policy and strategy orientation. Some sectors also have research and extension services (i.e., agriculture and fisheries) that allow for sector-specific knowledge generation. This has aided the absorption of specific environmental issues into the research agendas, hence there is some knowledge generation at this level. They also have a network of implementing agencies through which this information can be taken to the communities.

However, sectoral/institutional priorities (i.e., food security, productivity, income) override the incorporation or promotion of sustainable practice, and most of the knowledge generated and shared is geared to increasing productivity. Climate change adaptation is also hampered by limited technical knowledge of climate change, the uncertainty in the science, and the specificity of actions that impede generalised solutions that can be easily mainstreamed. Short planning cycles, structural and leadership changes, poor coordination among ministries also hinder long-term commitment needed to undertake climate-change adaptation.

At the civil society level

Civil society groups have the flexibility in scope and function to give priority to environmental issues and incorporate this element into their programmes. They are also helped by access to funds and technology that aid adaptation and can give specific training, education, awareness to implementers. The greatest asset this group of actors has is their ability to work across different levels from policy to practice and provide a good feedback/knowledge transfer mechanism.

Hurdles in this category of actors is that organizations working specifically on sustainability issues are few and geographically scattered, hence they are not adequate to generate a critical mass that can enable scaling up climate change adaptation. The civil society lobby is also perceived as a negative force that opposes certain government policies, which limits their ability to influence change. Short-term project cycles also mean that these interventions are time-bound and may not sustain over time.

At the Community/Individual Level

At the level of practice where communities and individuals try to adapt to climate change, it is economic benefits that are driving it. Sustainable activities also seem to happen more on a supplementary level (i.e., growing saline resistant crops in degraded land or dolphin tour boats) benefiting from niche markets and premium prices. However prevailing environmental conditions such as droughts or depleted resources are leading to communities looking for options. Access to external support such as funding, knowledge, etc., is also a clear enabler that has led to adoption of sustainable practices.

Barriers to adaptation on this level have been the economic risk burden that would have to be faced, and the inability of poor people to take this risk. Technical knowledge and access to information on climate change and adaptation measures is also a hurdle. Additionally, the lack of institutional support to endorse or encourage sustainable practices (as many are still pushing the conventional/economic growth agendas) is preventing an impetus to change.

Way Forward for Building Adaptive Capacity

Given the cross cutting nature of climate change and the need to integrate environment into a range of sectors, building adaptive capacity needs to consider how the various actors involved will act or react to the proposed initiatives. It is important to understand and unravel the context (macro and micro), vested interests, competing agendas, capacities and resources that exist amongst the actors. This involves looking at how the agendas of the different actors interact and counteract with regard to climate change adaptation and the need to capitalize on the existing enablers while taking action to address and minimize the hurdles. For example:

- What is in the policy and what is practical: where sustainable development may be advocated in the policy but interventions and financial resources may not be part of the implementing plan, or a more specific mismatch where organic fertilizer is advocated by the policy but in practice farmers are not able to find/make the quantities of organic fertilizer.
- Balancing the various needs at different levels and stakeholder groups – the sectoral/institutional mandates, the livelihood needs at the community level and the ecosystem requirements.

Due to the specificity of adaptation to the product, location and climate threat a more decentralised approach may be more appropriate. This may also help to localize the activity and hence create more practical links amongst the actors. Furthermore, adaptation at every level needs to be supported through funding, knowledge technology, capacity and experimentation to come up with specific problem solvers in order to have options for the future. Forums where information on the success and failures of these experiments can be shared, disseminated and exchanged are also necessary. Another important aspect that has to be taken into account is the time component that adaptation involves. It is a gradual process that has to work down through the levels of policy makers, and across through the stakeholders to get individuals on board and build resilience to climate change impacts through trial, error and research according to the specific climate threats and context. Understanding the interactions among the many stakeholders through the chain of policy to practices and vice versa should be a key part of the process of building adaptive capacity.

Climate Change Models Shift Boundaries of Agro -Ecological Zones in Sri Lanka

by
Muthuwatta, L.P.
and
Liyanage, P.K.N.C.

Climate change models for Sri Lanka suggest that profound and complex changes in rainfall patterns are becoming a reality. It's never too early to consider what this means and how it could impact agriculture and therefore all of us.

The news that climate change will affect Sri Lanka's weather will surprise very few these days. However, a recent study¹ projecting rainfall distribution patterns in Sri Lanka for 2050 warns that climatic zones could shift. It also suggests that the intensity of rainfall will vary more greatly than observed over recent times. The findings reported by Muthuwatta and Liyanage, have important implications for agriculture – from farmers to policymakers.

With global temperatures warming over the past century, Sri Lanka has already displayed its share of signs of climate change. The resulting extreme weather events have even now affected agricultural production. Concerns for water and food security for a projected global population of 9.6 billion in 2050 are high. In its 2007 assessment report, the Intergovernmental Panel on Climate Change (IPCC) stated that the nature of changes will vary across different geographical regions and development statuses. It added that the way regions respond and adapt will also affect climate change.

Using rainfall data from a baseline period of 1970 to 2000, the researchers analysed a climate model projection to 2050 and looked at how and where rainfall in the major agro-ecological zones may change. In Figure 1 they show climatic zone boundaries could be affected due to changes in rainfall in 2050. The changes of areas under major climate zones are shown in Table 1.

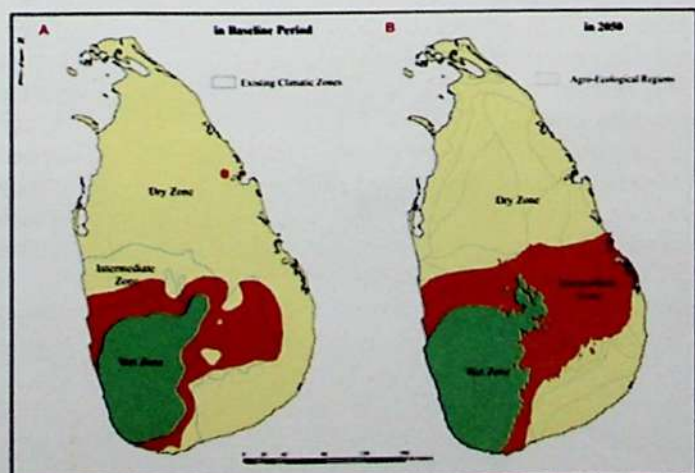


Figure 1: Changes in climatic zone boundaries by 2050

Table 1: Current and projected areas (km²) under three major climatic zones

Zone	Current	Baseline	2050	%change*
Dry	38,627	43,734	35,492	-8.1
Intermediate	14,212	11,866	17,312	21.8
Wet	12,696	10,278	12,793	0.03

*Change of area compared to the current climatic zone map

Re-drawing Boundaries and Policies?

The key findings show that average rainfall in Sri Lanka in 2050 will increase by 155 mm or about 7%, compared to the period 1970-2000, with the highest proportional increase of rainfall predicted for southern and south-eastern parts of the country. It shows the Dry Zone of the island shrinking by 8.1%. But the biggest change appears to be in the Intermediate Zone where in 2050, it is predicted to expand by 21.8%.

The model also shows that of the 48 agro-ecological regions, 11 agro-ecological regions display decreasing rainfall patterns. The rest of the agro-ecological regions display an increasing trend of rainfall in the future, and of these, 11 show the greatest changes.

A Silver Lining

The model predicts that two of the regions now included in the Dry Zone could be re-classified as Intermediate, while three currently in the Intermediate Zone could be eligible to be Wet Zone regions by 2050. With intensity, duration and distribution of rainfall changing beyond current boundaries of climatic zones by 2050, it's time to re-think long term agricultural policies.

Contrary to most gloomy climate change forecasts, these results are welcome news for Sri Lanka. But they come tempered with a prediction that although there will be more rain in a greater expanse of land, the variability of rainfall in 11 of the 48 agro-ecological regions exceeds data from the baseline period. What this means is that we can expect an increase in extreme rainfall too which will greatly affect food production.

Increased Food Demand

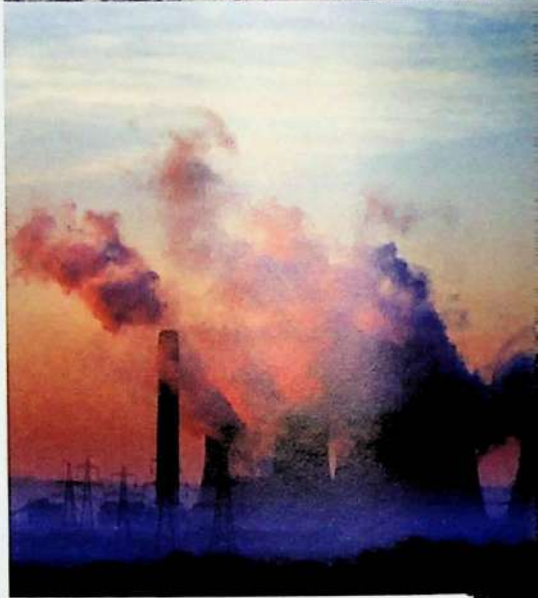
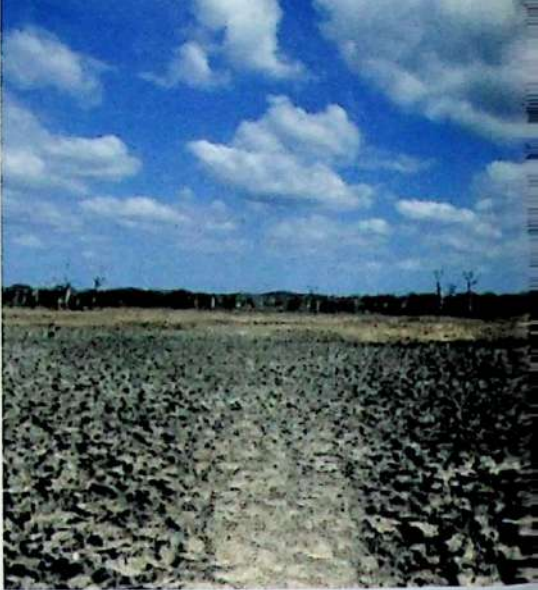
As Sri Lanka increases her per capita income, higher incomes and a larger population will result in increased food demand. Without adaptation and mitigation plans in place to offset climate change impacts, self-sufficiency in major crops and water and food security will be seriously compromised. This is a prospect that a developing economy can ill afford, especially an agricultural-based one such as Sri Lanka. Paddy cultivation is notoriously susceptible to variations of rainfall while other exports like tea, rubber, and coconut, also depend on rainfall during crucial growth periods.

The global trend is expected to continue and countries are gearing up to deal with it. For Sri Lanka, analysing the magnitude and areas of climate change and how water resources and agriculture will be impacted over time will be critical to being better prepared to face them.

Planning for the Future

It is clear that forward planning is required to mitigate the impacts of climate change as well as to formulate adaptation strategies. The projected data for 2050 in this study suggests that the type of agro-ecological area could change in several regions. This implies that crops cultivated at present may be affected and may provide benefits to farmers and agriculturalists in areas hitherto disadvantaged by climate. Co-author Muththuwatta says, "This information is very valuable for those planning to expand crops into new, non-traditional areas as well as policy makers. All agriculture and livestock farming could be affected."

Approaches such as integrated water resources management, closer collaboration and knowledge sharing will be key to good management practices and governance. Research is vital to minimise the inherent errors in climate change modelling, and decreases risk and uncertainty. Studies of other climate variables such as temperature and evapotranspiration are necessary to estimate the water availability and requirement for different crops under future climate projections. While the study brings hope that climate change may bring advantages as well as disasters, there is no better advantage we could have than good preparation.



Is it the time to go back
to where we came from: Addressing the debate

Organic Vs Inorganic Rice

farming through a new research approach?

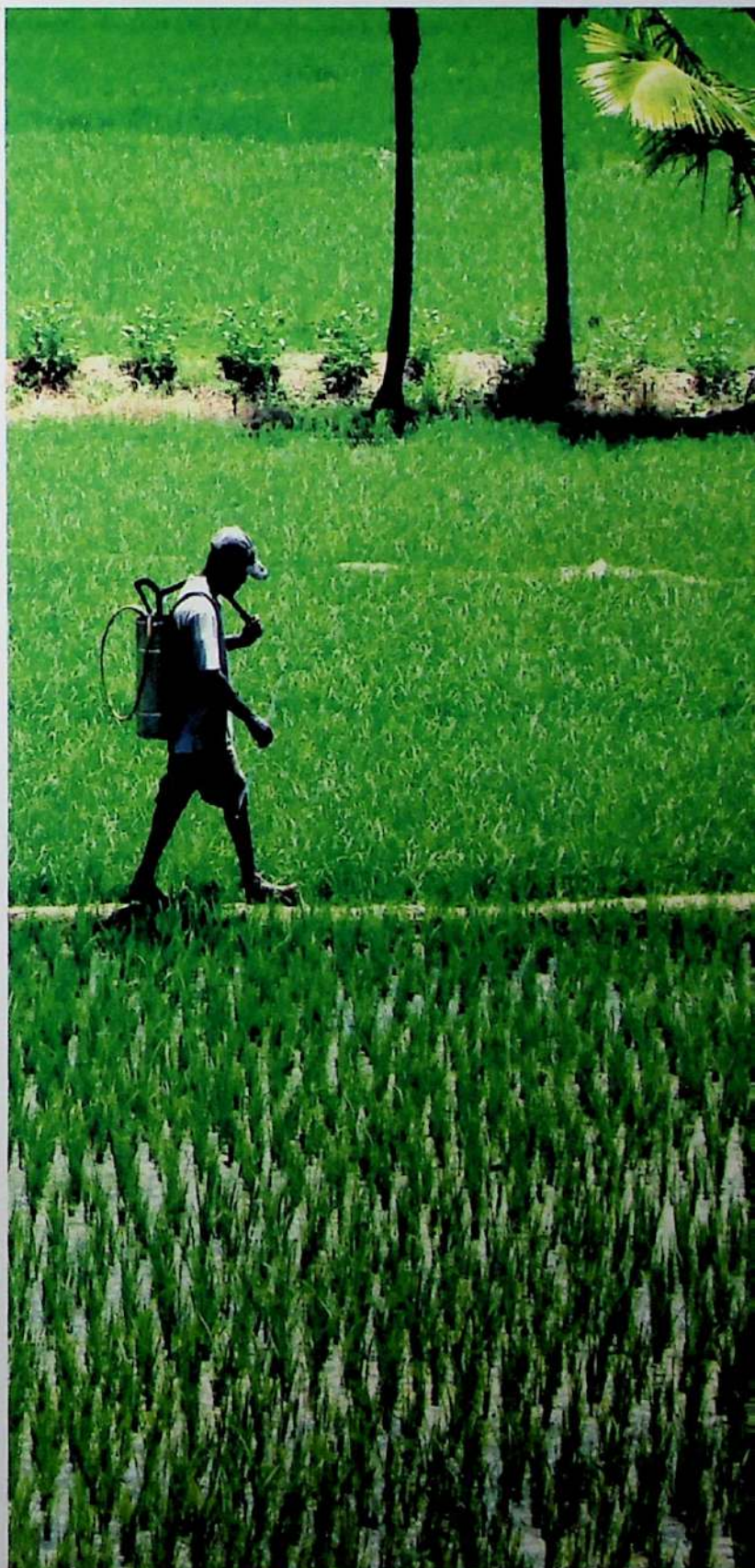
by
Chatura Rodrigo

Introduction

Achieving food security continues to be a challenge for Sri Lanka. Increasing population, changes in lifestyles, changes in food preferences and emerging middle income class demand more production. Therefore, governments need to make sure they are self-sufficient in their staple food, in our case, it is rice 1. Records suggest that Sri Lanka has achieved self-sufficiency in rice, which as a country we have to be very proud of 2. However, there is a burning question that we need to ask from ourselves, "Is chemical fertilizer and pesticide based intensive agriculture a viable option for the future?" Much is being discussed and debated on the topic of the harmful effects of chemical fertilizer and pesticide based intensive agriculture, especially issues related to health and environment. Some argue that Sri Lanka should look into the possibility of having more organic rice farming and some argue that it might not be viable 3. Therefore, there is a clear ambiguity, among the scholars and policy makers in establishing whether a shift into organic rice farming is a viable option or not. Existing research is not strong enough to make an informed policy decision, and hence there lies a research opportunity as well as a responsibility to all the environmental and agriculture economists of the country.

Transformation from Organic to Inorganic

Sri Lanka has a rich history of rice farming. There was a time that we were not concerned about rice production; what was produced was enough to feed the nation. But things changed, and with the increase in population suddenly there were questions about "whether organic farming and traditional rice cultivation is capable of feeding the nation?" Then came the green revolution, there were new improved rice varieties which yielded far greater than traditional varieties and we were able to feed the nation. But these rice varieties were only successful with the help of chemical fertilizers and pesticides. Hence, successive governments made their full effort to make sure that the farmers are provided with fertilizer subsidies and the chemical companies were more than happy to keep on supplying the necessary pesticides. Within a few decades, organic rice farming was transformed into a chemical fertilizer and pesticide based intensive agriculture achieving self-sufficiency in rice 4.



Future Policy Outlook in Terms of Rice Farming

People who talked about sustainable growth are now talking about green growth. Countries are now more and more concerned about the toxic free produce and the environment. Post-2015 development agenda has put equal access to safe food and environment conservation at its heart. Therefore, developing countries like Sri Lanka want to make sure that they achieve self-sufficiency in their staple food, but also produce toxic free products while minimizing the environment degradation⁵. Hence, having organic rice cultivation which satisfies all these requirements to a greater extent could be a possible solution. While there were many scholars arguing about the health and environment benefits of organic rice farming, the government also has shown increasing interest, by promoting more organic rice, while reducing fertilizer subsidies to considerable levels, especially with the 2013 and 2014 budgets⁶. But there are some who raise very important questions regarding organic rice farming; such as 'can we keep abreast with the demand for rice?', 'will this yield desirable profits for farmers?', 'is there a significant consumer demand for rice?'.

Organic Rice Farming and Ecosystem Goods and Services (EGSs)

Ecosystem good and services are benefits arising to people from ecosystems⁷. Agriculture systems such as organic rice farming systems are capable of providing many EGSs⁸. Agriculture systems are multifunctional, hence at a given point they are capable of providing many EGSs. Some of the EGSs produced through organic rice farming systems are: toxic free produce, improved water quality, improved soil quality, increased bio-diversity and aesthetic appeal⁹. Therefore, while economic viability and the self-sufficiency are quite important to address the debate on organic Vs inorganic rice farming, it is equally important that people understand the benefits received from organic farming as EGSs are for the moment not being traded in the market place. However exploring all these factors is not an easy task. Yet, debates like these deserve solid arguments. Hence, the "valuation of organic rice farming, including EGSs provided by the farming systems" is quite important.

What are the Research Options?

Valuing ecological goods and services is a complex task. However, there are very dynamic methods established by environment economists which allow one to tackle these tasks quite comprehensively. In establishing the viability of organic rice farming systems, the research problem that one would want to explore is "whether organic rice farming attracts a significant

value". The answer to this research problem will justify whether Sri Lanka is ready to expand into organic rice farming. An effective valuation tool will capture all the aspects of rice self-sufficiency, economic viability, and preferences towards the different EGSs produced by the organic rice farming systems.

A valuation can be done either through consumers (demand side) or farmers (supply side). However, in the case of organic farming, a comprehensive valuation through consumers is not quite possible. The organic rice products are available in the market place. A consumer pays a certain price for that, which is above the price of inorganic rice. Therefore, there is a price premium (difference between organic and inorganic) available, which represents the willingness to pay (WTP) for organic rice. However this price premium represents the EGSs produced by the organic rice farming systems. Hence, even though a comprehensive valuation is not possible, a research could possibly capture what different EGSs does this price premium represent? It is also possible to capture the separate willingness to pay values for different EGSs.

But, a more promising approach would be to look at this research problem through farmers. Farmers cultivate organic rice for commercial purposes as well as consumption. Therefore, a farmer will also be a consumer and that is a unique situation for a valuation study. There are many valuation methods, but two promising approaches are, stated preference approaches and revealed preference approaches. However, since the percentage of organic rice farming is small compared to the inorganic rice farming, a better way to employ is the revealed preference approach. A popular revealed preference method adopted by environment economists to look at farming systems is the "production function approach". Production function approach basically explains a production of a commodity as a function of the inputs to the production system, opportunity cost of time and EGSs produced by the production system¹⁰. In giving a valuation for the organic rice farming systems, this approach will take into account the economics, self-sufficiency and EGSs aspects, which is the centre to the debate on organic Vs inorganic rice farming.

The Challenge and Way Forward

It must be acknowledged that there is plenty of research done into the organic rice farming sector in Sri Lanka. However, the majority of these studies are focused on improving organic rice farming systems, mostly by new improved traditional rice varieties, producing efficient organic fertilizers or changing farming methods. There are also a few studies done to look at the consumer perceptions on organic rice products as well as other organic products such as fruits, vegetables and tea. However, the research has largely failed to capture the economic value of organic farming systems, which can be directly used to evaluate policy options. Hence this sort of a study will be the first of its kind in Sri Lanka, and for the South Asian region for that matter.

Researchers of the Institute of Policy Studies (IPS) of Sri Lanka have taken up that challenge. Recently a research study was launched to estimate the economic value of the organic rice farming systems of Sri Lanka, taking a mixed method approach. This research study will explore both the consumer side and the farmer side, including trying to establish whether organic rice farming is a viable option for Sri Lanka, in terms of economic benefits to the farmers, securing self-sufficiency of rice, producing toxic free healthy products and minimization of environmental degradation.

This research could examine whether organic rice farming, even though it yields health and environment benefits, is or is not a suitable option for maximizing farmers profits and ensuring self-sufficiency in rice. At the same time, it could also evaluate whether Sri Lanka is ready for a major, transition from inorganic to organic rice farming. Either way, it will be a deciding factor in the mostly debated topic in the agriculture sector for the past several years, and the policy makers will be able to make an informed judgment on their policy directives.

- 1 Samarathunga, P. 2010, "Multiple Facets of Food (In) Security in Sri Lanka: An Input to Food Policy, Policy Option to Achieve Food Security in South Asia," Institute of Policy Studies of Sri Lanka
- 2 Udaya Gammanpila, 2013, "Are We Truly Self-sufficient in Rice?," Ceylon Today newspaper, visited online 10th January 2014, <http://www.ceylontoday.lk/76-27200-news-detail-are-we-truly-self-sufficient-in-rice.html>

- 3 Waidyanatha, P. 2013, "Can Organic Agriculture Feed the World", The Island Newspaper, visited online 10th January 2014, http://www.island.lk/index.php?page_cat=article-details&page=article-details&code_title=90645
- 4 Naalir, M. 2012, "Sri Lanka Self-sufficient in Rice Production", Sunday Observer Newspaper, visited online 10th January 2014, <http://www.sundayobserver.lk/2012/03/18/pol06.asp>
- 5 Dharmasena P, 2012, "Traditional Rice Farming in Sri Lanka: Still Viable with Climate Change", Institute of Policy Studies, CLIMATE net Blog, <http://climatenet.blogspot.com/2012/03/traditional-rice-farming-in-sri-lanka.html>
- 6 Government of Sri Lanka, 2014, "Budget Speech 2014", Ministry of Finance and Planning, visited Online 10th January 2014, <http://www.treasury.gov.lk/>
- 7 Millennium Ecosystem Assessment, 2005, Ecosystems and Human Well-Being: Synthesis.
- 8 Abler, D. 2004, " Multifunctionality, Agricultural Policy, and Environmental Policy", Agricultural and Resource Economics Review, Vol 33 No 1, pp 8-17
- 9 Sandhu, H.S, Waratten, S. D, and Cullen, R, 2010, "Organic Agriculture and Ecosystem Services" Journal of Environment Science and Policy, Vol. (13) pp. 1-7.
- 10 Pattanayak, S. K. 2004, "Valuing Watershed Services: Concepts and Empirics from Southeast Asia", Journal of Agriculture, Ecosystems and Environment, Vol. (104), pp. 717-184.



Essential Factors in Bringing Back Organic Rice Farming: A Case Study from Nilwala River Basin

by
Chatura Rodrigo

Introduction

Paddy farming accounts for nearly 40% of the total cultivatable land in Sri Lanka. However, majority of this is under inorganic paddy cultivation and only around 5% is under organic paddy cultivation. Organic paddy cultivation is largely for private consumption, therefore it is mainly for subsistence purposes. Most of the time, organic rice goes hand in hand with traditional paddy varieties. Over the years, concerns over non-communicable diseases (NCDs), chemical free produce and environmental sustainability has persuaded many people to consume organic rice.

While the government has emphasized its intention on promoting organic paddy cultivation in the country through consecutive budgets of 2013 and 2014, encouraging farmers to practise more commercial organic paddy farming is faced with many issues that need considerable attention. This article focusses on a case study of the Nilwala river basin in Matara. It highlights the issues faced by organic farmers and some farmer-driven initiatives to overcome them.

Main Constraints Faced by farmers of Commercial Organic Paddy Production

Stand-alone cultivation has increased the cost of cultivation of organic paddy farming. Many organic paddy farmers do not have large land areas. The average paddy land size varies from 0.5 acres to 2 acres while the majority is around 1 acre of paddy land. Often these are marginalized lands, either abandoned after so many years of inorganic paddy farming or not cultivated for several years. Lands, especially in the Nilwala river basin are not very suitable to use machinery. Instability in the top soil layer prevents larger machines operating in the paddy lands and ploughing is done manually, which is very labour intensive. Moreover, these lands are located apart, individually, and there are many commercial inorganic paddy lands in between. Therefore, unlike in the commercial chemical based paddy farming where the lands are cultivated as "tracks of lands",



organic farming is much more "plot oriented". This has prevented farmers from getting the advantage of "economies of scale". Furthermore, having inorganic paddy lands in between have increased the land preparation and water management costs significantly.

Finding seed paddy is a major issue for organic paddy farming, especially if the farming is for commercial purposes. Even though there are many traditional paddy varieties involved with organic rice farming in Sri Lanka, few have attracted commercial attention. Usually, organic farmers practise broadcasting as a way of planting, while some are using methods such as "Parachuting". Both methods demand more seed paddy. On average 1 kg of traditional seed paddy ranges from between Rs.90-Rs. 100. However these are for common varieties. There are high yielding, nutritious varieties which are sometimes hard to find even if the farmers would like to buy. These varieties are distributed among farmers through their own networks. There are organic farmers who cultivate organic paddy to produce seed paddy for the requirement of others. Unlike inorganic seed paddy, there are only few organic farmers who successfully produce seed paddy. Sometimes, organic farmers in Anuradhapura and Galle have to get their seed paddy from farmers in Homagama and Horana in the Colombo district, since these varieties are available only with farmers in those areas. Therefore, the cost of securing seed paddy for cultivation is quite high for most organic paddy farmers.

6 Chatura Rodrigo, 2014, "Is It Time to Go Back Where We Came From: Addressing the Debate Organic Vs Inorganic Rice Farming Through a New Research Approach", February 3rd 2014, Daily Mirror newspaper.



Water Management and Labour Discourages Farmers a Lot in Engaging in Commercial Organic Paddy Farming

As mentioned earlier, majority of the commercial organic farming is concentrated on marginalized paddy lands. These lands do not have irrigation facilities and many farmers are dependent on the rainfall. For most of the commercial organic farmers in the Galle and Matara districts, the last two seasons were failures due to irregular rainfall patterns. They did not receive enough rainfall to start the land preparation, and heavy rainfall came just before the maturation and harvesting stages, destroying the harvest. In Elipitiya of Galle district, out of 180 acres of paddy land, only 30 acres were cultivated during the last season due to low availability of water. Some farmers do have access to nearby water ways, but they refuse to obtain water from these sources since it is already polluted with upstream inorganic cultivation. To make things worse, local authorities of many areas give priority to providing irrigation water for inorganic farming, ignoring the nearby organic paddy lands.

Labour is becoming an inadequate and expensive factor of production for organic paddy farming. In the early days, farmers used to share labour popularly known as "attam". Groups of farmers would get together and move from one paddy land to the other in land preparation, planting and harvesting. However, over the years, labour has become an expensive component. With two meals and two teas, a male labourer would cost around Rs. 1500/day and female labourer would cost around Rs. 1000/day. Even at that cost, it is hard to find labour for each season and farmers end up employing more and more family labour. Since the majority of the younger generation is moving away from paddy farming, the available labour is less productive, hence increasing the number of labour days and ultimately the cost of cultivation. Furthermore, in areas such as Galle and Matara, there is high demand for labour from tea and cinnamon cultivators. In Matale and Kandy, it is by tea and export agriculture. All these restrict the availability of labour for organic paddy farming.

Organic manure is limited and costly and has created many constraints for farmers, limiting their productivity. Organic farmers use a combination of organic manure in their farming. There are animal based as well as plant based manure. An animal based 50 Kg fertilizer bag, which is called "KatuPohora", is around Rs.2,500. There is a plant based fertilizer mixture as well which is at the same price range. In addition, farmers use liquid fertilizers also which are most often manufactured by themselves with animal waste and plant matter. This requires farmers to buy the animal waste if they do not rear livestock, and require family or hired labour in manufacturing. Therefore, taken together, the organic commercial farmer has to pay a significantly higher amount for fertilizer compared to commercial inorganic farmer. On average, with the fertilizer subsidy, an inorganic farmer pays a price of Rs.7 per 1 kg for inorganic fertilizers which on average will be around Rs.1,200 per acre. There are commercial organic farmers who do not apply all these organic manures and apply only a limited amount, but their production per acre is comparatively very low compared to a farmer who applies the required amount of organic manures.

Weed and pest management and harvesting are also costly for commercial organic rice farmers. Traditional varieties in organic farming also have a tendency to attract many pests and diseases that attack the new improved varieties in inorganic farming. Since the organic rice farming does not include any chemicals, pest and disease control needs careful and continuous attention from the farmer. There are many traditional and organic ways to deal with weeds and pest attacks, however it needs early detection and prevention most of the time. It is not that easy as applying a broad spectrum chemical like in inorganic farming. Most of the time, weeding is done by hand which requires many man hours ultimately increasing the cost of production. Planting methods such as broadcasting and Parachuting will limit the applicability of machinery in weeding. There are methods of cultivation which are applied in organic farming that will enable weeding by machines. However, most of the marginalized paddy lands used for organic farming do not allow the use of such machinery. There are bio-pesticides in the market at a very reasonable price, but this effectiveness might not be high when the pest attack is dominant. Therefore, unlike in the case of inorganic farming, both weeds and pests have the capacity to destroy the cultivation very easily. Sometimes, there are farmers who in the worst situation, ended up applying chemicals to save their cultivation, but then these activities would waste the entire effort of organic cultivation. Harvesting is again costly since some traditional paddy varieties in organic farming do not accommodate machinery with the height of the plant. Therefore, there are issues of mechanization in harvesting organic rice as well. Employing manual labour in harvesting means more cost to the organic farmer.

Marketing channels of organic rice is still developing and the price is high for many consumers. On average, a 1kg of organic rice would cost between Rs.170-Rs. 200. However, there are varieties that would be priced above Rs.300/kg. On average, inorganic rice will cost between Rs.50-Rs.75 per 1 kg, which is accessible for the poor and lower middle income consumers. Therefore, the demand for organic rice is mainly by the upper middle income and the higher income groups of the country. These segments account only for a minority of the rice consumers in the country. Hence if the organic rice market to be expanded, the price has to go down. Obviously, the organic rice should attract a higher price for desirable characteristics of being healthy and environmentally friendly food and to cover the higher cost of production. Nevertheless, the current prices are beyond the

purchasing power of majority of consumers and hence need to be brought down, preferably with incentives to reduce the cost of cultivation.

Consumers who demand organic rice as explained above, are distinctive and are mostly residents in urban areas. Therefore, rice produced in the rural areas need to come to urban areas. However, marketing channels are not well established yet and only in few places in the main cities such as Colombo, Matara, Galle and Kandy sell organic rice, which is not sufficient to cater to the growing consumer base. Because of this there are many consumers who go directly to the farmer or the miller to buy the product rather than going to the market place.

What are the Lessons Learnt from the Nilwala River Basin Farmers

Nilwala river basin farmers in Aththudawa, Matara are focused on cultivating a traditional paddy variety called "Maa-Vee". This paddy variety has proved to be very effective with the soil type of the area, agro climatic conditions with proven resistance to weeds, pests and climate change impacts. Therefore, these farmers have selected an appropriate paddy variety that suits the local conditions. These farmers were inorganic farmers a few years back, but they made a voluntary decision to take up organic rice farming saving the government 22 million rupees in fertilizer subsidy. These farmers cultivate together. They share labour, machinery, seed paddy and organic manures thus achieving economies of scale in production. Since all the farmers are practising organic farming, the water ways are not polluted by upstream cultivations.

There are more than 60 farmers who cultivate on a commercial basis and they are closely linked with the local authorities. Agriculture extension officers and officials of the Southern Provincial Council are keen on developing organic paddy farming in the Nilwala river basin. Hence they enjoy favourable conditions, securing the government officials' assistance as well as the political will for organic farming. Harvesting was an issue for these farmers as they only had a limited number of machinery. Rather than hiring machinery from outside, farmers took their own initiative to overcome this. As a result, now there are dedicated harvesting machines in the area, providing secure and continuous employment for several people. Several farmers have got together and established a mill to process the paddy harvest. Initially they were buying paddy at a rate of Rs.50/kg. But with more supply from farmers and demand from wholesale buyers, the mill has been able to buy paddy at a rate of Rs.75/kg, which is a good opportunity and motivation for production.

These farmers provide a very valuable example in addressing many issues discussed earlier regarding commercial organic farming. They act together, thus realizing economies of scale in production. Working as a group has reduced their costs of land preparation, water management, planting, weed control, pest

control and harvesting. They have benefitted from the institutional support and political will which enable them to secure water for agriculture, a market place for the produce and agriculture extension services to improve the farming practices. Furthermore, they work closely with the society, providing employment to others in becoming entrepreneurs such as mill operators, harvesting machinery operators, transporters and organic manure producers. Their example provides a light of hope for those who are keen to take into organic agriculture as a way of producing healthy and environmentally friendly foods.

Wanninayake, W.M, C, B and Shantha, A, A. 2013. Pricing Economic Value of Organic Rice Under Dichotomous Framework: An Environmental Perspective. Kelaniya Journal of Management, Vol 2, (2), 1-22.

Rodrigo, C, 2013, "Traditional Paddy Cultivation in Providing Ecological Services: Resilience Against Climate Change and Many More", National Conference on Livelihoods, Biodiversity and Ecosystem Services, Colombo, Sri Lanka, pp 24-30.

Chatura Rodrigo, 2013, "Use of Traditional Paddy Cultivation as a Means of Climate Change Mitigation", September 19th 2013, The Island newspaper.

H.P.S Somasiri, "Sustainability of Paddy Fields and Ecosystems Towards Society", 4th INWEPF Steering Meeting and Symposium, Bangkok, Thailand.

Small Organic Farmers Association of Sri Lanka, <http://www.sofasl.org>, visited online on 5th May 2013.



The Impact of Price on the Organic Rice Farming Sector in Sri Lanka

by
Chatura Rodrigo

Developing the organic rice farming sector and ensuring that it makes a significant contribution towards the rice consumption in Sri Lanka is a necessity today. However, for the past decade, the spread of organic rice production in the country was limited to marginalized lands. Many farmers cultivate for their own consumption; while only a portion of rice is sent to urban markets. This too targets a selected segment of consumers, mostly the upper middle income and high income groups. While many argue that the slow growth in the sector is due to the difficulties in production, one cannot ignore that the high price of organic rice has a possible impact on the reduction in the demand for consumption.

has scientific evidence of these benefits. In addition, the application of organic manure prevents toxic material from being absorbed by the rice plant. Chemical fertilizer, especially Triple Super Phosphate (TSP) has the probability of releasing heavy metal to the soil, which can be absorbed by the plant or being washed into the water streams polluting the surface as well as ground water. Therefore, the rice varieties as well as the way it's cultivated defines the good quality of organic rice.

Among the EGSs produced through the organic rice farming systems the major ones are soil quality improvements, reduction of water pollution and improving the biodiversity. On average, an organic farming system can change all these factors to the positive side by 5-10%. Therefore, contribution of organic rice farming to the environment is significant and important.



Why Organic Rice?

Organic rice is healthy, toxic free and produces valuable Ecosystem Goods and Services (EGSs) such as improved soil productivity, reduced water pollution and increased bio-diversity. While consumers prefer organic food due to health concerns, not all of them are conscious about the environmental benefits and may not be aware of the concept of EGSs. Therefore, it is safe to argue that the driving force for organic rice demand is its health benefits. Traditional rice varieties that are known for many positive health impacts are mostly used in organic farming. Some such varieties contain a low glycemic index, suitable for diabetic patients; some for people with cholesterol, while some help ease off the effects of chemotherapy for cancer patients. The farmers who have been cultivating and consuming traditional rice for years, have always been aware of these health benefits, and the researchers of Industrial Training Institute (ITI) of Sri Lanka now

Price Issues

Organic rice does not have a controlled price. There are several major organic rice varieties in the market. Some popular ones are "pachchaperumal, KaluHeenati, WedaHeenati, SuduHeenati, KuruluThuda, MadaThawalu, Pokkali, Masuran and Rath Kanda". On average, the price of a 1Kg packet will be between LKR 150 and LKR200. However, the prices differ, based on the variety, area of cultivation and other factors. The price difference based on rice varieties is on average LKR 20 to LKR30. The price difference based on area of cultivation is on average LKR 30 to LKR50. For example, a kilo of organic rice of a specific variety in the Matale district is higher than the same variety in the Galle district. The prices are cheaper in Colombo and Gampaha districts compared to Matale, Galle, Anuradhapura, and Kurunegala districts. Organic farming practices also vary according to the areas. Farmers in some areas use imported organic fertilizer, which costs around LKR 3000/= for a 50Kg bag, while some only use livestock manure and green matter as organic manure. The price of organic rice is high in areas where the input cost is high in terms of organic manure. In some areas the farmers practice organic farming in close association with the religion. Therefore, their cultivation practices are based on auspicious times, or chanting and offerings to gods. In such situations, there's a high probability of increased rice prices as farmers try to compensate such good practices through pricing. There are farmer organizations and networks who closely work across Sri Lanka who makes efforts to implement a uniform price for a given variety. However, this attempt has shown only a little success since farmers do not always sell their produce through farmer organizations, as they have directly established links with consumers, retail shops, and supermarkets.

The Need for an Organic Certification Body

Organic certifications for the sector are not provided through a certified body; instead they are based on reputation and word-of-mouth recommendations. Some farmer organizations have established a good reputation through media, and there's a higher chance of consumers regarding these products as organic. Some have established links with reputed people such as doctors, religious leaders and local politicians who recommend their products as "true organic". Therefore, while such farmers have the opportunity to sell their produce at a higher price, others tend to sell at a lower price. Some small scale producers tend to supply their produce to farmer organizations that operate with reputation. That way they do not have to spend money on marketing their products by themselves, forgoing the opportunity cost.

As mentioned earlier, consumers purchase organic rice mainly because they want a healthy and safe product. Therefore, when standard certifications are not available, a consumer would look for reputation and recommendation. In such situations, small producers without any recommendation or reputation are driven off the market forcing them to abandon organic rice farming or only cultivate for self-consumption.

The high price of organic rice also prevents middle income and low income families from purchasing the products denying them the health benefits of the same. There are some families who purchase organic rice for the consumption of their children, as the entire family cannot afford the products. Whether it is from a reputed and recommended source or not, the price of organic rice is higher than inorganic rice, with sometimes a price difference of about LKR 100. Therefore, for a poor consumer, the opportunity cost of forgoing healthy and safe food is lower than his willingness to pay for organic rice. Hence, due to the high price, organic rice may not be a preferred option for lower middle income and poor consumers away, which in turn threatens the demand for organic rice.

What Can be Done?

It is important to control the price of organic rice and reduce it to a level that can be consumed by all consumers. If not, organic rice will be a luxury commodity produced by large-scale farmers at commercial level, and purchased by upper middle and higher income groups. Researches have shown that urban consumer are willing to pay between LKR 80 and LKR 125 for a kilo of organic rice. This is even low among rural consumers. Therefore, a significant price reduction is needed to increase the consumer base for organic rice.

There are many things reflected in the price of a commodity. Most importantly it reflects the cost of production. The price difference between organic and inorganic rice essentially represents the opportunity cost of producing organic rice without using agro-chemicals and fertilizers, compared to inorganic farming. Therefore, in order to reduce the rice price, it is necessary to reduce the opportunity cost of producing it. While there are many government interventions, such as the fertilizer subsidy and seed paddy subsidy for the inorganic rice production, there aren't any

such interventions for organic rice farming. What is available is training programmes, awareness programmes and distribution of equipments to make organic fertilizer. While such interventions are necessary to boost the organic paddy farming sector, they do not necessarily reduce the opportunity cost.

Major policy interventions to reduce the opportunity cost of supply in organic rice include providing subsidies for seed paddy purchasing, and organic fertilizer and mechanization. A kilo of seed paddy used in organic farming is around LKR 100, which is nearly two times higher than the price of inorganic seed paddy. Manufacturing organic fertilizer require a lot of labour time. As mentioned earlier, a bag of organic fertilizer is 10 times higher than a subsidized bag of a chemical fertilizer. Since organic paddy fields are small, the possibility of achieving economics of scale is low; as a result the cost of machinery and labour use is high. Therefore, the introduction of financial assistance in terms of grants or loans to purchase machinery is also essential. Such policy interventions does not necessarily have to be implemented at farmer level; implementing these at farmer organization level will also help address the price issues in the organic farming sector.

Role of ICTs in Early Warning of Climate-Related Disasters: A Sri Lankan Case Study

by
Kanchana
Wickramasinghe

Need for an effective disaster early warning system for Sri Lanka was re-emphasised during the devastating storm which caused a number of deaths, a couple of months ago. The frequency and intensity of natural disasters in Sri Lanka including cyclones, floods and landslides are on an increasing trend, due to the impacts of global climate change (Ministry of Environment, 2010). While a number of strategies are necessary to address growth in climate-related natural disasters, an effective early warning system can play a crucial role in lessening the probable negative impacts.

The traditional ways of disseminating disaster early warnings in Sri Lanka have been through radio and television, military forces and early warning towers. However, during a disaster situation, there may be constraints in delivering the message, as mass media channels are not always switched on and the other approaches have limited reach. Recent developments have shown that the information and communication technologies (ICTs) can be used effectively to disseminate disaster information. However, developing countries in most of the cases are faced with resource constraints for the establishment and implementation of disaster early warning systems.

The Disaster Early Warning Network (DEWN) which was launched in 2009, in response to 2004 tsunami, aims to provide timely, reliable and cost-effective mass-scale disaster early warnings using ICTs. This article intends to assess DEWN as an ICT-based approach for disaster early warning in Sri Lanka.

Characteristics of DEWN

The DEWN is a multipartite effort and a case for public-private partnerships in delivering ICT-based early warnings. The agencies in the DEWN include, the Disaster Management Centre (DMC), Dialog Telekom Ltd. (a private mobile telecommunication operator and funder), Microimage (Pvt) Ltd. (a private software development company), and the University of Moratuwa (UOM). The ultimate stakeholders are the emergency personnel and general public (Dialog Telekom subscribers) who will benefit from the warnings.

The DEWN server is located in Sri Lanka's Disaster Management Centre (DMC), the responsible agency in the island for all disaster management issues. The DMC receives early warning information from recognized technical agencies. The DMC holds the responsibility for verifying the emergency situation and then issuing alerts. Emergency personnel are alerted first in the case of a potential disaster and public alerts are issued after the threat is further verified (DMC 2009).

DEWN's disaster alerts carry a number of important features:

- o DEWN makes use of several technologies to disseminate alerts. The end devices include normal cellular phones and alarm devices which were specially developed for this initiative.

- o In order to send alerts to mobile phones, two commonly-available mobile communication technologies are used:

1. Short Message Service (SMS) – Used to send messages to mainly emergency personnel. Since SMS is not immune to possible network congestion that may occur during disasters, it is not used for mass-alerting.

2. Cell broadcasting (CB) – Used to send mass alerts as CB is immune to network congestion.

- o DEWN alarm devices have a number of functionalities which are essential in emergency communications. They are designed to be kept in the public places such as police stations, religious/community centres, markets, hospitals, etc. They can be triggered either by SMS or CB. The device has been successfully tested, though further study and improvements are ongoing so that the device is not yet operational at national level.

- o DEWN's messages are trilingual and can be customized based on the situation.

DEWN is expected to be a successful example of an early-warning system suitable for addressing the growing threat of climate change-related natural disasters. However, no such major disaster has happened in Sri Lanka since DEWN's implementation.

DEWN is currently operational to send disaster-related information to the key contacts via SMS. It had also been used in the case of recent incident of storms to deliver the message to the relevant personnel. However, DEWN has not been used to send disaster early warnings to the general public to avoid panic situations.

Lessons

The public-private partnership has been a major reason for the success of the DEWN as the disaster management agencies who are responsible for early warning have less access to resources and the private sector partners can provide the resources. This emphasizes the fact that public-private partnerships can play a vital role in the ICT-based disaster management approaches.

Also, DEWN is built on existing mobile technology which ensures reduced costs and long-term viability. Also, the design of the DEWN has disaster-relevant components such as an audible alarm warning and ability to send trilingual messages. Mobile phones now increasingly have been popular ICT technology in Sri Lanka, as well as in other developing countries. However, this type of initiatives requires collaboration of other mobile telecommunication partners, in order to provide a full coverage.

Also, ICT based solutions have to be complemented by other disaster management actions. Proper awareness raising among the general public, training for those using specialist devices like the alarm are some of them.



The Other Side of the Coin: Can Climate Change Bring in Positive Impacts?

by
Chatura Rodrigo

Introduction

Most of the global phenomenon has two sides to their story. They bring negative as well as positive impacts. Climate change is no different. Debate on the climate change impacts has a long history. Many talk about the negative impacts of climate change. However, there are also scientists who argue on the positives of climate change. A major reason for not talking about the positive impacts is that the negatives are much more overwhelming than the positives. Negative impacts are easily visible. Floods, heavy rainfalls, droughts, disease outbreaks, harvest losses, reduction in drinking water, threats on energy security, threats on food security and threats on bio-diversity, top the list. However, positive impacts are hard to convince and receive less attention from the scientific as well as policy making entities.



Positive Impacts of Climate Change: Argument of the Other Side

The first documentary on the benefit of climate change was released in 1992 produced by the Institute for Biosphere Research and was sponsored by the Western Fuels Association Inc. This was the era where there was a lot of concern about the CO₂ emissions and George W. Bush, - President of the United States of America agreed to a voluntary reduction in CO₂ emissions. In this documentary sponsored by the oil lobby group of the United States of America, soil scientist Sherwood Idso stated that the doubling of the CO₂ levels will produce a tremendous greening of plant earth while increasing the agricultural productivity by 30%. Industrially elevated atmospheric CO₂ has since increased to about 400 parts per million (ppm), nearly 90 ppm over 1950 levels(i). Even though this has resulted in some agricultural gains in recent decades, the Intergovernmental Panel on Climate Change (IPCC) argues that the overall negative impacts are much higher than the increase in agricultural productivity.

"Climate Change Reconsidered II: Biological Impacts", a report produced by the Non-governmental International Panel on

Climate Change (NIPCC) in year 2014 still argues on the positive benefits of climate change. The NIPCC, as its name suggests, is an international panel of scientists and scholars who came together to understand the causes and consequences of climate change. The NIPCC has no formal attachment to or sponsorship from any government or government related agency. According to the findings, atmospheric carbon dioxide is not a pollutant. It is a non-toxic, non-irritating, and natural component of the atmosphere. Long-term CO₂ enrichment studies confirm the findings of shorter-term experiments, demonstrating numerous growth-enhancing, water-conserving, and stress-alleviating effects of elevated atmospheric CO₂ on plants, growing in both terrestrial and aquatic ecosystems(ii).

The findings further reveal that the ongoing rise in the air's CO₂ content is causing a great greening of the Earth. All across the planet, the historical increase in the atmosphere's CO₂ concentration has stimulated vegetative productivity. There is little or no risk of increasing food insecurity due to global warming or rising atmospheric CO₂ levels. Rising temperatures and atmospheric CO₂ levels play a key role in the realization of the food security in Asian and African countries(iii). Terrestrial ecosystems have thrived throughout the world as a result of warming temperatures and rising levels of atmospheric CO₂. Rising temperatures and atmospheric CO₂ levels do not pose a significant threat to aquatic life. Many aquatic species have shown considerable tolerance to temperatures and CO₂ values predicted for the next few centuries, and many have demonstrated a likelihood of positive responses in empirical studies. Finally a modest warming of the planet will result in a net reduction of human mortality from temperature-related events. The findings further argue that more lives are saved by global warming via the amelioration of cold-related deaths than those lost under excessive heat (iv).

Basis for the Other Argument

Scientists who argue on the positive impacts of climate change do so under several scientific reasons. The main argument is on the climate change models. Global climate models are unable to make accurate projections of the climate even 10 years ahead, let alone the 100-year period that has been adopted by policy planners of today. These scientists further suggest that the output of such models should therefore not be used to guide public policy formulation. Such scientists also argue that no unambiguous evidence exists of dangerous interference in the global climate caused by human-related CO₂ emissions. These scientists stress that the cryosphere is not melting at an enhanced rate, sea-level rise is not accelerating, and no systematic change has been documented in evaporation or rainfall or in the magnitude or

intensity of extreme meteorological events. They further argue that any human global climate signal is so small as to be nearly indiscernible against the background variability of the natural climate system and climate change is always occurring. Finally, the scientific community concludes that a phase of temperature stasis or cooling has succeeded the mild warming of the Twentieth Century. Similar periods of warming and cooling due to natural variability are certain to occur in the future irrespective of human emissions of greenhouse gases.

How Can the Positive Impacts be Harnessed: A Developing Country Perspective

It is very clear that the two groups who argue against positive and negative impacts of climate change have enough solid evidence to prove their own arguments. Therefore, for developing countries, rather than trying to pick a side, it is quite important to understand the take-home message from both these arguments. Among many points under the debate, main areas that developing countries should focus on are food security and energy security.

Scientists who argue on the positive impacts of climate change are optimistic about increased productivity of food crops with increased CO₂ levels. However, this is not for all the food crops. There is enough evidence that some crops are prone to perform less under increasing climate change impacts. Therefore, this calls for more research and development. If plants that perform well under the changing climate can be identified and if they can be acclimatized to the conditions where there are food insecurities, especially the Asian and African regions, it will be a perfect trade for all. Studies have shown that wheat plants (v) tend to produce less under the elevated CO₂ conditions while maize plants respond positively to the same situation (vi). Both these plants are grown in the Asian region where wheat is mainly grown in China and maize is grown in all most all the countries of the Asian region. Studies have also shown that elevated CO₂ levels are beneficial to forage cultivation (vii) and this is good news for the dairy sector since majority of the Asian communities are associated with farm animals at small scale.

For example, Sri Lanka's staple food is rice. There are many rice varieties in cultivation today and there are more than 2000 traditional rice varieties (viii). If more research can be carried out, there could be rice varieties, either traditional or new improved that could perform under increasing CO₂ concentrations (ix). Furthermore, availability of forage is a major constraint for the small scale dairy sector of Sri Lanka. With more research there are possibilities to come up with high yielding forage varieties that can yield under high CO₂ concentrations. These kinds of inventions can solve the forage issues faced by the small scale dairy sector in a time when the climate is changing.

Even though the scientists who propose the positive impact of climate change might not agree, current climate change models predict changes in the rainfall patterns. According to these models, total rainfall will decline while rainfall intensities will also change. These changes will affect energy production from hydrological sources. Therefore, Asian countries like Sri Lanka which depend on hydro energy will have a major issue in the future in meeting their energy demands. At the same time, CO₂ emission reduction will discourage the use of coal as an energy source. All these negative impacts of climate change will push

countries to adopt more renewable energy through wind, solar and bio-mass(x). These energy production avenues are environmental friendly, sustainable and will save government's money especially when compared to the use of coal. For example, Sri Lanka's energy policy is dependent on coal for the next decade. By 2020, Sri Lanka's energy mix will be mainly on coal power, however CO₂ emissions and financial burden on purchasing coal is a real issue (xi). With changing climate, water is becoming limited for energy production. Both these situations allow Sri Lanka to be more considerate on energy production through wind, solar and bio-mass. Therefore, climate change can bring in new prospects such as the development of the renewable energy sector, which is obviously a great positive impact.

Whether climate change is good or bad is not the real question. The real question is what we can do to minimize the negative impacts and harness the positive impacts. Clearly there are some positive effects of climate change. These positive impacts have opened up doors to more research and development and they have proposed new avenues for burning issues like food and energy security.

- i) Harman, G. 2014, "New Argument From Climate Change Deniers: Global Warming is a Good Thing", The Guardian Newspaper, Visited Online, 11th August 2014.
- ii) Idso, C.D., Idso, S.B., Carter, R.M., and Singer, S.F. (Eds.) 2014. *Climate Change Reconsidered II: Biological Impacts*. Chicago, IL: The Heartland Institute.
- iii) Mloom, A., J. 2010, "Carbon Dioxide Enrichment Inhibits Nitrate Assimilation in Wheat and Arabidopsis", *Science*, Vol. 328, No. 5980, pp. 899-903.
- iv) Idso, C.D., Idso, S.B., Carter, R.M., and Singer, S.F. (Eds.) 2014. *Climate Change Reconsidered II: Biological Impacts*. Chicago, IL: The Heartland Institute.
- v) Challinor et al. (2010), "Increased crop failure due to climate change: assessing adaptation options using models and socio-economic data for wheat in China", Visited Online 11th August 2014.
- vi) Kim, H., S. 2007, "Temperature Dependency of Growth, Development, and Photosynthesis in Maize Under Elevated CO₂", *Environmental and Experimental Botany*, Vol. 61, pp 224-236.
- vii) Seligman, N., G., and Sinclair, T., R., 206, "Climate change, interannual weather differences and conflicting responses among crop characteristics: the case of forage quality", Vol. 1, No. 2, pp 157-160.
- viii) Chatura Rodrigo, 2013, "Use of traditional paddy cultivation as a means of climate change adaptation in Sri Lanka," 19th September, 2013. The Island newspaper, Visited Online, 11th August 2014.
- ix) Chatura Rodrigo, 2014, "Is It Time to Go Back To Where We Came From", Daily Mirror, Visited Online, 14th August 2014.
- x) The Academy of Sciences for Developing Countries, 2008, "Sustainable Energy for Developing Countries", Visited Online 11th August 2014.
- xi) Chatura R., Senaratne, A., 2014, "Hydro Power and Sri Lanka's Energy Challenge", Daily Mirror newspaper, Visited Online, 11th August 2014.



CLIMATEnet

Policy Discussion Forum:

Linking expert knowledge
to generate policy insights
on climate change
adaptation under
uncertainty

Introduction

Climate change is a global phenomenon which is fast becoming an inevitable reality. Each country has to develop sound policies, strategies and practices to combat impacts of climate change. Sri Lanka is not an exception. While developed countries are more concerned about mitigation of climate change through investments on low carbon technologies, developing nations are compelled to focus on adaptation measures. Global projections indicate developing countries are likely to undergo more hardships due to impacts of climate change.

Climate change impacts are complex and spread over a broad spectrum of economic sectors and geographical areas. Among the more vulnerable sectors in Sri Lanka are agriculture, fisheries, coast conservation, irrigation, health, disaster management, power and energy and industry. The key strategy to face the impacts of climate change is adaptation. Adaptation refers to *adjustments*, which are in response to *actual or expected* variability or change in climate in order to *moderate and cope* with harmful impacts or to take *advantage of opportunities*. Human society in general is adaptive to changing conditions. Nevertheless, wide-ranging impacts spread over vast geographical areas at relatively rapid pace call for the necessity of planned efforts of adaptation supported by well-designed policies.

The foremost challenge for making policy decisions on adaptation is uncertainty. While many of us believe climate is changing, no one knows exactly what impact would affect us or at what time and in which location. In other words, despite broad consensus about the likelihood of climate change, its impacts are highly uncertain. In many ways, climate change can be considered as a deep uncertainty. The key sources of climate uncertainty are: inherent natural variability due to own dynamics of climate system; scientific uncertainty due to limitations of our knowledge and uncertainty about future emissions from anthropogenic sources.

Decisions on public policies for adaptation need information about impacts of climate change. Two major sources of information that offer clues about impacts of climate change are historical trends in weather patterns (e.g. temperature, precipitation etc.) and future projections by

climate models. Extrapolation of historical trends cannot be considered as a reliable source of information for making adaptation decisions due to inherent natural variability and uncertain future emissions. On the other hand, projections based on climate models, while providing useful insights about the likely future changes over long-term horizons (e.g. 25, 50 or 100 year horizons) are dependent on scenarios of future emissions, which are uncertain. Hence, neither of these sources provide sufficiently reliable information for making decisions on public policies on climate change.

Decisions on public policies on climate change adaptation involve investment of public resources. Public resources are scarce and allocation of them needs identifying investment priorities among competing policy interests. Identifying public investment priorities is a political economic process that gives priority for politically more sensitive issues. A vague picture from climate predictions and analysis of historical trends hardly. However, lack of reliable information does not justify delaying the action. Since the existing sources do not offer sufficient information for making policy decisions on adaptation, experts' views and judgments are necessary to bridge the resulting information gap and to convert current knowledge on climate change to policy decisions. Expert assessments are usually essential part of policy decision-making in many areas of public policy and its importance could vary subject to the availability of information. Naturally, a higher weight is given to expert judgment on issues where limited information is available and uncertainty is a critical factor. Policy on climate change adaptation represents such an area where expert review and assessment of available information is critically important for making policy decisions.

The Context

Sri Lanka has already initiated a policy and institutional set-up to deal with climate change. This system evolves gradually and the Climate Change Secretariat (CCS) established under the Ministry of Environment and Renewable Resources (MERR) is the main government organization that looks into

projects and initiatives regarding climate change. The major milestones of this national initiative include the formulation of National Climate Change Policy (NCCP) in 2012 and preparing the National Climate Change Adaptation Strategy for Sri Lanka: 2011 to 2016 (NCCAS: 2011-16) in 2010. In addition, there are many stakeholder agencies that deal with different aspects of climate change in Sri Lanka. These agencies have restricted mandates over relatively limited scopes and therefore other broader issues that escape limited domains of such agencies. Such issues need to be addressed by a variety of stakeholders such as universities, think tanks, private sector agencies, CBOs and NGOs. On the other hand, being a relatively new area of interest among other conventional priorities such as poverty alleviation and infrastructure development, existing policies and strategies are not fully geared to address the issues concerning climate change. Given this context, many gaps can be observed in policies/strategies to face the impacts of climate change. Even though the CCS has a mandate to look after broader national interests, it needs the cooperation of different line agencies responsible for various sectors and the support of other stakeholders such as research institutes, think tanks, universities, CBOs and NGOs. The challenge for CCS is successfully rallying the support of those multiple stakeholders and coordinating their efforts.

The current study made an attempt to fulfil this gap by generating essential policy insights in selected impact areas through the consultation of expert knowledge and opinions. The Institute of Policy Studies of Sri Lanka (IPS), as the apex policy think tank in the country, is in an ideal position to make a significant contribution for overcoming these policy gaps. Being a global threat with significant impacts over Sri Lanka's economy, climate change issues naturally stand high in the research agenda of IPS. Climate change policy studies of IPS were launched in a national workshop held in Dambulla in 2009. Since then, IPS has adopted a collaborative and consultative approach. IPS developed the CLIMATEnet—a web portal with blog facility—to share information/resources and exchange views with other important stakeholders. The CLIMATEnet has provided an ideal platform for launching a policy dialogue on climate change in Sri Lanka, enabling to network with various stakeholders.

Objectives

The project examined key impacts and vulnerabilities in different impact areas/sectors, including major gaps in adaptation and strategies to overcome these gaps. It also aimed to assess the information needs of respective sectors. The specific objectives can be stated as:

1. Identify major impacts involved in different areas/sectors with high vulnerability to climate change
2. Identify major gaps that need to be filled for successful adaptation in key impact areas
3. Examine suitable strategies/policies to bridge the gaps identified in respective impact areas/sectors with the consultation of key stakeholders
4. Assess the information needs of respective sectors that complement the proposed strategies and adaptation measures

Methodology

The study was based on qualitative information gathered through a series of consultation meetings with experts from seven identified impact areas. Hence, the main method used for gathering information is expert elicitations. Consultations focused on major gaps in a few critically important sectors that are vulnerable to impacts of climate change, namely:

- Agriculture,
- Fisheries and coastal resources,
- Water
- Health
- Energy
- Bio-diversity
- Human settlements

Consultations were carried out using a semi-structured format, suitably customized to capture the essential aspects of climate change issues in respective sectors.

Expert Elicitations

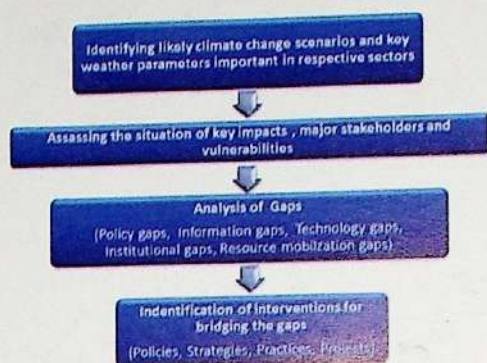
Expert consultation (EC) has become a widely used approach in many research areas. An expert is someone that possesses knowledge about a particular area of interest/subject as a result of training, skills, research or experience whose opinion is called on for interpretation. This definition covers not only academics and intellectuals but practitioners such as farmers, fishers etc. who may possess specialized knowledge on their respective fields of activity gained through extensive experience. Knowledge of experts has been identified as a substantial source of information on a particular area not known by many others. Expert judgments are predictions made by experts on what may happen in a given situation using their knowledge. Expert judgments have been found useful when:

- Complex dynamic systems are involved
- Limited ability to acquire necessary information over a reasonable timeframe
- Decisions cannot be postponed until the necessary judgement is fully acquired

These conditions closely match the situation found in climate change adaptation and expert elicitation can be considered ideal for informing policy makers under limited information.

There are two broad approaches of expert elicitation, namely, independent individual consultations and group consultations. Group consultations include methods such as expert panels and Delphi techniques. Delphi techniques are more structured methods of expert elicitation. In the present study, semi-structured group consultation and brainstorming approach was used. The discussions were structured in the following generic framework (Figure 1), taking the climate change impacts on selected areas one by one.

Figure 1: Generic Framework for Policy Analysis

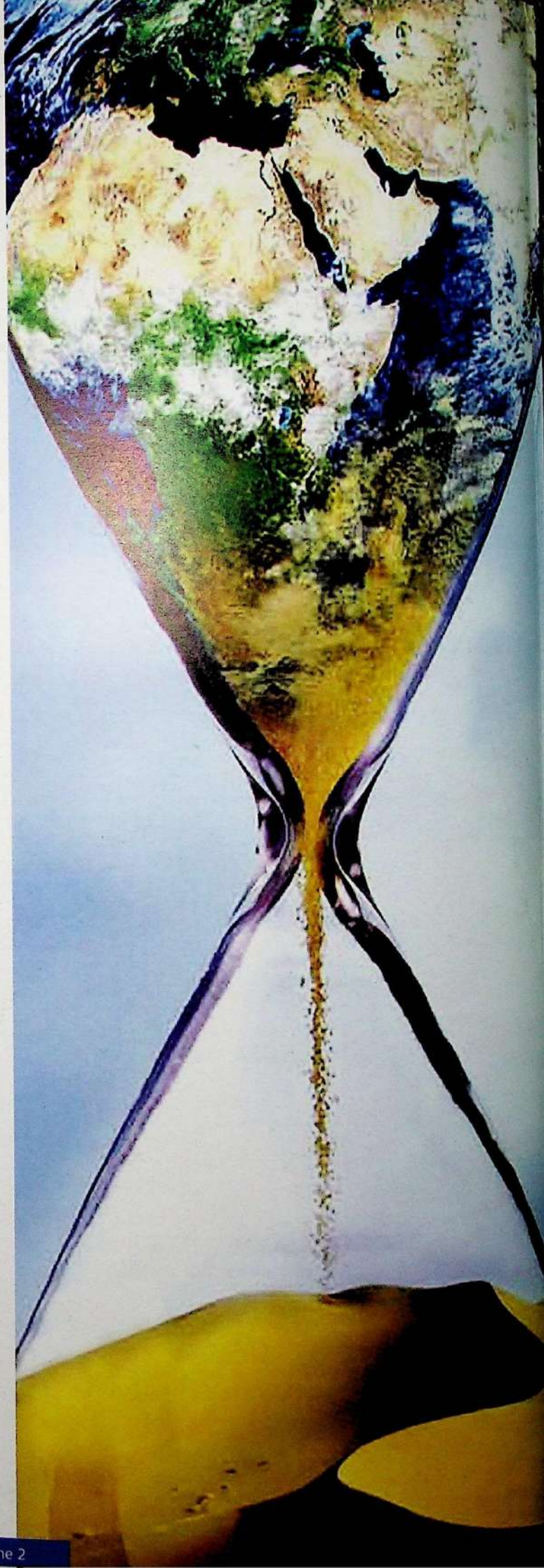


Lists of experts from each impact area were selected from the government organizations, universities, research institutes, private sector, NGO/INGOs and community groups. A series of seven expert consultation workshops was conducted to extract the information on each impact area.

The Outcome of the Project

The project is an exploratory study which is a part of the broader agenda of climate change research in IPS. Through this project, the IPS makes an attempt to develop a dialogue on climate change policy issues in Sri Lanka using the CLIMATEnet as a platform. The aim of the forum is to transform the scattered expert knowledge on climate change into a set of policy recommendations. At the end of each discussion, a policy brief was produced focusing on the particular impact area. This would help to fill an important gap in current national policy on climate change in Sri Lanka. The policy briefs will be initially published in the CLIMATEnet. The first of the policy briefs is expected to be published from January 2015 and will be followed by others at monthly intervals. It is expected to prepare an edited hard copy publication at the end of the web publication of all policy briefs.

The future IPS research on climate change will build upon the insights developed in the current study. Moreover, the project has also been designed as a networking activity with stakeholders in several other sectors. Hence, in addition to the targeted knowledge outputs, a continuous future flow of gains can be expected from networking with key stakeholders of the subject.





/instituteofpolicystudies



/TalkEconomicsSL



www.ips.lk/talkingeconomics



/IPSsrilankavideo



A PUBLICATION BY
THE INSTITUTE OF POLICY STUDIES OF SRI LANKA

SUPPORTED BY



Think Tank Initiative