



EEPSEA
Climate Change Conference

Climate Change: Impacts, Adaptation, and Policy in South East Asia



**Grand Mirage Resort, Nusa Dua
Bali, February 13-15, 2008**

Economy and Environment Program for Southeast Asia

EEPSEA CLIMATE CHANGE CONFERENCE

CLIMATE CHANGE: IMPACTS, ADAPTATION, AND POLICY IN SOUTH EAST ASIA

*WITH A FOCUS ON ECONOMICS, SOCIO-ECONOMICS AND
INSTITUTIONAL ASPECTS*

**GRAND MIRAGE RESORT, NUSA DUA, BALI, INDONESIA
FEBRUARY 13-15, 2008**

**ECONOMY AND ENVIRONMENT PROGRAM FOR SOUTHEAST ASIA
FEBRUARY, 2008**

EEPSEA CONFERENCE ON CLIMATE CHANGE: IMPACTS, ADAPTATION, AND POLICY IN SOUTH EAST ASIA
13-15 FEBRUARY 2008.

PROCEEDINGS

Copyright ©EEPSEA (Economy and Environment Program for Southeast Asia) 2008.

EEPSEA reserves full rights to this publication. This publication may be reproduced in full or in part as long as EEPSEA is cited as the original source in the publication where the reproduction appears.

Authors:

Herminia Francisco
Orapan Nabangchang
Bui Dung The
Arief Anshory Yusuf

Editor: Clare Westwood

Design and Layout: Arief Anshory Yusuf

Publisher: International Development Research Centre, 22 Cross Street, #02-55, South Bridge Court, Singapore 048421, (65) 6438 7877, www.eepsea.org and eepsea@idrc.org.sg

THIS CONFERENCE WAS FUNDED BY IDRC (International Development Research Centre), CIDA (Canadian International Development Agency) AND SIDA (Swedish International Development Cooperation Agency).

ACKNOWLEDGEMENT

My appreciation goes to all the participants of the Climate Change Adaptation Conference for their contributions by way of paper presentations and their active and thoughtful interactions that led into the production of this important piece of work. This report contains useful information on the status of research on the important topic of climate change adaptation and the questions that need to be answered in order for us to respond appropriately to the needs of climate change-vulnerable communities and sectors in Southeast Asia. It also contains a list of priority research areas that researchers, policy-makers, and natural resource managers have identified for consideration by research and development agencies supporting adaptation efforts in the region. I hope that our partners in Southeast Asia will find these recommendations worthy of their attention.

I acknowledged the full support of Drs. Orapan Nabangchang, Bui Dung The, and Arief Yusuf, EEPSEA Senior Economists, in organizing the conference. Dr. Yusuf also created the website for the EEPSEA Climate Change Adaptation Initiative (<http://climatechange.eepsea.org>) and I invite everyone to visit this website to access the powerpoint presentations of the various conference papers. I thank Ms Ang Cheng Hiang and Ms Catherine Ndiaye who provided excellent administrative support in getting the conference to run smoothly.

I am also appreciative of the support provided by the Regional Director of IDRC, Richard Fuchs, at all stages of preparation for and execution of this conference and in facilitating the focus group discussions with policy-makers; Ms. Vivien Chiam, for her help in media support; and Drs. David Glover, David James, Rex Cruz, and Budy Resosudarmo, for their help in facilitating workshop sessions.

Finally, I am grateful to Ms. Clare Westwood for her documentation and excellent and speedy editing of the proceedings and the synthesis report that we put together to make the output of the conference promptly and readily available to interested parties. I sincerely hope that we have done justice to capture the excellent contributions of everyone who helped make this conference a success.

Herminia A. Francisco

Director

Economy and Environment Program

For Southeast Asia (EEPSEA)

TABLE OF CONTENT

Acknowledgement	1
Table of Content	2
Introduction	3
1. OPENING ADDRESS By Dr. Herminia A. Francisco	3
2. WELCOMING REMARK By Dr. David Glover	5
3. IPCC 4TH ASSESSMENT REPORT ON THE IMPACTS, ADAPTATION AND VULNERABILITIES IN ASIA: IMPLICATIONS FOR SOUTHEAST ASIA by Rex Victor Cruz	5
4. THE ECONOMICS OF CLIMATE CHANGE by Muyeye Chambwera	6
5. WORKSHOPS ON CLIMATE CHANGE AND AGRICULTURE – Summary by Orapan Nabangchang	7
5.1 Scope and Coverage of Papers Presented in Session A	7
5.2 Methods/Sciences and Sources of Information	7
5.3 Findings and Discussions	8
5.4 Conclusion	10
6. WORKSHOPS ON ENHANCING ADAPTIVE CAPACITY AND RISK MANAGEMENT— Summary by Bui Dung The	11
6.1 Introduction	11
6.2 Impact of Climate Change in Southeast Asian Countries	12
6.3 Adaptive Capacity	14
6.4 Risk Management	16
6.5 Recommendations for Future Research	17
7. WORKSHOPS ON ADAPTATION TO SEA LEVEL RISE AND CLIMATE CHANGE MITIGATION – Summary by Arief Yusuf	18
7.1 Sea Level Rise: Impacts and Adaptation	18
7.2 Mitigation in the Energy and Forestry Sectors	23
8. POLICY MAKERS PANEL SESSIONS: WHAT NATIONAL AND LOCAL GOVERNMENTS ARE DOING ON CLIMATE CHANGE ADAPTATION	26
8.1 Policy-Makers Panel: What Are National Governments Doing on Climate Change Adaptation?	26
8.2 Local Government Units Representatives Panel: What Are Local Governments Doing in Response to Climate Change?	28
9. SYNTHESIS: KEY POINTS ARISING FROM THE PLENARY AND BREAK-OUT GROUP PRESENTATIONS: Post-conference analysis – by Herminia A. Francisco	30
9.1 Discussion Questions	30
9.2 Responses by Participants	31
10 CLOSING ADDRESS BY Dr. Herminia Francisco	40
11. CLOSING REMARK BY Mr. Richard Fuchs	40
About EEPSEA	42
Appendix A: Program	43
Appendix B: List of Participants	48
Appendix C: Abstracts of Papers	55

INTRODUCTION

The Economy and Environment Program for Southeast Asia (EEPSEA) organised a conference on climate change adaptation in Bali, Indonesia from 13 to 15 February, 2008. The event brought together key players in the subject-area by way of 65 participants comprising researchers, policy-makers, NGOs and donors. About 40 papers were presented in the workshop sessions while national and local government policy-makers and project managers presented existing work on climate change adaptation by way of panel presentations. The main aim of the conference was to determine critical areas of research to support climate change adaptation strategies in Southeast Asia.

This report covers the main proceedings of the conference with syntheses of workshop and group discussion sessions as well as short summaries of panel presentations. Abstracts of the papers presented are given in the appendix. For the full presentations/papers, please visit the website: <http://climatechange.eepsea.org>

1. OPENING ADDRESS BY DR. HERMINIA FRANCISCO

DIRECTOR, EEPSEA

Good morning everyone. It is my great pleasure to welcome you to this conference on Climate Change Adaptation. My name is Hermi Francisco, and I work for the Economy and Environment Program for Southeast Asia – EEPSEA. EEPSEA's mandate is to develop capacity in conducting research on environmental issues using the tools of economics – we have been doing this work in this region since 1993. EEPSEA is administered by Canada's International Development Research Centre (IDRC). Our two other donors are the Canadian and the Swedish International Development Agencies. I see this conference as a manifestation of a shared belief that adaptation to climate change is an urgent issue that everyone should contribute to. EEPSEA is committed to doing its part using the tools that we know best from our discipline – environmental economics. A year ago, we made a call for proposals on the economics of adaptation to climate change. That call resulted in our supporting 4 research projects and 6 case studies. Two of those case studies will be presented in this conference. In our call, we expressed interest in proposals dealing with:

- Cost-benefit analyses or cost-effectiveness analyses of existing or potential adaptation strategies; and the assessment of ancillary benefits from adaptation;
- The role of information provision in adaptation decisions of local policy-makers;
- Barriers to autonomous adaptation and determinants of adaptive capacity; and
- Incentives and disincentives to private sector involvement in the provision of adaptation services or technologies.

I realize that there are other topics that are relevant to the various communities with which you are working and we would be happy to hear your suggestions on this. We realized three things in the course of finding our niche in this subject area.

One—and we were glad to find this out—is that a number of research organizations are already engaged in climate change adaptation research in the region. For instance, a comprehensive project involving multi-regions and multi-sectors was carried out by START (System for Analysis, Research and Training Regional Center) through the Assessment of Impacts and Adaptation to Climate Change project from 2003 to 2006. Some of the researchers who participated in the Asia assessment under that project are with us today. There is also the Asia-Pacific Network which is currently working on the Assessment of Impact, Vulnerability and Adaptation on Rice Production and Water Resources involving four Southeast Asian countries. There are many more organizations doing research on this topic but since their entry has been fairly recent, most of their work is still on-going like ours. We thought that bringing together the key players in this subject-area would help us find out more about the work of these research organizations so that we can identify complementary research areas to focus on.

Two, we realized that research from a single disciplinary perspective, in this case economics, would not be sufficient in tackling such a challenging topic as climate change. We need technical scientists to measure the physical impacts of climate change and/or adaptation strategies before we can value these impacts. We also need inputs from social scientists to capture the perspectives of local communities with regard to climate change. A well-executed study needs to be strongly rooted in science with inputs from other disciplines. We are therefore glad to have in our midst researchers from the natural science and social science streams. I am sure that we can learn a lot from one other in this conference.

Three, it became clear to us that adaptation is largely a local issue as impacts will be felt mostly by local communities located in areas most vulnerable to climate change. This requires strong policy support to facilitate adaptation. As such, research solutions have to be policy-relevant as well as responsive to the needs and circumstances of vulnerable communities. This then makes it imperative for us to listen to and consult with policy-makers and local communities. We have thus invited a number of policy-makers from both the national and local government levels so that researchers may dialogue and exchange ideas with them during this three-day event. While we were unable to bring representatives from local communities to this conference, I trust that their viewpoints and challenges will be highlighted through the various conference papers presented by researchers who have worked directly with these communities.

In closing, it is my hope that through this conference, we can discover how we can better position research efforts in this subject-area, so that together, we can contribute more effectively to facilitating climate change adaptation in Southeast Asia. I thank you for your participation and contribution.

2. WELCOMING REMARK BY DR. DAVID GLOVER

PROGRAM LEADER, ENVIRONMENTAL ECONOMICS, IDRC

On behalf of IDRC, I'd like to welcome you to this event. We are very pleased to be sponsors of this conference, along with our partners CIDA and SIDA. IDRC has a large and growing portfolio in environmental research. Environmental economics and climate change are growing areas within that and we hope to further expand our support to climate change adaptation in the near future.

EEPSEA is one of several environmental economics networks operating in Asia, Africa and Latin America. Each of these is in the process of identifying a useful role for itself in supporting work on climate change. The ideas and suggestions you come up with in the coming days will be valuable not only for Asia but for other regions as well. As you listen to the presentations, please try to draw out useful and interesting research questions that could be the subject of future work supported by EEPSEA and IDRC. I look forward to hearing your insights and advice.

3. IPCC 4TH ASSESSMENT REPORT ON THE IMPACTS, ADAPTATION AND VULNERABILITIES IN ASIA: IMPLICATIONS FOR SOUTHEAST ASIA BY REX VICTOR CRUZ

(This report was compiled by the IPCC team of experts, of which Rex Cruz was the Coordinating Lead Author.)

Asia is the most populous region in the world with 3.9 billion people. Sixty one per cent live within 100 km of the coastline. Global warming is least rapid in Southeast Asia compared to the global average. However, the number of hot days (more than 30 degrees Celsius) is projected to increase steadily over this century. There will also be a rise in the occurrence of extreme weather events and a 10-20% increase in tropical cyclone intensities in South, East and Southeast Asia. Sea level is likely to continue to rise based on an average 3.1mm/year increase over the last decade compared with 1.7-2.4 mm/yr in the last century. By 2050, a rise of 40-90 cm is predicted in different parts of China. In central and southern Japan, rice yields are projected to fall by up to 40% in irrigated lowland areas while cereal yields could decrease by as much as 30% by 2050 in Southeast Asia. By the same year, 1,000 km² of cultivated land and sea cultured areas in Bangladesh are predicted to become salt marshes and 15,000–20,000 km² of the Mekong Rive Delta are expected to be flooded. The most vulnerable places and people in Asia include coastal areas and the poor informal urban sectors. Overall, SEA is classified as a “highly vulnerable” region in most categories: food & fiber, biodiversity, water resources, coastal ecosystems, human health, and land degradation. This has adverse implications on development opportunities. The constraints to adaptation include physical and financial limitations, and domestic conflicts while effective adaptation strategies comprise developing and improving information systems, enhancing disaster preparation, building the capacity of local communities, mainstreaming adaptation at all development levels, integrated area development, and sustainable forest management.

ADDITIONAL INPUT FROM THE Q&A SESSION

There is a need to conduct more studies at the local level to see the impacts of climate change on communities as the IPCC report is on a very big scale. A lot of downscaling efforts, relevant to small areas of concern, have to be made. A database on this should be developed. Thailand will have some downscaled data available this year.

4. THE ECONOMICS OF CLIMATE CHANGE *BY MUYEYE CHAMBWERA*

THE INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT (IIED)

The areas of high vulnerability to and low adaptive capacity for climate change are Africa, Asia, Latin America and the Small Island States. The main climate change options are mitigation and adaptation, the latter being the most immediate policy option at hand. The economic dimensions of adaptation comprise three perspectives: welfare, resource allocation and sustainable development. The main reference model is the Stern Review of 2006 which provides a cost-benefit framework to estimate the net benefit value of adaptation. Existing economic data is subject to different methods and is highly aggregated with limited case studies and low coverage of developing countries. There are several methodological issues to consider in evaluating adaptation as climate change is an applied field involving risk management and other dimensions. Valuation challenges include for instance, how to value saved or lost lives. The costs and benefits of adaptation are best estimated using data from real places where adaptation is required.

ADDITIONAL INPUT FROM THE Q&A SESSION

There are different estimates for costs of adaptation given by different sources, for example, the Stern Review and Oxfam. A very relevant issue is finding the least cost way to help local communities adapt. A multi-disciplinary approach is needed to address the issue as there has to be a linkage between environmental and social dimensions in bringing justice to the poor who are the least responsible for the problem of climate change. The present understanding of and planning on climate change is from a global perspective which is then communicated downwards to lower levels. It is difficult to isolate climate change impacts because (1) there are multiple stresses overlapping with no clear boundaries; (2) governments are not concerned with local communities with respect to climate change; (3) governments combine climate change with other issues they had to address; and (4) the political dynamics vary from country to country. Therefore, technical scientists need to work with social scientists and economists on the macro and micro aspects of climate change and adaptation, and both the top-down and bottom-up approaches have to be employed. Local communities cannot afford to wait for policy-makers to make decisions before adapting – they are in the ‘front lines’ so they have to take timely adaptation action.

5. WORKSHOPS ON CLIMATE CHANGE AND AGRICULTURE – SUMMARY BY ORAPAN NABANGCHANG

5.1 SCOPE AND COVERAGE OF PAPERS PRESENTED IN SESSION A

Altogether 12 papers were presented. The papers covered various aspects of climate change impacts on agriculture and adaptation measures. Key issues raised by the country papers are summarized in Table 1.

Table 1. Summary of papers presented in Workshop Session A

Country/ Researcher	Impacts	Adaptation
China (2) Jia Li, et. Al, 2008; Liu Yingjie and Lin Erda, 2008	-changes in agro-ecosystems and water supply -livelihood of farmers -health impacts -temperature and investment on output	-measures to address changes in seasonality, water availability and soil quality -adaptation measures of LGU and local people -technological means, -institutional & capacity building -regional specific measures
Philippines (5) Pulhin, et al, 2008; Espaldon, et al, 2008; Pulhin, et al, 2008; Lasco, et al, 2008.	-climate variability and extreme events, e.g. El Nino, La Nina -vulnerability of farmers in upland and watershed areas	-differences in ability to adapt given land assets, income and education -knowledge systems and capacity to adapt -current adaptation models
Thailand (3) Chinvanno S. 2008; Towprayoon S., 2008; Jinrawet A, 2008	-risks and vulnerability of rain-fed farmers based on changes in rice productivity -GHGs from rice production -climatic change simulation and crop modeling	-mitigation options to reduce GHGs from rice production
Indonesia (1) Amien, I and E Runtunuwu, 2008	-changes in crop acreage and productivity	-water conservation & agricultural waste recycling, -hard and soft interventions -climate observation networks -people empowerment
Lao PDR (1) Soulideth Souvannalath, 2008	-vulnerability of farmers given loss of rice output	-individual coping strategies, adjusting farm practices and off-farm income

Note: Number of papers from each country is indicated in parenthesis.

5.2 METHODS/SCIENCES AND SOURCES OF INFORMATION

5.2.1 SOURCES OF INFORMATION ON THE SCIENCE OF CLIMATE CHANGE

The analyses drew upon two types of data, scientific bio-physical data and socio-economic data. The biophysical data on climate change for some of the studies was based on historical records of temperature, rainfall, and extreme climatic events as well as rural and agricultural statistics. Biophysical data was based on

projections of changes for various climate change scenarios in climate change models such as CCAM and EHCAM 4. Projections of changes in temperature and carbon dioxide (CO₂) were used as inputs for crop models such as DSSAT and CERES to project changes in yields of selected crops such as rice, sugarcane, tomatoes and peanuts. The other group of studies presented focused on the impacts of climate changes on households in selected study areas. These studies included those conducted in Heilongjiang Province in northeast China, in Bukidnon in the Philippines, in the Ubon Rachathani Province of Thailand, and in the Vientiane plain of Lao PDR.

The major findings of the bio-physical climate change models were that with climate changes, there would be more extreme climate events, higher incidence of floods and droughts, rising temperatures, and increasing precipitation. These changes would affect crop productivity and output. Variability such as early or delayed rainy seasons and prolonged rains will change both the supply and flow of water supply. These changes, in combination with changes in temperature and CO₂ levels can affect the physiology of the crops produced (changes in transpiration and respiration, maturation period, etc.), as well as other plants and living organisms and the soil quality. In addition, temperature rises, water availability, CO₂ levels, etc. may make the conditions in some geographical areas unsuitable for production, but could also have the positive effect of increasing areas that can be brought under production.

5.2.2 INFORMATION FROM FARMERS

Studies in Session A which focused on the impacts of climate changes on the households utilized a combination of research approaches such as key informant interviews, stakeholders meetings, and participatory mapping which involved local people identifying locations of farms, settlements and household surveys. One study which focused on mitigation options to reduce greenhouse gases implemented field experiments. Another methodology employed included inter-sectoral analysis of adaptive strategies. Households provided information on their perceptions of losses and risks, and coping and adaptive measures undertaken. Visuals and maps were used as aids to communicate risks and perceptions of loss. One other approach used was multi-criteria analysis to classify farmers into different levels of risks and vulnerability.

5.3 FINDINGS AND DISCUSSIONS

The impacts of climate change vary by geographical locations. The differential impacts on the various socio-economic groups are determined by the location of settlement and production sites, and levels of income, education and awareness. The higher income group, for example, have greater capacity to cope. In general, the impacts on farm households with livestock is less than households relying on income from a single crop.

5.3.1 EXISTING ADAPTATION MEASURES

Adaptive strategies can be classified into two distinct groups, i.e., 'top-down' and 'process-oriented'.

The 'top-down' adaptive strategies include technologies that rely on sound scientific information. Among the 'top-down' adaptive strategies cited in the presentations were better (i) climate prediction technologies; (ii) agro-ecological maps as guidelines for sustainable agriculture development; (iii) crop calendar maps; (iv) crop breeding adapted to unfavorable environments; and (v) biomass and nutrient management, and efficient energy technology.

'Top-down' adaptive strategies also include the development of infrastructure, the most common being investment in improvement of irrigation systems in anticipation of the fluctuation in the water supply. Experiences from the Philippines with crop insurance and calamity support funds are examples of institutional measures to minimize farmers' risks.

The second group of adaptation measures focus primarily on the 'processes' of adaptation. These are by nature, participatory, aimed at providing knowledge so that farmers can have better access to information and be able to use the information to anticipate changes and be more prepared. The advantage of 'process-oriented' adaptive strategies over 'top-down' measures is that the former recognizes the importance of both scientific information and the traditional-ecological knowledge of farmers, hence meeting the challenge of how to combine and apply both in different geographical settings and for different socio-economic groups. Some empirical examples of 'process-oriented' adaptation measures include water conservation efforts, the establishment of climate field schools, and the advocacy of multiple knowledge systems which aim at combining scientific knowledge with traditional knowledge of local communities.

5.3.2 DIMENSIONS OF CLIMATE CHANGE ADAPTATION

Empirical evidence of adaptation measures presented reflect the different dimensions of adaptation:

- (1) To stabilize agricultural production. Farmers adapt by adjusting their farming practices, their crop calendars, the type of seeds used, and the crops planted. Some adjustments to stabilize production, such as increasing the use of fertilizers and chemical inputs, may necessitate additional outlay and can worsen farmers in financial situations.
- (2) To sustain levels of income by finding supplementary income outside of the farm.
- (3) In the case of extreme climate events, adaptation measures are merely to minimize the expected damages. The common practices of the Lantapan farmers in Bukidnon in the Philippines for example, include reducing consumption, storing food and water, or praying. Observations were made that some adaptive measures were simply based on availability or ease of implementation.

5.3.3 KNOWLEDGE, INFORMATION AND ADAPTATION

A common observation was that knowledge and information were fundamental to devising adaptation strategies, hence the need to improve access to information on climate change and to develop early warning

systems. Sources of knowledge and information can come from many sources. Technical/scientific knowledge and traditional-ecological knowledge can be complementary to each other in that science can validate farmers' local knowledge as well as enhance their ability to adapt. The challenge thus, was primarily one of selecting and putting together appropriate strategies.

5.3.4 THE ISSUE OF DOWNSCALING

With regard to future directions, the issues of 'downscaling' and 'upscaling' were discussed. Among the requirements for downscaling were:

- (1) Better understanding of the variability of the impacts in different zones
- (2) Capturing both positive and negative impacts
- (3) Understanding differential impacts and degrees of vulnerability on different socio-economic groups

Work on downscaling presented included the study by Dr. Attachai Jintrawet on *'Simulating Rice Production Systems in Thailand under Various Climate Scenarios: Preliminary Results of a Simulation Study'* and by Felino P. Lansigan on *'Managing Risks due to Changing and Variable Climates in Vulnerable Agroecosystems in the Philippines'*

5.3.5 THE ISSUE OF UPSCALING

Based on the papers presented which focused on specific communities and crops, a number of observations were made on the issue of how to 'upscale' findings and lessons learnt and how knowledge of local level adaptation measures could be incorporated into policy making. It was recognized that the micro-nature of studies on adaptation made generalizations problematic for a variety of reasons such as data collection at the local level being based on farmers' perceptions of risks and vulnerability; studies reflecting only one point in time and not capturing the dynamics of impacts, risks, and vulnerability; and differences in perception of timeframes of farmers and scientists. The approaches and methodologies for data collection thus need to be further refined.

5.4 CONCLUSION

Most studies on climate change in the field of agriculture measure biophysical impacts and are largely crop-specific. There is need to expand models to incorporate socio-economic factors such as pressure for land conversion, and the prices of agricultural products and inputs. At this stage of modeling of the biophysical impacts of climate change, the expansion to include the non-biophysical aspects can be easily done.

The studies presented which focused on the impacts on and adaptation measures of households affected by climate change adopted a primarily qualitative approach. While such studies provide important information,

there is a need to go further to identify, quantify and monetize the negative and the positive impacts of climate change.

Also needed are studies which look beyond mere adaptation practices to the assessment of adaptive performance, capacity and needs. Recognizing that climate changes is only one among many ‘stressors’, taking a holistic approach was necessary. The study framework adopted by Lasco, Cruz, Pulhin and Pulhin on *Trade-off Analysis of Adaptation Strategies in the Philippines* explored the trade-offs between adaptive measures highlighting that some measures could have both positive and negative trade-offs.

On the issue of survey instruments, several areas for improvement identified were:

- (i) How to better communicate risks and vulnerability in various contexts,
- (ii) How to design research to capture the dynamism of future socio-economic development,
- (iii) How to use scientific knowledge and calibrations and compare these with perceptions of losses
- (iv) How to develop a better understanding of the cumulative impact of climate change
- (v) How to assess specific sectors and groups under different production systems in different geographic regions

In conclusion, there is need to have clearer distinction between climate change and climate variability. While climate change may be so distant into the future that it becomes difficult to predict accurately and understand, rainfed farmers face climate variability all the time. Worsening climate variability and the high probability of extreme climate events are only going to make farmers even more vulnerable. Moreover, the uncertainty is not just due to climate change, but also to other constraints faced by small-scale rainfed farmers such as access to factors of production, indebtedness, price fluctuations, and market competition. As such, adaptation will always be conditioned by a number of institutional, financial and know-how constraints. Given that the impacts will vary by agro-ecological zones and within zones, the baseline socio-economic situation is going to determine farmers’ ability to cope and adapt. Therefore, policies will have to be area-specific and target group-specific.

6. WORKSHOPS ON ENHANCING ADAPTIVE CAPACITY AND RISK MANAGEMENT— SUMMARY BY BUI DUNG THE

6.1 INTRODUCTION

This brief synthesis on the adaptive capacity of and climate-risk management in Southeast Asia countries is prepared based primarily on the papers presented during Session B on “Enhancing Adaptive Capacity and Risk Management”. There were 13 papers presented comprising four case studies, two action research (in

collaboration with the surveyed communities), four conceptual papers, and three papers reviewing past studies on climate change. A brief profile of the papers is presented in Table 2.

Table 2. Papers presented by country and topical focus

Country & Researchers	Impacts of Climate Change	Adaptation to Climate Change	Risk Management
Cambodia Thoeun (2008)	Prediction of climate change and assessment of impacts		
China Li (2008)	Prediction of impacts on maize, wheat, potato		
Indonesia Boer & Perdinan (2008) Djajadiningrat (2008)	Impact review Valuation methods	Financing adaptation Valuation methods	
Malaysia Salleh & Ghaffar (2008)		Vulnerability and adaptive capacity framework	
Philippines Castillo et al. (2008) Sales (2008) Concepcion (2008)	Impact review	Capacity assessment and building	Local risk assessment
Thailand Wangwacharakul (2008)	Impact assessment framework		
Vietnam Tran et al. (2007)	Impact review	Adaptation measures	Risk assessment
Regional/global Tibig (2008) Murray (2008) Jesdapipat (2008)	Impact review	International institution and mechanisms: UNFCCC, CDM, technology transfer	

The following sections of the synthesis discuss the impacts of climate change and variability, adaptive capacity, climate change risk management in Southeast Asian countries in the region, and recommendations for future research.

6.2 IMPACT OF CLIMATE CHANGE IN SOUTHEAST ASIAN COUNTRIES

6.2.1 CLIMATE CHANGE AND NATURAL HAZARDS

Changes in climate in Southeast Asian countries were reported by the different presenters. Countries in the region were experiencing more frequent and intense environmental hazards. The type of natural hazards/natural extreme events varied across country and locality. The most common climate extreme events in the Philippines, Indonesia and Vietnam were cyclones, floods, storm surges, forest fires, and droughts while Lao, Cambodia, and Thailand faced increasing droughts and floods.

The paper *“Flood Risk Management in Central Vietnam: Challenges and Potential”* by Phong Tran et al. reported an increasing trend in rainfall, temperature, and extreme climate events such as floods and storms over the last decade in the coastal areas of Thua Thien Hue Province in Central Vietnam. In Indonesia, the most frequent hazards were floods, windstorms, forest fires, droughts, and high tides/storm surges. Hazards have occurred more frequently since the 1980s. Papers from the Philippines also told similar climate change stories.

Climate change will continue on the same trend with higher frequency and intensity. It was predicted that in Cambodia, air temperature could increase from the current year's temperature by 0.30, 0.70 and 2.00 °C in 2025, 2050 and 2100 respectively. Using CCSR under SRESA2, annual rainfall in Cambodia was predicted to increase by up to 6% of the current rainfall with the magnitude of change varying with time and location. The increase in rainfall in the lowland areas will be higher than that in the highland and coastal areas. The case study in Ningxia China using downscaling techniques predicted that the annual mean temperature of the whole region of Ningxia would increase by 1.4~1.9 °C in the 2020s, 2.5~3.4 °C in the 2050s, and 4.0~5.6 °C in the 2080s.

6.2.2 VULNERABILITY

Research on vulnerability and adaptation to climate change in Southeast Asia is still limited. The vulnerability and resilience to climate change is determined by the nature of the natural hazard, the exposure level and the adaptive capacity of the affected community. The same community may have different levels of vulnerability to different types of natural hazards. It is thus important to identify vulnerable areas, sectors, and communities. Adaptation measures and strategies cannot be well designed unless better insights into vulnerability are available.

The paper *“Vulnerability and Adaptive Capacities of Low Income Economic Systems to the Climate Change Threat”* by Salleh and Ghaffar proposed a set of indicators to identify communities at risk. These included (1) type of environmental stress; (2) location [marginal regions]; (3) income seasonality [limited diversity]; (4) awareness and livelihood priorities; (5) external and internal living environments; and (6) poor institutional linkages.

At the household level, the vulnerability associated with low income systems could be the function of many factors such as: (1) the population and demographic structure of the household; (2) the economic livelihood activities; (3) the physical characteristics of the household unit; (4) the immediate living environment; (5) the exposure to climate-induced hazards; (6) inherent coping mechanisms; and (7) the existence of infrastructure and support systems. A further factor could be the nature of awareness (apathy, sympathy or empathy) to the climate change threat.

Given the geographical and socio-economic characteristics and natural threats in Southeast Asia, coastal areas have been identified as the most vulnerable sites. The most vulnerable groups identified were poor communities, especially those who depended on natural resources such as fisherfolk and farming

communities. Upland subsistence farmers were also identified as a vulnerable group as their livelihood depended significantly on rainfall. Their capacity to adapt to extreme climate events and future climate changes was limited due to their limited resources and access to climate information and technologies. Natural resource-based industries such as agriculture, fishery, and forestry would also be very much affected by climate change and variability.

6.2.3 IMPACTS

The papers presented revealed the huge damage/losses caused by extreme climate events in Southeast Asia over the last couple of decades. However, efforts to understand the science of the impact of climate change on different sectors such as agriculture, forestry, fishery, health, and biodiversity at national and local levels are limited. This may be due, among other things, to the lack of expertise, facilities and tools to undertake rigorous studies.

There were two case studies presented using climate change models (PRECIS, MAGICC-SCENGEN) to predict rainfall and temperature at national and local levels. The predicted climate data was then used as input for crop simulation models namely, CERES - Crop Environment Resource Synthesis, and SUBSTOR - Simulation of Underground Bulking Storage Organs. The lesson learnt from these two studies is that in order to produce reliable results, models need to be validated and downscaling techniques need to be developed.

It was found that predicted impacts are often not valued. However, the losses from disasters are often quantified and valued.

6.3 ADAPTIVE CAPACITY

6.3.1 ADAPTATION MEASURES

Adaptive capacity of a society refers to the ability to plan, facilitate and implement adaptation strategies and measures. It is affected by a number of factors such as wealth, technology, infrastructure, institutions, and social capital.

Adaptive measures, both structural and non-structural, are varied and differ across country, locality and sector. They are often based on local experiences and perceptions.

Coastal farmers in Thua Thien Hue Province, Vietnam, construct houses in elevated areas or with high foundations to avoid flood waters. They adjust production activities, changing crop varieties and cropping calendars to avoid the adverse impacts of floods as much as possible. Small scale fishers and shellfish gatherers in Cavite, the Philippines, have also adopted various adaptation measures such as reinforcing existing house structures, moving to safer places, putting up sandbags along the shoreline, and storing or sharing food. A number of fishermen have given up fishing to engage in other occupations elsewhere (temporary migration).

In the face of the severe situation of climate change, the people of Ningxia (China) have adopted the following adaptation measures: (1) restoration of farmlands to forests and pastures; (2) development and utilization of wind and solar energy; (3) weather modification; (4) adjustment of crop production structures; (5) water-saving irrigation systems; (6) improving pollution control and reduction, and (7) raising awareness.

It was pointed out that economic analysis (namely, CBA and CEA) of adaptive measures was rarely done. The impact as well as the sustainability of adaptation measures needs to be assessed.

6.3.2 ENHANCING ADAPTIVE CAPACITY

The capacity to adapt to climate change and variability is very limited. There is insufficient expertise and facilities to provide reliable predictions of climate change and its impact on different sectors at national and local levels. Planning and communication processes are also poor, lacking the effective participation of stakeholders, especially the local people. The vulnerable groups are very short of resources for adaptation. Funds for adaptation are still very far from adequate even at national levels.

Two initiatives to enhance local adaptive capacity were reported. In Ningxia, China, stakeholders were involved in climate change impact prediction and an integrated framework to design adaptation strategies has been developed. Stakeholders in the Mag-Asawang Tubig Watershed of the province of Oriental Mindoro in the Philippines have developed a Co-Benefits Framework for Climate Change Adaptation - Disaster Risk Management (CCA-DRM), establish Telemetric Rain Gauges (TRGs), and mainstream local climate change adaptation into development plan and strategies. The experience of the project so far indicates that different stakeholders involved in the project dovetail with each other in the identification and ranking of co-benefits strategies. Enhancing the present resilience of the watershed not only builds capacity for coping with disasters and adapting to climate change, but also contributes toward overall sustainable development in the area. A number of recommendations on how to improve adaptive capacity were made. These include enhancing local capability to predict and monitor climate change impacts, increasing the participation of stakeholders in adaptation efforts, increasing communication between different levels/stakeholders (central and local governments and local people), and mainstreaming climate change adaptation and mitigation into development strategies and plans.

There were four papers discussing international institutions and mechanisms related to climate change such as the UNFCCC, CDM, technology transfers, and mechanisms to finance adaptation. A number of the Articles of the UNFCCC clearly define responsibilities and actions called for with regard to adaptation to climate change, both in terms of financial and technological resources. The UNFCCC plays a catalytic role in promoting adaptation strategies and practices. In addition to developing work programmes, it channels funds to actual adaptation projects through its financial mechanisms. Three special funds have been set up to provide support for adaptation; the Special Climate Fund (SCCF) and the Least Developed Countries Fund (LDCF) under the Convention, and the Adaptation Fund (AF) under the Kyoto Protocol,. It was argued that UNFCCC initiatives

have so far focused more on need assessments, barriers, and capacity building, rather than Technology Development and Transfer (TDT) per se. There were different viewpoints on the impact of the different institutions and mechanisms on adaptation strategies in Southeast Asian countries. These countries are at different levels of economic development. Those that have the capacity to make use of the opportunities (namely, technical support and funding) created by international mechanisms for climate change adaptation, may be able to integrate international concerns into national adaptation strategies. However, there are some countries that do not have such capacity. The issue of equity at international and regional levels is currently not well addressed by the various international institutions and mechanisms.

6.4 RISK MANAGEMENT

From risk-based perspective, mitigation and adaptation are tools to reduce the risk associated with climate change. They complement rather than substitute each other. Risk is a function of hazard, exposure and vulnerability as depicted by this equation: Risk = Hazard x Exposure x Vulnerability

The case study from Vietnam shows that local people have different perceptions of flood risk. Furthermore, traditional flood management methods, mostly dependent on large-scale infrastructure, are limited and less effective given the increased intensity and frequency of natural disasters. And there is a lack of effective participation by stakeholders in risk management planning. The case study of Cavite, the Philippines, reports that coastal communities at the site have low capacity to cope with current and future climate risks. They lack facilities such as evacuation and health centers, and logistical support such as ambulance vans and emergency kits. The existence of shoreline protection measures such as seawalls, rock walls and breakwaters is, however, widely considered to have reduced the vulnerability of the communities to climate-related hazards.

In terms of human resources, the majority of the coastal communities at Cavite consider their capacity to be poor. This rating is attributed to the people's low level of awareness on disaster risk reduction, proper waste management, lack of disaster teams and health personnel, and negative attitudes towards evacuation. As for being able to provide financial resources, the majority of the communities rated their capacity as poor to fair. This was primarily due to inadequate Calamity Fund allocations.

Given the future projection of worsening impacts of long-term climate change and accelerated SLR under a "business as usual" scenario, the two case studies in Vietnam and the Philippines have incorporated proposals to mainstream adaptation and risk management strategies into community development plans and to promote community and multi-stakeholder participation.

6.5 RECOMMENDATIONS FOR FUTURE RESEARCH

Session B identified a number of research issues that need to be undertaken/addressed to support the process of enhancing the adaptive capacity and resilience of society to climate change and variability.

(1) Specific issues for vulnerable areas and sectors:

- Vulnerability mapping to identify vulnerable sites and the characteristics of communities at risk;
- Predicting the socio-economic effects/impacts and costs of disaster/climate risks;
- Linkages between poverty, vulnerability, and gender concerns;
- Impacts of climate change on biodiversity and ecosystems
Traditional knowledge and practices which enhance adaptation
Economic analysis of adaptation/risk management options and how to prioritize these options

(2) Improving information

- Prediction of climate change and its impact on vulnerable sectors/groups/sites
- Understanding and using short-term climate variability information (seasonal weather forecast)
- Linkages and communication between different stakeholders and levels

(3) Capacity-building

- Assessment of local capacity in risk management planning and monitoring: this is necessary for the designation of capacity-building interventions
- Evaluation (sustainability, cost and benefit distribution) and documentation of initiatives to enhance capacity

(4) Policy and institutional reform

- Policy and program review: It is necessary to understand how issues of CC adaptation and risk management are addressed/considered in development policies, plans, and program.
- How international institutions/mechanisms affect CC adaptation in SEA countries.

(4) Improvement of research quality

- Validity of the models: Most climate change models and impact models were designed by developed countries. Therefore, they need to be modified and validated to ensure that they can produce reliable results in the different natural and socio-economic settings in Asia

- Downscaling: It is necessary to downscale climate change and impact models to national and local levels. This is to produce more relevant and useable information and data for adaptation in specific localities.
- The inclusion of socio-economic scenarios into projection mode

7. WORKSHOPS ON ADAPTATION TO SEA LEVEL RISE AND CLIMATE CHANGE MITIGATION – SUMMARY BY ARIEF YUSUF

This summary of the papers presented in Session C is divided into two main sections. The first section discusses the papers on the impacts of and adaptation to sea level rise, and the second section discusses the issue of mitigation in the forestry and energy sectors. Both sections begin with brief descriptions of the papers presented, followed by an assessment of the scope of the issues raised and some discussion on important areas that were given little attention. Common findings and research gaps are discussed at the end.

7.1 SEA LEVEL RISE: IMPACTS AND ADAPTATION

Sea level rise (SLR) as a result of climate change affects human society through various natural mechanisms such as flooding, rising water tables, erosion, and saltwater intrusion. These SLR-related impacts adversely affect many socio-economic aspects of human life namely, deterioration in the quality of fresh water resources; declining productivity of various economic activities such as coastal agriculture, forestry, fisheries, aquaculture, and tourism; deterioration in the quality of human health; destruction and degradation of private settlements and public infrastructure; and biodiversity loss. Papers from this session discuss various case studies of how society is affected by SLR, and how people can adapt to its impact.

In terms of country coverage, most of the papers that discuss the impacts of and adaptation to SLR are from Vietnam (6 papers). This is reflected of the fact that the country holds one of the most highly vulnerable mega deltas in the world – the Mekong River Delta. Indonesia, Philippines, and Thailand are each represented by one paper.

Table 3 gives a brief summary of the nine papers presented on SLR impacts and adaptation. Two papers from Vietnam (Vien's and Kien's) emphasize the assessment of impacts. Vien's paper focuses on analyzing SLR impacts by identifying the sites in the Lower Mekong Delta most vulnerable to SLR. This paper predicts an increase in flooding, crop failure, erosion, water shortages, depletion of groundwater, deteriorating fresh water quality, seawater intrusion, and biodiversity loss in the future due to SLR in the region.

The paper by Kien assesses the impacts of SLR on one of Vietnam's main coastal lagoons; the Tam Giang Lagoon. It states that local residents will face the impacts of SLR in their daily life such as the inundation of low-lying lands, erosion of beaches, and increased flood and storm damage, and salt intrusion into aquifers and surface waters.

On the issue of adaptation, the papers from Vietnam analyze several cases of SLR adaptation in the country including examining current adaptation practices. The study by Kien, for example, reports that flood-based farming systems can generate many social and economic benefits, and contribute to the improvement of local livelihoods. Meanwhile, Chinh found that local people responded to SLR-related impacts in various ways including changing their economic structure by reducing their investment in agriculture and investing more in fishery (aquaculture and fishing); establishing irrigation systems to reduce salt water intrusion; and building better, more solid infrastructure.

The impact of SLR on settlement and land loss in Indonesia was presented by Susandi. It is the only paper that discusses the impact of SLR on a national scale. From Thailand, a case study of adaptation strategies in one district in Bangkok (one of the most vulnerable Asian cities), was presented by Areeya and Rawadee. According to them, households in the area have individually applied three types of autonomous adaptation strategies: protection (such as stone breakwaters, bamboo revetments, and dyke heightening), retreat, and accommodation. The Bangkok case study highlights a weaknesses in individual adaptation, where an individual decision to adapt becomes a negative externality to others. In contrast, one case study (Perez) of community-based flood early warning system in the Pampanga River Basin, Philippines, assesses collective adaptation. It is learned from the paper that adaptation strategies should first seek to identify gaps in current capacity to address climate variability and extremes.

People living in coastal communities are also vulnerable to a range of health effects due to climate change. Kien et al elaborate this issue in a study conducted in Vietnam. From a policy perspective, this paper emphasizes the need to integrate climate/environmental management, disaster management and human health in the process of planning and policy-making.

In terms of the scope of the presented papers, the impacts of flooding and rising water tables on socioeconomic sectors such as settlements and infrastructure is the area most discussed. The impacts of flooding on agriculture, coastal forestry, and fisheries are also discussed and elaborated in many of the papers. However, other aspects like tourism, recreation, and biodiversity are hardly touched upon. This opens up opportunities for future research since these are areas where the economics aspect of climate change will easily fit in. Tourism is an important economic activity in the countries like Thailand and Indonesia. Possible income loss in this sector could be an important area of research. Understanding the potential loss of biodiversity due to SLR in terms of the economic value is another research area where environmental economics tools can be applied.

Table 3. Summary of papers on the impacts of and adaptation to sea level rise

Country/ Researchers	Objectives	Methodology	Findings
Thailand: 1. Vinh	To assess sites and areas in the Lower Mekong Delta vulnerable to climate change	Secondary data analysis and literature review	More flooding, crop failure, erosion, water shortages, depletion of ground water, deteriorating fresh water quality, seawater intrusion, and biodiversity loss.
2. Kien	To examine the economic and social benefits of flood-based farming in An Giang Province	Productivity approach valuation	Flood-based farming and services have contributed significantly to the improvement of local livelihoods.
3. Nam	To assess the impacts of sea level rise on the coastal lagoon of Tam Giang	Secondary data analysis and literature review	Local people will face the impacts of sea level rise in their daily life such as inundation of low-lying lands, erosion of beaches, increased flood and storm damage, and salt intrusion into aquifers and surface waters.
4. Chinh	To investigate how local people in Nam Dinh Province, Red River Delta are affected and adapt to sea level rise	Household survey and secondary data analysis	Sea level rise affects agricultural productivities, infrastructure, houses and buildings. Adaptation measures include changing economic structures (investing more on aquaculture and fishing), establishing irrigation systems, and building better, more solid infrastructure.
5. Suu & My	To study the effects of climate change, and identify the local adaptabilities of fishermen and farmers in Thuan An town, Phu Vang District, Vietnam.	Secondary data analysis, literature review, stakeholder analysis, survey	Vulnerability of each group, each occupation and each village vary by geographical position, ability to access resources, living and working environment. Adaptation measures include building dams, shelters, and channels.
6. Kien et al	To review the current situation of climate change and human health, and analyze current policies to identify gaps and find ways to integrate climate change adaptation into the health sector.	Literature review, secondary data analysis	In Vietnam, there have been isolated studies, weak, ineffective collaboration between key institutions dealing with climate/environment, disasters, and health ; and lack of data and information sharing.

Table 3. Summary of papers on the impacts of and adaptation to sea level rise (continued)

Country/ Researchers	Objectives	Methodology	Findings
Indonesia (Susandi)	To assess the impacts of sea level rise on coastal areas.	Climate change model	The loss of coastal areas and small islands such as South Kalimantan coast, South Sumatra, East Java, Central Sulawesi, Nusa Tenggara, the Moluccas and South Papua. The estimated loss of land by 2100 will be about \$25.5 billion (90,260 km ²) worth.
Thailand (Rawadee & Areeya)	To assess the adaptation strategies for coastal erosion/flooding of communities in Bang Khun Thian District, Bangkok.	Household survey, literature review	Each household has applied more than one adaptation option – protection strategies are the most popular. The annual adaptation cost is approximately US\$ 3,130 per household, which is equal to 23% of the average household income.
Philippines (Perez)	To discuss a case study of community-based flood early warning system (CBFEWS) in the Lower Pampanga River Basin, Philippines.	Secondary data analysis, literature review	Adaptation to future climate change should first seek to identify gaps in current capacity to address climate variability and extremes, and should demonstrate the ability to address immediate as well as long-term benefits

The methodology used in the papers range from the application of climate and meteorological models to find the impacts of SLR to more socio-economic methodologies like household surveys, opinion polls, literature reviews, and secondary data analysis.

In general, most of the papers acknowledge that the degree of variation in the impacts of SLR is high. In fact, the papers presented many cases where the impacts of SLR varied not only by natural and geographical characteristics, but by socio-economic conditions as well.

A number of papers made tentative attempts to quantify and monetize the impact of SLR, and the costs and benefits of adaptation. One example is the use of land price to estimate the value of land loss in Indonesia—a staggering \$25.5 billion—due to SLR. Another is the cost of adaptation for coastal erosion/flooding in Bang Khun Thian District, Bangkok, calculated to be around 23% of the average household income. In Vietnam, the various monetized benefits of adaptation (from flood-based livelihoods) in the form of net benefits resulting from changing economic activities in the Mekong Delta is calculated by Kien.

The general finding on the issue of adaptation suggests that households in coastal areas have conducted various adaptation measures. These include *protection* strategies, where for example, households in Bangkok, Thailand, apply hard structures such as stone breakwaters parallel to the coast to protect their aquaculture ponds; *retreat* measures, for example, where farmers move away or move their ponds inland; and

accommodation measures, where for example, households in Bangkok, Thailand, restructure their houses to accommodate floods, and households in Vietnam's Mekong Delta accommodate flooding through flood-based livelihoods.

From the various papers discussed above, some challenges and scope for improvement are raised. Firstly, the natural or biophysical relationship between climate change, sea level rise, and coastal zones is complex and involves some degree of uncertainty. Adding socio-economic components into such a relationship is, thus, a challenge in itself. It demands, for example, collaborative research among natural scientists and social scientists.

Secondly, re-emphasizing the importance of evidence or science-based impact assessments is necessary. Some of the papers present and predict merely indicative impacts instead of evidence-based ones. Isolating the impacts of SLR from other various factors unrelated to climate change (such as coastal economic development) is important in overcoming this attribution problem. Attribution problems have to be treated carefully because social scientist rely quite heavily on such assessments to analyze the socio-economic aspects of the impacts of SLR.

Most of the papers presented acknowledged the need for more research to improve the understanding of the impacts of and adaptation to SLR in the region. Such future research should meet the following criteria: (a) Considers all aspects of SLR to ensure comprehensive treatment of the problem; (b) Has direct policy relevance and provide concrete recommendations for actions such as awareness raising, local/regional regulation, and capacity-building; (c) Uses advanced methodologies for socio-economic analysis, such as those which measure quantifiable socio-economic impacts like economic values of the benefits and costs of adaptation to SLR; (d) Explores the role of the market and private sector in adaptation through market/financing incentives and other means; (e) Covers large-scale studies such as national/regional assessments to be used as inputs for national (or regional/ASEAN) policy-making.

In the framework of the research areas identified above, some examples of extensions of the research reported in the presented papers should be mentioned. The impact of SLR on the value of land lost in Indonesia (Susandi) could be extended into including more socio-economic variables, and improving the economic valuation of the land loss. In terms of improving comprehensiveness, the health aspect of the impacts of and adaptation to SLR (Kien) is among the areas least researched, and hence should be given priority. Some of the current practices of institutionalized adaptation such as early warning systems in the Philippines (Perez) need more in-depth analysis - economic impact evaluation is called for. Meanwhile, the Bangkok adaptation study (Rawadee & Areeya), which suggests a negative externality effect of individual adaptation requires validation from more studies. Finally, some papers (such as by Kien, which report on the economic benefits of SLR) need validation as well from further research in different sites, regions, and countries.

In general, the papers presented various case studies with tentative findings on the impacts of and adaptation to SLR in the Southeast Asian region. Despite some limitations in various aspects, lessons learned have been identified, not only for policy relevance, but more importantly for future research. The papers presented provide a tentative body of knowledge that can be used for formulating more focused future research on sea level rise adaptation in Southeast Asia.

7.2 MITIGATION IN THE ENERGY AND FORESTRY SECTORS

All the papers that discuss mitigation of climate change are Indonesian studies¹. Two papers (from Masripatin and Murdiyarso) discuss the forestry sector, whereas the other three (Resosudarmo et al, Budiono, and Yusuf) focus on the energy sector. Tabel 4 is a brief summary of the five papers presented.

Table 4. Summary of papers on mitigation in the energy and forestry sectors

Researchers	Objectives	Methodology	Findings
Masripatin	To present and discuss the current status of programs to reduce emissions from deforestation and land degradation in Indonesia	Literature review	The government of Indonesia has directed its long-term policy to the rehabilitation of degraded forest land, conservation and management improvement of the remaining forests, and curbing illegal logging and illegal trade through law enforcement, inter-sectoral approaches and international cooperation.
Murdiyarso	To review, discuss, and analyze climate change impacts, mitigation and adaption in Indonesian forestry Sector from a socio-economic perspective.	Literature review	Links mitigation and adaptation strategies by maintaining and restoring the most vulnerable ecosystem (peatlands), reducing peatland vulnerability to climate change, reducing peatland fire risks, providing options for sustainable livelihoods, and ensuring sustainable peatland management.
Resosudarmo et al	To understand the main driver behind the historical trend of increasing amounts of CO ² emissions in Indonesia.	IPAT Decomposition analysis	The main driver behind increasing CO ² emissions in Indonesia is the increase in carbon intensity which is due to the rapid use of coal as a source of energy, particularly by the electricity sector.

¹ One paper from Murdiyarso, however, discusses both mitigation and adaptation in the Indonesian forestry sector.

Table 4. Summary of papers on mitigation in the energy and forestry sectors (continued)

Researchers	Objectives	Methodology	Findings
Budiono	To analyze the relationship between the development of the manufacturing sector, its compositional changes, its demand for energy, and greenhouse gas emissions (GHGs).	Primary and secondary data analysis	The Indonesian manufacturing sector grew faster than the growth of GDP particularly in the last 25 years. This growth has been accompanied by an increase in the consumption of energy, but at a lower rate. Policies recommended to reduce GHG emissions include encouraging less energy intensive industries, discouraging energy-intensive foreign direct investment, and introducing an efficient energy pricing policy.
Yusuf & Resosudarmo	To analyze the economy-wide and distributional impact of introducing economic instruments (in this case, carbon tax) to reduce CO ² emissions in Indonesia	Economy-wide (CGE) model	The growth rates of the mining, heavy manufacturing, electricity, and transport sectors are predicted to decrease, while agriculture, agriculture-processing industries, and services will grow faster. This economic restructuring is progressive as it works in favor of rural and lower income households.

Masripatin discusses the current status of programs to reduce emissions from deforestation and land degradation in Indonesia. The discussion highlights the response of the Indonesian government to the increasing awareness of the global climate change issue especially from deforestation. The government of Indonesia has now directed its long-term policy to the rehabilitation of degraded forest land, conservation and management improvement of the remaining forests, and curbing illegal logging and illegal trade through law enforcement, inter-sectoral approaches and international cooperation. Indonesia has set up a road map for REDDI (Reducing Emissions from Deforestation and Degradation in Indonesia) through three steps and just completed the preparation phase, for developing REDD architecture and strategies to address the drivers of deforestation and forest degradation.

Murdiyarto's paper emphasizes the need to maintain the link between and synergize mitigation and adaptation efforts in the forestry sector. He highlights the need to maintain and restore the most vulnerable ecosystems by improving water regulating roles, sustaining carbon storing roles; reducing forest vulnerability to climate change; maintaining water tables and avoiding further degradation; reducing forest fire risks, developing and implementing early warning systems and improving fire responses and control systems; providing options for sustainable livelihoods; providing markets for non-timber forest products; instituting payment systems for environmental services and REDD payment mechanisms; ensuring sustainable forest management by using forest management best practices; and linking mitigation-adaptation measures to climate change.

Three papers (by Resosudarmo et al, Budiono, and Yusuf) discuss the issue of mitigation by the energy sector. From analyzing past CO² emissions data, Resosudarmo found that the main driver behind increasing CO² emissions over the last two decades from the energy sector in Indonesia is the increase in carbon intensity of

energy use (CO² emissions per unit of energy). The main reason for this is the rapid increase in the use of coal as a source of energy, particularly by the electricity sector. Budiono's paper, on the other hand, provides an in-depth discussion on the manufacturing sector as being the main contributor to CO² emissions, as its growth has always been faster than the aggregate economic growth.

While Resosudarmo et al and Budiono assess mainly the historical CO² emission trend, Yusuf and Resosudarmo's paper look at institutional and instrument options to reduce emissions. Their paper projects the economy-wide and distributional impacts of using economic instruments in the form of carbon tax to reduce CO² emissions. The research found that the output growth of some sectors like mining, heavy manufacturing, electricity, and transport will slow down, while that of other sectors like agriculture, agriculture-processing industries, and services will grow faster. This economic restructuring is progressive as it is in favor of rural and lower income households. When the revenue from the carbon tax is returned to the economy through a reduction in the tax rate, the aggregate output impact is minimal. However, when it is returned to households, the effect is progressive.

All three papers on mitigation by the energy sector recommend more or less similar types of government intervention. These include introducing an efficient energy pricing policy which takes into account the environmental cost of using fossil fuels; electricity reform; and eco-labeling. In general, all papers agree on the need for economic restructuring as a pathway to more climate-friendly economic development. Not only would it be pro-growth, pro-jobs, and pro-poor, but also pro-environment. All the papers suggest that low-carbon economic development is attainable, but the government needs to set up institutions and use the correct instruments.

To summarize, in mitigating carbon emissions, Indonesia is currently focusing on emissions from deforestation, not only because emissions from deforestation is a lot more than that from fossil fuel consumption, but because the incentive structure has been institutionalized in an international setting through the REDD program. However, due to the projected trend of rapidly increasing emissions from the energy sector and declining rate of deforestation, emissions from the former will eventually replace deforestation as the dominant source of CO² emissions in Indonesia. Therefore, attention to emissions from the energy sector is at least as important as that from deforestation. To tackle this long-term problem, Indonesia needs a development strategy to pursue low-carbon economic development. This strategy may include economic restructuring (changing the structure of the economy to be more climate-friendly) and reducing the carbon intensity of energy uses (such as promoting renewable non-fossil energy). However, incentive mechanisms need to be further institutionalized for these strategies to work in a market economy.

8. POLICY MAKERS PANEL SESSIONS: WHAT NATIONAL AND LOCAL GOVERNMENTS ARE DOING ON CLIMATE CHANGE ADAPTATION

8.1 POLICY-MAKERS PANEL: WHAT ARE NATIONAL GOVERNMENTS DOING ON CLIMATE CHANGE ADAPTATION?

8.1.1 NATIONAL ACTION PLAN ADDRESSING CLIMATE CHANGE ADAPTATION – BY *SULISTYOWATI HANAFI*

ASSISTANT DEPUTY MINISTER FOR CLIMATE CHANGE IMPACT CONTROL, MINISTRY OF ENVIRONMENT, INDONESIA

Indonesia is particularly vulnerable to climate change impacts due to its long shoreline of 81,000 km and the fact that 65% of Java's population lives along the coastline. Indonesia issued its national plan on climate change in December 2007. It has made a commitment to the UNFCCC and the Kyoto Protocol with UU 6/1994 and UU 17/2004 respectively and adopted a “triple-track strategy” with “pro-poor, pro-job and pro-growth with pro-environment principles”. It has a National Action Plan (NAP)— focused on adaptation—to be used as a guide for various institutions in conducting coordinated and integrated efforts on climate change. The NAP contains policies on mitigation and adaptation, institutional strengthening, capacity building, technology and funding. The key sectors the NAP is focused on are: agriculture; marine, coastal and fisheries; infrastructure; health; forestry and biodiversity; and water resources. There are immediate and medium-term plans for action.

ADDITIONAL INPUT FROM THE Q&A SESSION

The national strategy on adaptation is coordinated by the Ministry of Environment and supported by all relevant agencies and sectors. The last international convention on climate change in Bali last December has changed the way the local people act towards climate change. All the media headlines during the convention were on climate change and more local people are aware of and understand the topic now. The MOE receives invitations every day from NGOs, universities or government bodies to speak on climate change.

8.1.2 CAMBODIAN NATIONAL ADAPTATION PROGRAM OF ACTION TO CLIMATE CHANGE – BY *CHEA CHAN THOU*

DEPUTY DIRECTOR FOR PLANNING AND LEGAL AFFAIRS DEPARTMENT, MINISTRY OF ENVIRONMENT, CAMBODIA

Cambodia is a “Least Developed Country” and vulnerable to climate change due to its agrarian economy which is heavily dependent on natural resources. It has a 435 km vulnerable coastline, significant incidence of tropical diseases, and limited financial, technical and institutional resources for adaptation. In May 2003, it signed up with UNDP to develop NAPA which was implemented in October 2003 by the Ministry of Environment and

completed in 2005 after 18 months. The three main activities under NAPA were: (1) gap and policy analysis, (2) field survey, and (3) project profiles preparation. It was found that current national policies mainly focused on post-disaster emergency relief with little attention paid to improving local capacity, research and education. Meanwhile, households faced droughts, floods, sea water intrusion, malaria and diarrhoea. NAPA developed 39 proposed project activities distributed by sector (agriculture, human health, coastal zones and water resources) and climate-related hazards. The three categories of action were capacity building, awareness raising and infrastructure development.

ADDITIONAL INPUT FROM THE Q&A SESSION

The implementation of the 39 projects depends on the donors (i.e. if funding can be obtained) as the government has no money to implement these plans. It has, however, presented the official proposal to potential donors.

8.1.3 WHAT THE LAO-PDR GOVERNMENT IS DOING ON CLIMATE CHANGE – BY *SYAMPHONE SENGCHANDALA*

DEPUTY DIRECTOR INTERNATIONAL ENVIRONMENT DIVISION, DEPARTMENT OF ENVIRONMENT, WATER RESOURCE AND ENVIRONMENT ADMINISTRATION, PRIME MINISTER'S OFFICE, LAO PDR

The local NAPA focuses on four key sectors – agriculture, forestry, water, and health. It has identified 46 projects on adaptation. A case study on the vulnerability and indigenous adaptation of Lao farmers to climate change impacts in the Vientiane Basin Plain and Savannaket was conducted. There are serious limitations to adaptation planning and implementation namely, the lack of local experts, information and financing. What is needed is technical assistance to carry out studies on the impacts of climate change especially in the four sectors of focus, capacity building support, and technology transfer for monitoring and adaptation strategies.

ADDITIONAL INPUT FROM THE Q&A SESSION

Lao has not yet accessed funding for the implementation of its adaptation projects from the LDCF, but the government is in contact with the UNDP for support for the agricultural sector. However, it is not enough – more funds are needed. The competition for funding underscores the growing need to develop South-South cooperation even more. One possibility is for Laos to tie up with Cambodia on some joint climate change initiatives.

8.2 LOCAL GOVERNMENT UNITS REPRESENTATIVES PANEL: WHAT ARE LOCAL GOVERNMENTS DOING IN RESPONSE TO CLIMATE CHANGE?

8.2.1 CLIMATE CHANGE PLANNING IN ALBAY, PHILIPPINES – *BY MANUEL RANGASA*

DIRECTOR OF CENTRE FOR INITIATIVES & RESOURCES ON CLIMATE ADAPTATION (CIRCA); CONSULTANT FOR ENVIRONMENT AND ECO-CULTURAL TOURISM OF PROVINCE OF ALBAY, THE PHILIPPINES

Albay is the region most hit by various climate change events in the Philippines. It is led by a governor who is described as a “green economist”. The Albay Agenda is to be strong on the environment, education and economy, and is a framework for other national climate change initiatives. Albay is the first province to proclaim climate change adaptation as a governing policy. The Albay Strategy is economic, social development and socio-economic growth. Therefore it encompasses (a) ways to include adaptation to climate change and climate/disaster risk reduction into development plans; (b) programs for health, quality education, housing for resettlement, water, sanitation and hygiene; and (c) livelihood programs and agriculture, fishery and forestry support. CIRCA – Centre for Initiatives and Research on Climate Adaptation, was set up as a research and training institution to enhance the ability of Albay residents and Filipinos in general to cope with climate risks brought about by climate change.

ADDITIONAL INPUT FROM THE Q&A SESSION

The League of Mayors is involved in replicating the program for other areas. The Albay Project has small funds and many international financial institutions help with disaster management.

8.2.2 BMA’S MISSION ON GLOBAL WARMING 2007-2008 – *BY DR. BANASOPIT MEKVICHAI*

DEPUTY GOVERNOR OF BANGKOK, THAILAND (BMA: BANGKOK METROPOLITAN ADMINISTRATION)

In the last 40 years, Bangkok’s lowest temperature has risen by two degrees Celsius. There has also been flooding in the city and coastal erosion at Bangkhuntien where the rate is about 1-4 m per year. More than 80% of carbon dioxide emissions in Bangkok is from electricity and fuel consumption. The Governor of Bangkok launched an awareness program by issuing a leaflet on how to use alternatives. As a result of a dialogue with the private and public sectors, the BMA got the Bangkok Declaration on the Cooperation to Alleviate Global Warming signed on 9 May 2007. The five main items in this declaration are on reducing energy use, reducing GHG emissions, adaptation to global warming as a way of life, promoting carbon sequestration through sustainable tree planting, and dissemination of information to the public. The governor’s office is collaborating with international organisations like the World Bank and UNEP on various projects. The aim is to make Bangkok the environmental capital of ASEAN. The BMA has drafted a five-year (2007-2012) action plan for

global warming alleviation comprised of five aspects – transportation system, alternative energies, green buildings, waste water management, and plantations.

ADDITIONAL INPUT FROM THE Q&A SESSION

The poor stay in the areas where there are already structures built to protect them e.g., for those living along the rivers, there are river dykes. There are some people living outside the protected areas but another agency is in charge of building housing estates for them. Adaptation has been conducted by those living in suburban areas. Hosting the COP meetings in Bangkok has helped the people’s understanding of the issues via the media while the BMA has also disseminated information.

8.2.3 CAPACITY BUILDING FOR ADAPTATION TO CLIMATE CHANGE – *BY MS NGUYEN THI PHUC HOA*

SENIOR SPECIALIST IN DISASTER MITIGATION PROGRAMME, THE CANADIAN CENTRE FOR INTERNATIONAL STUDIES AND CONSERVATION (CECI), VIETNAM

Flood-related disasters in Vietnam are expected to increase and large areas of agricultural land will be flooded and mangroves, lost. Seventy per cent of the 86 million people in the country live in areas subject to storms and floods. Thua Thien Hue Province for instance, is particularly vulnerable to climate change hazards like typhoons, floods, salinity, and droughts in its coastal areas; river flooding and landslides in its low lying areas; and landslides, flash floods and typhoons in its mountainous areas. The Capacity Building for Adaptation to Climate Change project (CACC), implemented by CECI (Canadian Centre for International Studies and Cooperation) was highlighted as a model case. The objective of the project was to strengthen capacity to plan and implement community-based anticipatory adaptation strategies through disaster preparedness and integration of risk reduction and mitigation into local development planning. It introduced the “Safer Village Plan” and “Safer Production Plan” concepts. The local communities in Quang Dien and Phu Yang districts were provided with basic knowledge of community-based management, safer planning techniques, and disaster resistant building practices. They were empowered to analyze their situation and vulnerability and decide on appropriate adaptive action.

ADDITIONAL INPUT FROM THE Q&A SESSION

The CACC was a three-year project (which received CAD\$500,000 from CIDA) and has been duplicated in other areas. One reason for its sustainability has been the development of a local trainers pool. It is being recommended that the local government institutionalise the model so that all can gain from it.

8.2.4 GENERAL DISCUSSIONS

8.2.4.1 FINANCING

IFAD (International Fund for Agricultural Development) is one source of funding for climate change and agriculture, and natural disaster management projects.

8.2.4.2 SUSTAINABILITY OF PROJECTS

The BMA has dialogues and meetings with corporate partners and other government agencies for follow-up and evaluation of its project. Cambodia's NAPA clearly identifies responsibilities and outputs, but needs to evaluate progress regularly. Indonesia believes that there must be strong commitment from all stakeholders in order for plans to be effective and sustainable.

9. SYNTHESIS: KEY POINTS ARISING FROM THE PLENARY AND BREAK-OUT GROUP PRESENTATIONS: POST-CONFERENCE ANALYSIS -- BY HERMINIA A. FRANCISCO

9.1 DISCUSSION QUESTIONS

The questions discussed by each group were:

- Q1. What attributes/qualities should a climate change adaptation research/study possess?
- Q2a. What are the research questions that will help us meet the qualities that you have identified in Q1?
- Q2b. Given a score of 1-7, with 1 as very low and 7 as very high, how would you rate the level of knowledge/information in your country for each of the research questions in Q2a?
- Q3. Based on the research questions in Q2a, identify 2-4 potential research projects that will address them.
- Q4. Can you identify 2-3 localities in your own country where these research projects could be carried out?
- Q5. When you answered Q4, what criteria did you use in selecting those localities?

9.2 RESPONSES BY PARTICIPANTS

9.2.1 WHAT CLIMATE CHANGE ADAPTATION RESEARCH SHOULD ADDRESS

The answers to what Climate Change Adaptation (CCA) research should address reflect a shared vision of what a good CCA research should be. This vision has three key elements: *focus, scope, and approach*:

Focus: Research has to target vulnerable poor communities/sectors and respond to the needs of the users of the research information (policy-makers, vulnerable communities, donors, and civil society). It should generate findings that not only add knowledge, but also lead to concrete action to improve the adaptive capacity, vulnerability, and livelihoods of the affected communities. Research should further support decision-makers in evaluating adaptation options using economic considerations.

Scope: A good research study on climate change adaptation should consider the issue in relation to the Millennium Development Goals and national development goals such as sustainable development and poverty alleviation. It should also consider the cross-sectoral impacts of climate change and adaptation interventions as well as assess the sustainability of such interventions. Finally, such research should not be limited to the evaluation of adaptation options, but should also consider implementation issues like transparency, particularly in the case of planned community adaptation.

Approach: The research should be science-based, adopting an inter-disciplinary approach to allow for comprehensive analysis.

Table 5. The Attributes of a Good Climate Change Adaptation Research Study

Given by Participants	Summarized as:
1. Relevant to what the government needs in terms of data & information	POLICY-RELEVANT
2. Addresses the needs of vulnerable communities and sectors	PRO-VULNERABLE GROUPS
3. Contributes to enhancing livelihood	WELFARE-ENHANCING
4. Generates results that can influence behaviour and has well-defined users of information	USER-SENSITIVE AND USER-FOCUSED
5. Leads to specific plan of action	ACTION-ORIENTED
6. Leads to identification of cost-effective/efficient adaptation options	ENABLES ECONOMIC ASSESSMENT OF OPTIONS
7. Contributes new knowledge/information	KNOWLEDGE-ENHANCING
8. Considers how adaptation is linked to other macroeconomic/national goals or indicators	EXPLORES CROSS-SECTORAL LINKAGES
9. Is objective and science-based	SCIENTIFIC
10. Promotes inter-disciplinary approach	COMPREHENSIVE
11. Considers regional context and promotes regional/international collaboration	REGION-WIDE; ALLOWS KNOWLEDGE SHARING &/OR UPSCALING
12. Is responsive to donors' priorities	DONOR-SENSITIVE
13. Assesses sustainability of adaptation interventions (beyond project support)	SUSTAINABLE; FORWARD-LOOKING
14. Contributes to ensuring transparency in the implementation of adaptation programs	PROMOTES TRANSPARENCY
15. Adapts the IPCC framework for analyzing impacts, vulnerability and risks	BUILDS ON EXISTING FRAMEWORK OF ANALYSIS
16. Clearly defines the scale of analysis	WELL-DEFINED BOUNDARY/SCOPE
17. Assesses 'replicability' of adaptation options	WIDE APPLICABILITY OF SOLUTIONS
18. Develops capacity of local government	CAPACITY-BUILDING
19. Incorporates ethical considerations	ETHICS-BASED

9.2.2 RESEARCH QUESTIONS/AGENDA

Seven areas for climate change adaptation (CCA) research were identified based on an analysis of the results of the workshop and plenary discussions. Tables 6 and 7 at the end summarize the key research questions, knowledge gaps, potential research projects, priority study sites, and criteria for choice of study sites.

a) Identification & Characterization of the Vulnerable Communities & Sectors

- Who are the vulnerable communities and sectors?
- What makes them vulnerable?
- What is their current level of adaptive capacity?
- How can the adaptive capacity of poor households and communities in the most vulnerable sectors (e.g. agriculture) be enhanced?

b) Multi-dimensional Analysis of Adaptation Practices in Southeast Asia

There are various dimensions to the analysis of adaptation practices at both household and community levels. These *spatial, temporal, and depth* dimensions must be taken into consideration in identifying appropriate planned adaptation initiatives. The spatial analysis considers what adaptation practices are in place, given the types and levels/scales of adaptation. The time dimensions of adaptation include past and present (socio-economic, political and institutional) circumstances as well as projections about future changes. Finally, the analysis of past adaptation experiences should explore the processes and rates of adaptation and assess the sustainability of adaptation options.

i) Spatial: Type & Scale

- Type 1: Accommodation, protection and retreat
- Type 2: Structural and non-structural
- Type 3: autonomous vs. planned vs. bundled
- Scale: household, community, provincial, national, regional (SEA)

ii) Temporal

- Dynamics
 - Future scenarios should consider the changes in climate events as well as the possible changes in social and economic structures.
 - Past experiences and indigenous knowledge on adaptation could serve as bases for learning, but it should be recognized that future events may be outside the ‘experience domain’ of the current generation.
- Sustainability
 - How can we sustain adaptation technologies or interventions in community life beyond the life of the research project?

- Process and Rate of Adaptation
 - Understanding how and over how much time adaptation strategies have evolved and spread.
 - Assessing if spatial movements (e.g. migration, inland movement) as adaptation strategies have taken place among vulnerable communities.
- Depth of Analysis (Going beyond descriptive accounts of what adaptation practices exist at household and community levels):
- Assessment of existing adaptation practices relative to: adaptation needs, current levels of adaptive capacity, and practices advocated by science and indigenous knowledge systems.
- Understanding the barriers to adaptation and analyzing the determinants of adaptation

iii) ***The Economics of Adaptation Interventions***

Research that provides critical information to decision-makers on the costs and benefits of adaptation options is very much needed, particularly as adaptation funds are extremely limited and adaptation projects have to compete with other government projects.

As decisions to adapt are made at the private/household level as well as the societal (community/government) level, both financial and economic analyses must be made. Besides these, aspects relating to the distribution of impacts, such as equity and share of the costs and benefits, must also be looked into.

- Cost benefit/cost-efficiency analyses of various types of adaptation practices/technologies on various scales.
- Distributional impacts of adaptation interventions (cost-benefits for different sectors/stakeholders)
 - Cost sharing of adaptation interventions

iv) ***Methodological Issues Affecting Economic Analysis of Climate Change Impacts and Adaptation Interventions***

The economics of climate change and adaptation have been made complicated by the long time-scales and wide geographical-scales involved. These factors make it difficult to attribute observed or predicted changes to climate change as caused by global warming. This has implications for the skills of researchers tackling economic analyses in this subject-area.

- How to isolate the impacts of climate change from climate variability and other compounding factors in the social, economic, and policy environment.

- Scaling up or generalization of case study results to national levels.
- What baseline should be used in measuring the impacts of climate change and adaptation interventions?

v) ***Downscaling and Scope-scaling Methods/Models Used in Climate Change Analysis***

Modeling in climate change research to date faces two main constraints: the models work mostly on large scales (regional or national) and are largely limited to quantitative physical impacts on selected crops. The challenge is to bring the analysis down to a level that is relevant to local decision-makers and to expand the scope to monetary impacts beyond crop production levels.

- Downscaling regional models to measure the impacts of climate change and adaptation interventions.
- Scope-scaling: Climate models usually predict the physical impacts of climate change on specific crops or sets of crops. There is a need to extend the scope to include socio-economic impacts at the household level, measured in economic terms.

vi) ***Better Understanding and Communicating of Research Findings***

One of the main aims of a CC research activity should be to find ways to communicate climate change research findings more effectively to policy-makers, communities, civil society, other scientists, and other concerned groups. This could encompass an analysis of current levels of knowledge of communication strategies, forms and modes of communication used, the types of information being communicated, and other relevant factors.

Communicating with policy-makers

- How is priority setting in the climate change agenda decided upon at various levels of government?
- How are government decisions affected by the type and form of information provided to policy-makers?
- What is the best form of communicating research findings to policy-makers?
- How can one address the mismatch between the 'short-term planning horizon' of politicians and the long-term consequences/impacts of climate change?

Communicating with Communities and Civil Society

- How is climate change understood by local communities/civil society?

- Do local communities/civil society have a concrete idea of how humans contribute to climate change?
- What are their perceptions on how people can mitigate and adapt to climate change?
- What information do they need to help them make informed adaptation decisions?
- What form and mode of information dissemination/delivery do they find most effective in influencing their decisions?

g) Private-sector Involvement in Adaptation

- What are the opportunities for private sector/civil society involvement in climate change adaptation efforts?
- Are there success/failure stories of private sector/civil society participation in climate change adaptation efforts?
- What factors will influence the private sector's decision to engage in the provision of services/technologies for adaptation to climate change?
- What are the financial returns from investment in the provision of services/technologies for adaptation to climate change?
- What is the difference between the private sector's and government sector's provision of adaptation services/technologies?

9.2.3 NON-RESEARCH CONCERNS

The workshop participants also raised concerns on how to establish and maintain a closer dialogue between researchers and policy-makers, and among researchers (namely, natural and social scientists) through networking activities. They further pointed out the need to explore potential sources of financing for adaptation interventions in the region.

a) Enhancing Research-Policy Linkage

- Involve policy-makers at relevant levels in the research process from the start to ensure their 'buy in'.
- Translate research findings to socio-economic terms as these are what matter to policy makers. Use 'creative communication'.
- Explore how to communicate recommendations to extension workers as they would have longer-standing commitment to match the long-term nature of climate change.

- Link with climate change focal persons in the various countries.

c) *Enhancing Networking in the Region*

- Increase collaboration among researchers in the region through joint research.
- Encourage research that will enhance South-South collaboration on climate change adaptation
- Explore South-South exchanges for capacity-building
- E-information sharing (websites, etc.)

d) *Financing Adaptation Interventions*

There is a need to help national governments and local communities access adaptation funds from international platforms such as the UNFCCC, Kyoto Protocol, and other bilateral, multilateral, and NGO adaptation funding sources. This could entail assisting them in finding information on where and what funds are available, preparing proposals on how to access these funds, and building their capacity in how to manage these funds to ensure that maximum benefit is achieved. Exploring ways on how communities can share the burden of adaptation funding, through cash and non-cash contributions, should also be looked into.

Table 6. Key Research Questions for and Knowledge Gaps in Southeast Asia

Research Questions	Indicator of Knowledge Gap
Where are the vulnerable areas and what are good vulnerability indicators?	3.5
Who should adapt to CC?	1.7
How should the costs of adaptation be distributed?	3.5
Which adaptive options are cost efficient?	2.3
What is the impact of adaptation on other development goals e.g. poverty alleviation?	1.7
How should the adaptive capacity of vulnerable groups and their knowledge bases on adaptation be improved?	2.0
What are the best adaptation strategies and options?	1.5
How do vulnerable groups make decisions and take action in adapting to climate change?	1.5
How do current policies and regulations influence autonomous adaptation at the household level?	1.6
What are the economic costs of adapting to sea level rise?	1.1
What are the relevant government policies to enhance adaptation capacity?	2.7
How should the socioeconomic scenario be incorporated into analyses of adaptation impacts?	2.0
What are the roles of the private/business sector in adaptation strategies?	1.8
Who/What and where are the most vulnerable people/sectors?	3.8
What are the adaptation needs of vulnerable groups?	3.8
What are the negative and positive impacts of adaptation?	2.8
How should the communication of climate change to relevant sectors be improved?	2.2
What methods should be used to evaluate adaptation options?	2.7
How should adaptation be financed?	2.5
How can adaptation be made sustainable?	2.0
How do people perceive risks related to climate change?	3.3

Notes:

1. CCA= Climate Change Adaptation

2. The “Knowledge Gap” Indicator is in reference to a scale of 1 to 7 with 1 = very low level of knowledge and 7 = very high level of knowledge.

Table 7. Potential Research Projects, Priority Study Sites, & Criteria for Choice of Study Sites

Potential Research Projects	Priority Study Sites	Criteria for Choice of Study Sites
Climate change impacts on and adaptation of local communities	Albay, Samar, Batanes (Philippines); Ningxia (China); Hue, Nam Dinh (Vietnam); coastal areas in Thailand; agricultural sector in Central Thailand; Tonle Sap (Cambodia)	Vulnerability to climate change due to geographic location and poverty, limited information, and poor support from the national government.
Cost-benefit analysis of adaptation options	Vulnerable areas in the region	Needed by decision makers
Downscaling methodologies to assess climate change impacts, vulnerabilities, adaptation and risks	Regional	Needed by local decision makers
Region-wide analysis of impact of CCA in relation to development goals	ASEAN countries; ASEAN as a region	Regional concerns
Good Governance: Strengthening community institutions in CCA	Jakarta, eastern rural Java, Balikpapan Bay; Vietnam: Mekong RD; Phil: Isabela, Bohol	Capacity building is needed
Building the adaptive capacity of small farmers in major rice producing countries in SEA	Drought and flood-prone areas, rainfed areas in SEA	Vulnerable rice producing areas
Cost of adapting to sea level rise in Southeast Asia	Mekong Delta (Vietnam); Kakong, Kampot, Sihanoukville (Cambodia); Jakarta (Indonesia); Samutprakan (Thailand); Legaspi, Cebu (Philippines)	Sea level rise hotspots; poor areas; vulnerable sites based on NAPA
The adaptation process in the context of dynamic urban-rural linkages in Southeast Asia	Jakarta, Bogor, and Tangra (Indonesia); Red River Delta (Vietnam); Tonle Sap (Cambodia); Region IV and NCR (Philippines)	Secondary cities; potential for in-and out-migration; multiple land use and livelihood portfolio.
The role of the private sector in providing insurance for adaptation	Regional	Importance to the region
Enhancing 3-way communication of adaptation knowledge	Regional	Importance to the region
Enhancing the adaptation of communities in CC-stressed areas	Albay, Samar, Batanes (Philippines); Ningxia (China); Hue, Nam Dinh (Vietnam); coastal areas in Thailand; agricultural sector in Central Thailand; Tonle Sap (Cambodia)	Frequency of floods, intensity of droughts, fragile ecosystems
Impacts of climate change on health	Vulnerable sectors in the region	Low awareness of the health risks/impacts
Communication of CC risks 1) Scientists-policy-makers dialogue 2) Scientists-community dialogue	Jakarta, eastern rural Java, Balikpapan Bay; Phil: Isabela; Mekong RD; NE Peninsula Malaysia	Representativeness
Tools development (scientific, indicators, cost effective, user-friendly)	Mekong RD, NE Thailand; Jakarta, eastern rural Java, Balikpapan Bay; Lao PDR: Nam Khaning; Phil: Isabela	Existing projects/previous studies

10. CLOSING ADDRESS BY DR. HERMINIA FRANCISCO

DIRECTOR, EEPSEA

I am happy that I have better information now on what studies are available and who the players in this field are. I hope that you found the interactions in this conference useful too. This is a good start – I hope this networking activity will continue. We have developed the EEPSEA website on climate change and the various outputs of this conference will be put up there. We don't want this to be just a talking meeting. We want something concrete to come out of this. I see a list of projects that can be submitted to EEPSEA. Some topics can fit EEPSEA funding while other topics might be interesting to other donors. Adaptation practices and analysis have various dimensions. A spatial level analysis would have two components: a vertical scale—referring to adaptation from household and community level to provincial level; and a horizontal scale referring to types of adaptation – autonomous, planned, or bundled. There is also a temporal dimension, the dynamics aspect that considers both future scenarios and past practices and experiences; and pattern and rate of adaptation. There are many ways to dissect the analysis of adaptation practices. Essentially we should be building on existing studies already. For instance, we could extend impact analysis to go beyond physical impacts and qualitative analyses. Analysis of how decision-makers set policies is also important. We will definitely be following up on the topics identified in this conference and hope to initiate some cross-country studies. We also discussed how we can communicate better with policy-makers. One recommendation is to be creative in our communication strategies. There are other suggestions raised in the workshops which we should also all consider. On behalf of EEPSEA, I express our appreciation to each and every one in this room who has taken the time to be with us. I hope you have learned from the process of this conference as well. I thank my IDRC colleagues; Richard Fuchs, David Glover, and Vivien Chiam for supporting this activity. I also want to acknowledge CIDA, represented by Christopher Smyrl, and Linda Wishart—who just joined us this morning—and those from IFAD, SEI, and ISET. Last but not least, my thanks go to my management team and support staff for doing such a good job in helping to organize this conference.

11. CLOSING REMARK BY MR. RICHARD FUCHS

REGIONAL DIRECTOR, IDRC

I have learned a lot from this conference. Thanks to all of you for contributing to it so considerably. I'm neither an economist nor an environmentalist, so I tend to process what I learn at events such as this a bit differently than those who have either of these backgrounds. There are two climate change related issues I want to raise. First, the issue of climate change has become a publicly-celebrated profile over the past seven years of unrelenting economic growth. The question I raise is: what happens when the economy slows down, as it is now forecast to do? Does the elevated concern for

jobs, income, business and economic growth begin to trump our concerns about climate change? Does our concern about economic survival in the short term change our perception of the impacts of climate change in the medium and long term? The second issue I want to mention has to do with the fact that from 7-9 July 2008, the G8 meets in Japan. This year, the meeting focus is on climate change. Assuming the G8 doesn't get knocked off this issue by the softening economy, we can anticipate that the institutions within the G8 countries will increasingly be looking for ways in which they can embrace the climate change issues. So get your proposals ready. We respect all the time you've given to us in this conference and hope that this investment will be useful to you. I would like to thank CIDA and SIDA for being here with us. EEPSEA has been going on for 14 years and is going to get bigger and more interesting as we go down the road. I appreciate all of EEPSEA's efforts. Let us show our appreciation to Hermi and her staff and team for a job well done.

ABOUT EEPSEA

The Economy and Environment Program for Southeast Asia was established in May 1993 to support training and research in environmental and resource economics. Its goal is to strengthen local capacity in the economic analysis of environmental problems so that researchers can provide sound advice to policy-makers. The program uses a networking approach to provide financial support and also meetings, resource persons, access to literature, publication outlets, and opportunities for comparative research across its nine member countries. These are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, and Papua New Guinea.

EEPSEA's structure consists of a Sponsors Group, comprising all donors contributing at least USD 100,000 per year; an Advisory Committee of senior scholars and policy-makers; and a small Secretariat in Singapore. EEPSEA is a project administered by the International Development Research Centre (IDRC) on behalf of the Sponsors Group. The other donors consist of the Swedish International Development Agency (Sida) and the Canadian International Development Agency (CIDA).

APPENDIX A: PROGRAM

DAY 1: WEDNESDAY, FEBRUARY 13

08:00	Registration
09:00	Opening remarks and introduction— <i>Herminia Francisco, EEPSEA</i>
09:30	IPCC Report on Impacts, Adaptation and Vulnerabilities in Asia: Implications to Southeast Asia - <i>Rex Cruz (UPLB)</i>
10:30	<i>Coffee Break</i>
11:00	Economics of Climate Change - <i>Muyeye Chambwera (IIED)</i>
12:15	<i>Lunch</i>
Concurrent Sessions: Presentation of Research Works on Climate Change Impacts and Adaptation in Southeast Asia	
1:30	Session A: Climate Change & Agriculture ~ Venue: Kekak Room
5:00	Session Chair: <i>Herminia Francisco</i>
	Session B : Enhancing Adaptive Capacity & Risk Management Venue: Ballroom 2 Session Chair: <i>David Glover, IDRC</i>
	Session C: Adaptation to Sea Level Rise & CC Mitigation Venue: Ballroom 1 Session Chair: <i>David James, EEPSEA</i>

DAY 2: THURSDAY, FEBRUARY 14

Concurrent Research Presentations

09:00	Session A: Climate Change & Agriculture ~ Venue: Kekak Room
5:00	Session Chair: <i>Orapan Nabangchang, EEPSEA</i>
	Session B : Enhancing Adaptive Capacity & Risk Management Venue: Ballroom 2 Session Chair: <i>Rex Cruz, UPLB/Herminia Francisco</i>
	Session C: Adaptation to Sea Level Rise & CC Mitigation Venue: Ballroom 1 Session Chair: <i>Budy Resosudarmo, ANU/David Glover</i>

DAY 3: FRIDAY, FEBRUARY 15

Synthesis, Government Panels, Priority Setting & Response

	Synthesis of Workshop Sessions & Panel Presentations
08:30	Summary of Session A: <i>Orapan Nabangchang</i>
09:00	Summary of Session B: <i>Bui Dung The</i>
09:30	Summary of Session C: <i>Arief Yusuf</i>
10:00	Discussion
10:30	Coffee Break

11:00 **What are national & local governments, and Non-government Organization doing in response to Climate Change**

Panel Chair: Richard Fuchs, *IDRC*

Cambodia: *Chea Chan Thou*

Lao PDR: *Syamphone Sengchandala*

Indonesia: *Sulistyowati Hanafi*

Provincial Government Level: CC Planning in Albay, Philippines
(*Manuel C Rangasa*)

City Government CC initiative in Bangkok Metropolitan Area
(*Chanchai vitoonpanyakij*)

Experiences in Developing “Safer Villages” in Hue Vietnam
(*Nguyen Thi Phuc Hoa*)

1:00 Lunch

2:15 3 break up sessions to discuss GAPS & PRIORITIES for Research, Action Research and Development

4:15 Presentation of workshop output & Discussions

5:30 *Closing Program*

WEDNESDAY, FEBRUARY 13 -- CONCURRENT SESSIONS (AFTERNOON)

SESSION A: CLIMATE CHANGE & AGRICULTURE

Venue *Kecak Room*

Chair *Herminia Francisco*

1:30 *Preparation of the Local Adaptation Strategies to Climate Change in China – A Case Study of Heilongjiang Province – Jia Li*

2:10 *Adaptation to Climate Change the Case of Lantapan Farmers in Bukidnon, Philippines - Florencia Pulhin*

2:50 *Knowledge Systems in Climate Change Adaptations Among Farming Communities in the Philippines - Maria Victoria Ortega-Espaldon*

3:30 *Coffee Break*

3:50 *Assessing Risk and Social Vulnerability for Climate Change Adaptation: Case study on rain-fed farmers in Thailand - Suppakorn Chinvanno*

4:30 *Participants should move to either Session B or C*

5:10 *Close*

SESSION B: ENHANCING ADAPTIVE CAPACITY & RISK MANAGEMENT

Venue *Ballroom 2*

Chair *David Glover*

1:30 *Climate Change Adaptation and Disaster Risk Management (CCA-DRM): The Case of the Mag-Asawang Tubig Watershed, Oriental Mindoro, Philippines - May Celine T. M. Vicente*

2:10	<i>Flood Risk Management in Central Viet Nam: Challenges and Potentials - Phong Tran</i>
2:50	Mainstreaming Community-Based Adaptation to Climate Variability and Change into Integrated Coastal Management: The Case of Cavite City, Philippines - <i>Ramon Faustino Sales, Jr</i>
3:30	Coffee Break
3:50	Risks and Adaptation to Climate Change in the Mekong Region - <i>Frank Murray</i>
4:30	Adaptation to climate change and climate variability: Its Socio-economic aspects - <i>Perdinan</i>
5:10	<i>Close</i>

SESSION C: ADAPTATION TO SEA LEVEL RISE & CC MITIGATION

Venue	<i>Ballroom 1</i>
Chair	<i>David James, EEPSEA</i>
1:30	<i>The Impact of Climate Change on Sea Level Rise in Jakarta Bay with Reference to its Socio-Economic Impact - Armi Susandi</i>
2:10	Lower Mekong River Delta and Climate Change: Sites and Areas Vulnerable to Climate Change— <i>Ky Quang Vinh</i>
2:50	Economic and Social Benefits of Flood Based Livelihoods in Vietnam’s Mekong Delta: A case study in An Giang Province – <i>Nguyen Van Kien</i>
3:30	Coffee Break
3:50	Adaptation Strategies for Coastal Erosion/Flooding: A Case Study of the Communities in Bang Khun Thian District, Bangkok - <i>Rawadee and Areeya</i>
4:30	Impacts of Sea-Level Rise on Coastal Lagoon: A Case Study of Tam Giang – Cau Hai Lagoons in Central Vietnam - <i>Do Nam</i>
5:10	<i>Close</i>

THURSDAY, FEBRUARY 4 -- CONCURRENT SESSIONS

SESSION A: CLIMATE CHANGE & AGRICULTURE

Venue	<i>Kecak Room</i>
Chair	<i>Orapan Nabangchang</i>
09:00	Impacts, Vulnerability and Adaptation of Upland Communities to Climate Variability and Extremes in Pantabangan-Carranglan Watershed, Philippines - <i>Juan Pulhin</i>
09:40	Vulnerability and Adaptation for Lao Farmers to the Climate Change impacts: Vientianne Basin Plain – <i>Soulideth Souvannalath</i>
10:20	<i>Coffee Break</i>
10:50	GHGs from the agricultural sector - <i>Sirinthonthep Towprayoon</i>
11:30	Simulating rice production systems in Thailand under various climate scenarios: Preliminary Results of a Simulation Study - <i>Attachai Jintrawet</i>

12:10	<i>Lunch</i>
Chair	<i>David James</i>
1:30	Impact of and Adaptation to Climate Change: Status and Application in Agriculture - <i>Le Istiqlal Amien</i>
2:10	Climate Change Impacts on Agricultural Costs in Different Regions of China - <i>Liu Yingjie</i>
2:50	<i>Coffee Break</i>
3:20	Tradeoff analysis of adaptation strategies for natural resources, water resources, and local institutions in the Philippines - <i>Rex Cruz, Rodel Lasco, John Pulhin, and Florencia Pulhin</i>
4:00	Nairobi Work Plan: Guiding Adaptation Plans of Indonesia – <i>Dadang Hilman</i>
4:40	Managing Risks due to Changing & Variable Climate in Agricultural and Environmental Systems in the Philippines - <i>Felino Lansigan</i>
5:20	<i>Close</i>

SESSION B: ENHANCING ADAPTIVE CAPACITY & RISK MANAGEMENT

Venue	Ballroom 2
Chair	Rex Cruz, UPLB
09:00	Vulnerability and Adaptation Assessment in Cambodia - <i>Heng Chan Thoeun</i>
09:40	Vulnerability, Adaptive Capacities and Policy Implications of Traditional Economic Systems - <i>Khairulmaini Osman Salleh</i>
10:20	<i>Coffee Break</i>
10:50	Vulnerability, adaptation and resilience to climate change: Experiences and implications in Vietnam - <i>Nguyen Hai My</i>
11:30	Institutional Aspects of Climate Change: Partners and Players - <i>Vute Wangwacharakul</i>
12:10	<i>Lunch</i>
Chair	Herminia Francisco
1:30	Climate Change and Emerging Policy and Sustainable Development Options for Food and Water Security – <i>Rogelio Concepcion</i>
2:10	New Approaches for Impact and Adaptation Regional Study – A Case in Ningxia China – <i>Li Jianping</i>
2:50	<i>Coffee Break</i>
3:20	Advancing Climate Technology Transfer in Post-Kyoto Regime: A new proposal to bridging existing gaps— <i>Sitanon Jesdapipat</i>
4:00	Adaptation Planning in International Setting— <i>Lourdes Tibig</i>
4:40	Climate Change Mitigation and Adaptation in Indonesia: The role of environmental economic research - <i>Surna Djajadiningrat</i>
5:20	<i>Close</i>

SESSION C: ADAPTATION TO SEA LEVEL RISE & CC MITIGATION

Venue	<i>Ballroom 1</i>
Chair	<i>Budy Resosudarmo, ANU</i>
09:00	Household and Commune Adaptation Experience and Strategies for Sea Level Rise in Nam Dinh Province, Red River Delta - <i>Nguyen Quoc Chinh</i>
09:40	Livelihood Vulnerability and Local Adaptation Strategies to Natural Disasters in Huong River Basin: Case Study in Thuan An Town, Phu Vang District, Thua Thien – Hue Province - <i>Phan Thi Hoang My</i>
10:20	<i>Coffee Break</i>
10:50	A community-based flood risk management in Pampanga river Basin - <i>Rosa Perez</i>
11:30	Vulnerability and Adaptation to Climate Change: A View From Human Health and Policy Perspectives in Vietnam - <i>Tran Mai Kien</i>
12:10	<i>Lunch</i>
Chair	<i>David Glover</i>
1:30	Current status on programs to reduce emissions from deforestation and land degradation - <i>Nur Masripatin</i>
2:10	Impact, mitigation and adaptation to climate change in forestry sector: its socio-economic aspects— <i>Daniel Murdiyarso</i>
2:50	<i>Coffee Break</i>
3:20	Options on mitigating carbon emissions: Lessons from Past Emissions, and future projections - <i>Budy Resosudarmo</i>
4:00	Structural Change in Manufacturing sectors and Greenhouse gasses emissions: Some policy lessons on mitigation – <i>Budiono</i>
4:40	The Economy-wide and distributional impact of reducing Indonesian carbon emissions through economic incentives - <i>Arief Anshory Yusuf</i>
5:20	<i>Close</i>

APPENDIX B: LIST OF PARTICIPANTS

AUSTRALIA

Mr Frank Murray

School of Environmental Science, Murdoch University
Murdoch WA 6150, Perth, Australia
Tel: 61 8 9360 2501
Email: f.murray@murdoch.edu.au

Mr David James

Ecoservices Pty Ltd
13 Rayner Road, Whale Beach
New South Wales 2107, Australia
Tel: 61 2 9974 5450
Fax: 61 2 9974 1341
Email: ecoservices@iprimus.com.au

CAMBODIA

Mr Chea Chan Thou

Deputy Director of Department of Planning and Legal Affairs
#48, Preah Sihanouk Ave.
Ministry of Environment
Phnom Penh, Cambodia
Tel: 855 11 923 364
Fax: 855 23 218 370
Mobile: 855 11750758
Email: chanthouchea@yahoo.com

Mr Heng Chan Thoeun

Climate Change Office
Ministry of Environment
Cambodia
Tel: 855 23 218 370
Mobile: 855 16 577 899
Email: hcthoeun@yahoo.com

CHINA

Ms Li Jianping

Ningxia Meteorological Observatory
Yinchuan 750002,
People's Republic of China
Tel: 86 951 5043015
Fax: 86 951 5029924
Email: lijp_111@163.com; nxlyc@163.com

Mr Liu Yingjie

College of Resource Environment and Tourism
Capital Normal University
Rm 219, Building 10
No 105 North Rd of Western 3rd Ring
Beijing 100037, People's Republic of China
Email: colintennis@126.com

Ms Jia Li

59 Mucai Street, Xiangfang District
Institute of Ecoforestry Economics
Harbin 150030, Heilongjiang
People's Republic of China
Tel: 86-451-55191546
Mobile: 86-451-86767786
Fax: 86-451-55190254
Email: jiali0451@126.com

INDIA

Ms Seema Bhatt

ISET Associate
B94 IInd Floor
Defence colony
New Delhi 110024
India
Tel: 91 11 2433 0130
Email: seembhattao@gmail.com

INDONESIA

Mr Budiono Budi

Nusa Hijau Permai
CV-45 Citeureup Cimahi
Jawa Barat 40512, Indonesia
Tel: 62 22 665 1135
Mobile: 62 818643500
Email: budionob2004@yahoo.com

Mr Budy Resosudarmo

Division of Economics
RSPAS, Coombs Building
The Australian National University
Canberra, ACT 0200, Australia
Tel: 61 2 6125 2244
Mobile: 61 4 0561 6064
Email: budy.resosudarmo@anu.edu.au

Mr Le Istiqlal Amien

Agroclimatology and Hydrology Research
Institute
Jalan Tentara Pelajar 1A
Bogor 16111, Indonesia
Mobile: 62 8121110367
Tel: 62 251 32760
Email: i_amien@yahoo.com

Ms Nur Masripatin

Sekretaris Badan Litbang Kehutanan
Gedung Manggala Wanabakti
Blok 1 Lt 11, Jl Gatot Subroto-Senayan
Jakarta, Indonesia
Tel: 62 8121970235
Email: nur_masripatin@indo.net.id;
nurmasripatin@yahoo.co.id

Mr Surna Djayadiningrat

SBM Building –Institut Teknologi Bandung
Jl Ganesha No. 10
Bandung 40132
Indonesia
Mobile: 62 816700204
Email: naya@sbm.itb.ac.id

Mr Armi Susandi

Bandung Institute of Technology, ITB
Departemen Meteorologi - Labtek XI Lantai 2
Jl. Ganesha
No. 10 Bandung 40132, Indonesia
Mobile: 62 85220233898
Email: armi@geoph.itb.ac.id

Mr Daniel Murdiyarso

Center for Internasional Forestry Research
Jl. CIFOR
Sindangbarang
Bogor 16115 Indonesia
Mobile: 62 811947165
Email: D.MURDIYARSO@CGIAR.ORG

Mr Perdinan

Department of Geophysics and Meteorology
Faculty of Mathematics and Natural Sciences
Bogor Agricultural University
Kampus IPB Darmaga
Bogor Barat 16680
Jawa Barat, Indonesia
Tel/Fax. 0251 623850

Mr Dadang Hilman

Head of Division of Adaption of Climate
Change
Ministry of Environment
KNLH, Gd. A Lt 6
Jalan Panjaitan Kav. 24
Jakarta 13410 Indonesia
Tel: 62 21 851 7164
Fax: 62 21 8590 2521
Email: d_hilman@menlh.go.id;
climate@menlh.go.id;
dadanghilman@yahoo.com

Ms Sulistyowati Hanafi

Kementerian Lingkungan Hidup
Gedung A Otorita Batam Lt. 6
Jl. DI Panjaitan Kav. 24
Kebon Nanas Jakarta Timur 13410
Tel: 62 21 8517164 ; 62 21 8517148 ext
240

LAO PDR**Mr Soulideth Souvannalath**

Environment Research Institute (ERI)
Vientiane
Lao PDR
Email: souli2002@hotmail.com

Mr Syamphone Sengchandala

International Environment Division
Department of Environment (DOE)
Vientiane
Lao PDR
Email: syamphone_s@hotmail.com

MALAYSIA

Mr Khairulmaini Osman Salleh
Department of Geography
Faculty of Arts and Social Sciences
University of Malaya Center for Climate Affairs
(UMCCA)
University of Malaya
50603 Kuala Lumpur, Malaysia
Tel: 60 3 7967 5699
Fax: 60 3 7967 5457
Email: khairulo@um.edu.my;
khairulmaini@gmail.com

PHILIPPINES

Mr Rex Victor Cruz

Institute of Renewable Resources
College of Forestry and Natural Resources
University of the Philippines Los Banos
College, Laguna 4031, Philippines
Email: rexcruz@yahoo.com

Ms Rosa T Perez

Independent Researcher/Consultant
Climate Change, Environment and
Disaster Risk Reduction
Block 2 Lot 21
Flores de Mayo St., Largo
Quezon City, Philippines 1118
Tel: 63 2 417 2800
Fax: 63 2 936 8281
Mobile: 63 919 2020 710
Email: rtperez1@yahoo.com

Ms Maria Victoria Ortega-Espaldon

School of Environmental Science and
Management
University of the Philippines Los Banos
College, Laguna 4031, Philippines
Tel: 63 49 536 3080
Fax: 63 49 536 2251
Email: voespaldon@yahoo.com

Mr Rogelio Concepción

Director, Bureau of Soils and Water
Management
Department of Agriculture
Elliptical Road corner Visayas Avenue
Diliman 1100, Quezon City, Philippines
Email: rogerconcepcion@yahoo.com

Ms May Celine T M Vicente

Manila Observatory
Quezon City, Metro Manila, Philippines
Email: maycelinevicente@yahoo.com

Mr Felino P Lansigan

Institute of Statistics
School of Environmental Science and
Management
Interdisciplinary Program on Climate Change
University of the Philippines Los Banos
College, Laguna 4031, Philippines
Email: fplansigan@uplb.edu.ph

Mr Ramon Faustino Sales, Jr

Conrado Benitez Institute for Sustainability
(CBIS)
Philippine Rural Reconstruction Movement
(PRRM)
Covenor Philippine Network on Climate
Change (PNCC)
56 Mother Ignacia St. cor Dr. Lazcano
Paligsahan, Quezon City, Philippines
Email: ramonfms@yahoo.com

Mrs Florencia Pulhin

College of Forestry and Natural Resources
University of the Philippines Los Banos
College, Laguna 4031, Philippines
Email: yaybpulhin@yahoo.com

Mr Juan M Pulhin

College of Forestry and Natural Resources
University of the Philippines Los Banos
College, Laguna 4031, Philippines
Email: jpulhin@yahoo.com

Ms Lourdes Tibig

Climate Data Section
Climatology and Agrometeorology Branch
Philippine Atmospheric, Geophysical and
Astronomical
Services Administration (PAGASA)
Science Garden Complex
Agham Road, Diliman
Quezon City, Philippines 1100
Tel:/Fax: 63 2 434 2696
Email: lvtibig@yahoo.com

Mr Manuel C. Rangasa

Consultant for Environment and eco-Cultural
Tourism
Office of the Governor of Albay
Albay Capitol Complex, Legazpi City
Philippines 4500
Mobile: 63 906-3339400
Email: nongrangasa@yahoo.com

SINGAPORE

Mr Richard Fuchs

Regional Director
International Development Research Centre
(IDRC)
22 Cross St, #02-55 South Bridge Court
Singapore 048421
Tel: 65 6439 6832
Fax: 65 5439 4844
Email: rfuchs@idrc.org.sg

Mr David Glover

Program Leader, Environmental Economics
International Development Research Centre
(IDRC)
22 Cross St, #02-55 South Bridge Court
Singapore 048421
Tel: 65 6439 6854
Fax: 65 6438 4844
Email: dglover@idrc.org.sg

Ms Vivien Chiam

Partnership & Business Development Manager
International Development Research Centre
22 Cross St., #02-55 South Bridge Court
Singapore 048421
Tel: 65 6439 6828
Fax: 65 6438 4844
Email: vchiam@idrc.org.sg

THAILAND

Mr Vute Wangwacharakul

Agriculture and Resource Economics
Department
Faculty of Economics
Kasetsart University, Thailand
Tel: 66 2 9428649 ext 123
Email: fecovww@ku.ac.th

Mr Suppakorn Chinvanho

Southeast Asia START Regional Center
Chulalongkorn University
Old SWU Patumwan 5 Bldg. 5th Fl.
Bangkok 10400, Thailand
Tel: 66 2218 9464
Fax: 66 2251 9416
Email: suppakorn@start.or.th

Mr Attachai Jintrawet

Department of Soil Science & Conservation
& The Multiple Cropping Center
Faculty of Agriculture
Chiang Mai University
Chiangmai, Thailand
Tel: 66 53 944 621 ext 207
Email: attachai@chiangmai.ac.th,
atthachaij@gmail.com

Ms Sirinthornthep Towprayoon

King Mongkut's University
of Technology Thonburi (KMUTT)
5th Floor, School of Energy
Environment and Materials Building
126 Prachauthit Rd, Bangmod, Tungkr
Bangkok 10140, Thailand
Mobile: 66 081 751 4159
Email: sirin@jgsee.kmutt.ac.th

Ms Rawadee Jarungrattanapong

Natural Resources and Environment Program
Thailand Development Research Institute
(TDRI)
565 Soi Ramkhamheang 39, Wangthonglang
Bangkok, 10310, Thailand
Tel: 66 2 718 5460 ext 413
Fax: 66 2 718 5461-2
Email: rawadee@tdri.or.th

Ms Areeya Manasboonphempool

Natural Resources and Environment Program
Thailand Development Research Institute
(TDRI)
565 Soi Ramkhamheang 39, Wangthonglang
Bangkok, Thailand 10310
Tel: 66 2 718 5460 ext 509
Fax: 66 2 718 5461-2
Email: areeya@tdri.or.th;
areeya.kae@gmail.com

Mr Sitanon Jesdapipat

Acting Director
Center for Natural Resources and
Environmental
Management (NREM Center)
Mae Fah Luang University
333 Tasud, Muang District
Chiang Rai, Thailand 57100
Mobile: 666 7817111
Email: jsitanon@yahoo.com

Mr. Chanchai Vitoonpanyakij
Director General of the Department of
Environment
Bangkok Metropolitan Administration (BMA)
173 Dinso Road, Saochingcha, Phanakorn
Bangkok 10200, Thailand
Tel: 66 2 224 2966
Email: chan_v@dma.go.th

Dr Niramon Sutummakid (Observer)
Faculty of Economics
Thammasat University
Bangkok 10200
ThailandTel: 66 89-891 1271
Email:niramon@econ.tu.ac.th

Mr Edsel E. Sajor
Urban Environmental Management
School of Environment, Resources and
Development
AIT PO Box 4, Klong Luang Pathumthani 12120
Thailand
Tel: 66 2 524 5605
Fax: 66 2 524 6380
Email: esajor@ait.ac.th

Mr Songpol Kaopatuntip
Perspective Editor
The Bangkok Post
Tel: 66 2240-3700, ext 3236
Mobile:66 8 1801-5371
Email: songpolk@bangkokpost.co.th

UNITED KINGDOM

Mr Muyeye Chambwera.
3 Endsleigh Street
London WC1H 0DD, UK.
Tel: 44 20 7388 2117
Fax: 44 20 7388 2826
Email: muyeye.chambwera@iied.org

VIETNAM

Mr Ky Quang Vinh
Department of Natural resource and
Environment
Cantho City, Vietnam
Mobile:84 963619065
Email: kqvinh@ctu.edu.vn

Ms Nguyen Thi Phuc Hoa
33/5 Che Lan Vien
Truong An Ward
Hue City, Vietnam
Email: phuchoa55@gmail.com

Ms Phan Thi Hoang My
Hue College of Sciences
Centre for Social Sciences and Humanities
77 Nguyen Hue, Vietnam
Tel: 84 548 32788
Mobile:84 945 315429
Email: hoangmyhk@yahoo.com

Mr Tran Mai Kien
Graduate School of Global Environmental
Study
Kyoto University, Honmachi, Sakyo-ku
Kyoto 606-8501. Japan
Tel: 81 75 753 5634 (IEDM-Rajib lab)
Fax: 81 75 753 5708
Mobile:81 909 9879781
E-mail: tranmkien@mail.ru,
tranmaikien@yahoo.com

Mr Tran Van Giai Phong
International Environment and Disaster
Management Lab.
Graduate School of Global Environmental
Studies
Kyoto University
Honmachi, Sakyo-ku
Kyoto 606-8501. Japan
Email: tranphon@hawaii.edu

Mr Do Nam
Department of Science and Technology
Thua Thien Hue Province
Hue, Vietnam
Tel: 84 54 823804
Mobile:84 913425124
Email: donamhue@gmail.com

Mr Nguyen Van Kien
An Giang University
25 Vo Thi Sau Street
My Xuyen Ward, Long Xuyen City
An Giang Province, Vietnam
Tel: 84 76 854 545 ext 113
Fax: 84 76 842 560
Email: nvkiem@agu.edu.vn

Mr Nguyen Quoc Chinh

Faculty of Economics
Hanoi Agricultural University
Trau Quy, Gia Lam
Hanoi, Vietnam
Email: nqchinh@yahoo.com

Mr Nguyen Hai My (Observer)

Center for Environment Research,
Education and Development (CERED)
279/24, Giang Vo, Hanoi, Vietnam
Tel: 84 4 5120210
Fax: 84 4 5141550
Email: mynh1988@yahoo.com

**OTHER INTERNATIONAL
ORGANISATIONS****IFAD****Mr Gyudam Cho**

Senior Economist, Asia & Pacific Division
International Fund for Agricultural
Development
Via del Serafico 107. 00142 Rome, Italy
Fax: 0039 06 5459 3670
Email: g.cho@ifad.org

CIDA**Ms Linda Wishart**

Assistant Director: Planning and Operations
Southeast Asia Regional Program
Asia Branch, Canadian International Development
Agency
200, Promenade du Portage, Hull, Quebec
Canada K1A 0G4
Tel: 1 819 994 0232
Fax: 1 819 994 0253
Email: linda_wishart@acdi-cida.gc.ca

Mr Christopher Smyrl

Development Officer
Southeast Asia Regional Program Direction,
Asia Branch
Canadian International Development Agency
200 Promenade du Portage, Gatineau
Québec CANADA K1A 0G4
Tel: 1 819 953 2146
Fax: 1 819 997 0968
Email: christopher_smyrl@acdi-cida.gc.ca

SEI**Ms Kai Kim Chiang**

Research Fellow
Risk, Livelihoods and Vulnerability Programme
Stockholm Environment Institute-Asia
15th Floor, Witthayakit Building
254 Chulalongkorn University
Chalalongkorn Soi 64, Phyathai Road
Pathumwan, Bangkok
10330 Thailand
Tel: 66 2 251 4415-8
Fax: 66 2 251 4419
Email: kaikim.chiang@sei.se

SECRETARIAT**Ms Herminia Francisco**

Director
EEPSEA/IDRC
22 Cross St #02-55 South Bridge Court
Singapore 048421
Tel: 65 6438 7877
Fax: 65 6438 4844
E-mail: hfrancisco@idrc.org.sg

Ms Orapan Nabangchang

Senior Economist, EEPSEA
School of Economics
Sukhothai Thammathirat Open University
Chaeng Wattana Rd, Park Ket
Nonthaburi 11120, Thailand
Tel: 66 2 965 4747-8 ext 15
Fax: 66 2 965 7262
Email: onabangchang@idrc.org.sg

Mr Bui Dung The

Senior Economist, EEPSEA
College of Economics
Hue University, 100 Phung Hung
Hue City, Vietnam
Tel: 84 54 529139
Fax: 84 54 529491
Email: buidungthe@idrc.org.sg

Mr Arief Anshory Yusuf

Division of Economics
RSPAS
Coombs Building
The Australian National University
Canberra, ACT 0200, Australia
Tel: 61 4 2425 1990
Email: arief.yusuf@fe.unpad.ac.id

Ms Catherine Ndiaye

Program Assistant, EEPSEA
International Development Research Centre
22 Cross St, #02-55 South Bridge Court
Singapore 048421
Tel: 65 6439 6863
Fax: 65 6438 4844
Email: cndiaye@idrc.org.sg

Ms Ang Cheng Hiang

Part-time Secretary
International Development Research Centre
22 Cross St, #02-55 South Bridge Court
Singapore 048421
Tel: 65 6439 6852
Fax: 65 6438 4844
Email: cang@idrc.org.sg

APPENDIX C: ABSTRACTS OF PAPERS

SESSION A: CLIMATE CHANGE AND AGRICULTURE

PREPARATION OF LOCAL ADAPTATION STRATEGIES TO CLIMATE CHANGE IN CHINA – A CASE STUDY IN HEILONGJIANG PROVINCE

JIA LI ZHUANG, LI XU SHANSHAN, AND LUAN SHENGDE

Climate change is one of the world's most significant environmental issues and challenges in the 21st century. Local adaptation strategies on climate change are very important to poverty stricken areas both in China and in other countries around the world. This paper reports findings from a case study conducted in the Heilongjiang Province located in the northeast of China to analyze the impact of climate changes on agriculture, natural ecosystems, water resources, and health impacts. It also explores how the local government and communities are addressing the impacts of climate change. The paper discusses some of the adaptive measures such as the development of small-scale hydraulic engineering in field irrigation and drainage projects, small-scale irrigation, and watershed projects in non-irrigation areas to fight drought, and cultivating stress-resistant varieties with greater resistance to drought, water logging, high temperature, diseases and pests. Finally, this study summarizes several strategies on climate change. As part of local capacity building strategies, for example, initiatives have been made to improve climate observation systems. In Heilongjiang Province, the local government is also undertaking a number of greenhouse gas management activities. Other strategies discussed include the local recycling economy development strategy and new high-technology application strategies in agriculture and natural resources management.

ADAPTATION TO CLIMATE CHANGE: THE CASE OF LANTAPAN FARMERS IN BUKIDNON, PHILIPPINES

FLORENCIA B. PULHIN, RODEL D. LASCO, MA. VICTORIA O. ESPALDON AND KRISTINE B. GARCIA

Similar to most developing countries in the world, the Philippines is highly vulnerable to the impacts of climate-related events such as tropical cyclones and ENSO. The impacts of these events are aggravated by the deteriorating condition of the watersheds in the country. Among the most vulnerable sectors are the upland farmers estimated to be around 20 million people. Most of them cultivate marginal hilly areas and rely heavily on rain as a source of water for farming and domestic use. As such, they have inherently limited resources to adapt to climate change. To address the vulnerability of upland farmers to climate change, the project explored potential adaptation strategies developed by the local communities in Lantapan, Bukidnon, to cope with the impacts of

climate change. The methods used in the study was based on the techniques developed in the AIACC project (AS21) which employed a combination of data collection methods: secondary data gathering, household survey, use of participatory rural appraisal techniques, and direct field observations. The results of the study indicate that climate extremes and variability affect crop yields, farm incomes, soil quality, and the health of the upland farmers. The adaptation strategies undertaken by these farmers to cope with the impacts depend on the nature of the climatic events and the extent of their dependency on land-based livelihoods.

KNOWLEDGE SYSTEMS IN CLIMATE CHANGE ADAPTATIONS AMONG FARMING COMMUNITIES IN THE PHILIPPINES

MARIA VICTORIA O. ESPALDON

This paper focuses on the importance of multiple knowledge systems in enhancing the adaptive capacities of farming communities in the Philippines. It discusses the epistemologies of knowledge that are pertinent to strengthening the resilience of small farmers and farming households, which are among the groups most vulnerable to climatic variabilities, climatic extremes, and climate changes. The paper also discusses the need for effective communication systems to disseminate knowledge related to climate change in order to promote sound adaptation strategies. It draws insights from research undertaken in both upland and lowland farming communities in the Philippines.

ASSESSING RISK AND SOCIAL VULNERABILITY IN CLIMATE CHANGE ADAPTATION: A CASE STUDY ON RAIN-FED FARMERS IN THAILAND

SUPPAKORN CHINVANNO

Climate change affects people's livelihood and increases their level of risk and vulnerability. This paper discusses the results of a quantitative study that uses socio-economic data as multiple indicators in a multi-criteria analysis to assess risk and social vulnerability. A study was conducted on rain-fed rice farmers in Thailand whose livelihoods will be affected by climate changes. The risk and vulnerability levels of rain-fed farmers were assessed based on the analysis of changes in rice productivity under future climate scenarios. The result shows that approximately one-third of the farmers belong to the 'high resilience' group and can be classified as 'low risk'. The rest are at higher risk as they are highly sensitive to climate risks and severely lack coping capacity. The risk profiles of the farmers and the vulnerability of the community identified in this assessment provides direction for adaptation strategies and show that future adaptation measures need to focus on the reduction of sensitivity to climate risks and increasing the coping capacity of a large number of farmers vulnerable to the impacts of climate change.

CLIMATE VARIABILITY AND EXTREMES IN THE PANTABANGAN-CARRANGLAN WATERSHED, PHILIPPINES: AN ASSESSMENT OF IMPACTS AND ADAPTATION PRACTICES

JUAN M. PULHIN, ROSE JANE J. PERAS, RODEL D. LASCO, REX VICTOR CRUZ, FLORENCIA B. PULHIN AND KRISTINE GARCIA

This paper provides a qualitative assessment of the impacts of climate variability and extremes to local communities in the Pantabangan-Caranglan Watershed (PCW) located in northern Philippines. It also analyses local adaptation practices and their effectiveness in mitigating adverse impacts based on the experiences and perceptions of the local community. The paper draws from the outputs of the project, “An Integrated Assessment of Climate Change Impacts, Adaptation and Vulnerability in Watershed Areas and Communities in Southeast Asia”, which is part of a global initiative known as the “Assessments of Impacts and Adaptations to Climate Change” (AIACC) aimed at advancing scientific understanding of climate change vulnerabilities and adaptation options in developing countries. The findings of the study reveal that strong typhoons, droughts (associated with El Niño), and delayed onset of the rainy season tends to have more harmful impacts on a greater number of farmers compared to other climate-related stressors. Impacts vary among different socioeconomic groups with the poor farmers being the most adversely affected, and hence, most vulnerable. Similarly, adaptation practices and their effectiveness vary across socio-economic groups and geographic locations. In general, while various local adaptation practices exist, they are either limited or ineffective in minimizing adverse impacts especially among the poorer sectors of the community.

THE ASSESSMENT OF COMMUNITY VULNERABILITY AND ADAPTATION TO IMPACT OF CLIMATE CHANGE/ VARIABILITY: A CASE STUDY IN THE VIENTIANE PLAIN, LAO PDR

SOULIDETH SOUVANNALATH

Climate has a significant influence on agriculture, especially on rice cultivation in non-irrigated areas. Negative climate impacts on rice production leads to reduced farmer livelihoods. However, there has been no systematic study on the vulnerability and adaptation of farming communities to climate impacts in Lao PDR. Therefore, this study was conducted with the following objectives: (1) to develop and test a method of assessment of the vulnerability of rain-fed farmers to climate impacts; (2) to assess the vulnerability of rain-fed rice farmers to climate variability; (3) to identify the characteristics of vulnerable groups of rain-fed rice farmers; and (4) to explore adaptation options of rain-fed rice farmers to climate stress. This study applied three criteria: household economic conditions, rice production dependency and adaptive capacity. It classified rain-fed rice farmers into low, moderate and high vulnerability groups. The study assessed risk vulnerability by proxy as rice production lost at

30% and 50%. The results showed that the majority of the surveyed households were in the moderate vulnerability group followed by the low vulnerability group, and finally the high vulnerability group. The characteristics of these groups were different. Of the sample population, 69% and 36% were highly vulnerable to rice production loss of 50% and 30% respectively. Most farmers could adapt by adjusting farming practices and seeking alternative off-farm income to compensate for rice production loss. However, they still had limited collective adaptive capacity. The results also showed that the method used in the study to assess farmers' vulnerability could lead to a better understanding of vulnerability measurements and characteristics of vulnerable groups as well as adaptation. In addition, adaptation options were analyzed and recommended in this study.

GREENHOUSE GASES FROM THE AGRICULTURAL SECTOR: SUSTAINABLE MITIGATION POTENTIAL FROM RICE FIELDS

SIRINTORN THEP TOWPRAYOON

The area under agriculture in developing countries has increased by 19 per cent during the past year. Greenhouse gases from the agricultural sector in these countries are forecasted to increase in the next decade. Major contributions are methane and nitrous oxide from rice fields. Agriculture is one of the most important economic sectors in Thailand, employing the largest share of labour. With sustainable development being a priority under the current development policy, there are recommendations that economic, social and environmental aspects be taken into account when considering mitigation options to reduce greenhouse gases from rice fields. The options discussed in this paper aim to improve rice yields while trying to avoid interfering with the decision-making of farmers in terms of investment and way of life. The results highlight the opportunity to maximize the benefits from the rice fields in terms of energy production from rice straw combustion.

SIMULATING RICE PRODUCTION SYSTEMS IN THAILAND UNDER VARIOUS CLIMATE SCENARIOS: PRELIMINARY RESULTS OF A SIMULATION STUDY

ATTACHAI JINTRAWET, SUPPAKORN CHINVANNO, SITTHIPONG MORARAY AND CHITNUCHA BUDDHABOON

Rice-based agricultural systems are highly sensitive to climate changes induced by global warming. Despite uncertainties about the precise magnitude of climate change impacts for different regional and time scales, the assessment of these possible impacts on agricultural resources is important in formulating response strategies. In this study, CropDSS shell and CERES-Rice models are used to investigate rice crop yields in Thailand under future climate scenarios from the ECHAM4 Global Climate Model (GCM). Data from the ECHAM4 Global Circulation Model under the SRES A2 scenario is downscaled to a higher resolution using the PRECIS regional climate model (RCM) work on the following periods: 1980-1989 (baseline years), 2010-2039 (Future Period 1: FP1) and 2070-2099

(Future Period 2: FP2). The results project increases in annual rainfall in many parts of Thailand by around 20% and 50% compared with the annual rainfall during the 1980-1989 period. Temperatures in many parts of Thailand will also be warmer with longer summer times. Declines in rice yields are predicted under all production systems in FP1 and FP2. The August planting date provides a higher grain yield than the January one due to lower air temperatures at the time of flowering. The model was also used to assess effects under the different climate scenarios projected in the ECHAM4 model. However, it should be noted that the predicted amount of rainfall and the relationship with higher incidence of insect-pest attacks are not simulated in the CERES-Rice model.

IMPACT OF AND ADAPTATION TO CLIMATE CHANGE: STATUS AND APPLICATION IN AGRICULTURE

ISTIQLAL AMIEN AND ELEONORA RUNTUNUWU

As an archipelagic tropical country, Indonesia is one of the most vulnerable countries to climate change caused by global warming. The inevitable changes will have tremendous impacts on many aspects of life thus requiring reconsideration of the country's development strategy. Agriculture is Indonesia's main employment sector which still contributes significantly to the country's Gross National Product. This paper highlights the fact that this sector will be seriously affected through impacts on agricultural lands and production systems. The major risks will be the impacts on the production of food crops which could lead to a disruption of the national economy and threaten social stability. This paper discusses aspects of changes such as rises in temperature, altered rainfall patterns, prolonged periods of droughts, increasing extreme climatic events, changes in hydrological systems, and water availability. All these will result in changes in crop acreage, productivity, food production, and Indonesia's food security. Observations are that the understanding of and concerns over climate change phenomena and impacts are varied. The limited research results on these aspects by research centers and universities are inadequate to properly formulate strategies to cope with the current and coming consequences. The paper also discusses current responses to and preparations for adaptation to climate changes such as informative cropping calendar maps and crop breeding to develop new varieties which can better adapt to drought, prolonged flooding and saline soils. Efforts to provide training to increase farmers' knowledge on climate change and their ability to anticipate extreme climate events are also discussed.

CLIMATE CHANGE IMPACTS ON AGRICULTURAL COST IN DIFFERENT REGIONS OF CHINA

LIU YINGJIE

Based on the data from the "China Rural Statistical Yearbook" 1984-2003 of the National Bureau of Statistics and the annual temperature records, the impacts of changes in temperature and changes in the use of agricultural inputs on crop production for the last 20 years are analyzed for different regions of China. The results show that rises in temperature, which is the most important feature of climate change, have a positive impact on total output in northeast China. One of the explanations for this is an expansion of the production period. In contrast, temperature rises have negative impacts on total food production output in the north, northwest and southwest of China. Possible explanations include increasing water shortage. No significant relationship is found in east and central south China. In these regions, a general reduction in agricultural acreage has been observed, this being more related to non-climatic factors, particularly the fast growing economy. Results also indicate that in various regions, production output can initially increase significantly with increased agricultural input. The rate of output increases, however, declines over time. The study also draws attention to changes in precipitation considered to be a key factor in food production. While there are no changes in overall trend, notable regional differences can be observed.

MANAGING RISKS DUE TO CHANGING AND VARIABLE CLIMATES IN VULNERABLE AGRO-ECOSYSTEMS IN THE PHILIPPINES

FELINO P. LANSIGAN

In this study, the vulnerability of some major agricultural food and feed crops to climate change and variability in selected locations in the Philippines is assessed using process-based crop simulation models under different climate scenarios. The simulation results show that crop yields of rice, corn, sugarcane, tomato, peanut and cassava are significantly reduced as temperature increases at a preset CO₂ level of 330 ppm. While crop productivity will be enhanced at increased CO₂ concentrations, crop yields tend to decrease with increasing temperature. The vulnerability of crops differs across locations with different agro-environments. The paper analyses the impacts of climate change and variability on the hydrologic regimes of watersheds in selected natural hazard- and disaster-prone areas in the Philippines. Hydrologic frequency analysis shows that extreme events are becoming more frequent and more intense with shorter return periods. Modifications in crop management are expected to reduce the negative impacts while institutional and non-structural measures include providing crop insurance coverage, making available calamity assistance funds from the government and/or non-governmental organizations, and comprehensive land use planning (CLUP) by local governments. Pro-active responses include updating standards in infrastructure design and development (e.g. drainage

systems) and implementing effective early warning systems. Recent case studies conducted in the Philippines focusing on the socio-economic and institutional aspects of adaptation and mitigation strategies and managing risks due to climate change are also discussed.

SESSION B: ENHANCING ADAPTIVE CAPACITY & RISK MANAGEMENT

CLIMATE CHANGE ADAPTATION AND DISASTER RISK MANAGEMENT (CCA-DRM): THE CASE OF THE MAG-ASAWANG TUBIG WATERSHED, ORIENTAL MINDORO, THE PHILIPPINES

CHARLOTTE KENDRA G. CASTILLO, RONALD N. CHOY, JOEL D. DE MESA, EMILYN Q. ESPIRITU, LIZA L. LIM,
ANTONIA Y. LOYZAGA, JOHN B. ONG, INENILA S. ROBERTO, JAMES B. SIMPAS, MAY CELINE THELMA M. VICENTE
AND JOSE RAMON T. VILLARIN

This study focuses on an on-going three-tiered initiative for policy and decision-support to climate change adaptation and disaster risk management in the Mag-Asawang Tubig Watershed of the province of Oriental Mindoro in the Philippines. Objectives of the initiative are to develop a Co-Benefits Framework for Climate Change Adaptation – Disaster Risk Management (CCA-DRM), to establish Telemetric Rain Gauges (TRGs) and to mainstream local climate change impacts into adaptation strategies and risk-sensitive development plans. The experience of the project so far indicates that different stakeholders involved in the project dovetail with one other in the identification and ranking of co-benefits strategies. The Co-Benefits Framework reflects the multi-stakeholder partnership and participation that is central to values reformation and behavioral change. By improving current watershed management so as to better address socio-economic vulnerabilities, the capability to adapt to hazards brought about by climate change is also strengthened. The keys to these desired results depend on two factors: (1) the ability to predict future hazards so that preparations can be made; and (2) the capacity to continuously sustain the resilience of a community such that it will always be able to find a means of coping. Enhancing the resilience of the watershed communities not only builds capacity for coping with disasters and adapting to climate change, but also contributes towards overall sustainable development. By taking such an integrated approach, scarce resources can be maximized and multiple benefits can be attained at relatively low costs.

FLOOD RISK MANAGEMENT IN CENTRAL VIETNAM: CHALLENGES AND POTENTIAL

PHONG TRAN, FAUSTO MARINCIONI, RAJIB SHAW, MASSIMO SARTI AND LE VAN AN

This paper explores the impacts of floods on the economy, environment, and society, and tries to ascertain the coping mechanisms of rural communities to flood disasters in central Vietnam. It focuses on the social aspects of flood risk perceptions that shape the people's responses to floods. The research findings reveal that flooding is an essential element in the lives of coastal populations whose livelihoods depend on the productive functions of cyclical floods. The findings also reveal that floods, causing losses and damages, often inhibit economic development. The surveyed communities were found to have developed coping mechanisms to reduce the negative impacts of the floods, but these mechanisms are challenged due to environmental degradation. Integrated flood risk management is discussed as a suitable paradigm for coping with flood disasters.

MAINSTREAMING COMMUNITY-BASED ADAPTATION TO CLIMATE VARIABILITY AND SEA-LEVEL RISE INTO INTEGRATED COASTAL MANAGEMENT: THE CASE OF CAVITE CITY, PHILIPPINES

RAMON FAUSTINO M. SALES, JR.

Like any other island state, the Philippines is vulnerable to the impacts of climate change, particularly sea level rise. These impacts, which include tropical cyclones, increased flooding, coastal erosion, saltwater intrusion and drought, will exacerbate the current effects of environmental degradation on the urban coastal communities of the case study area, Cavite City, Philippines. Using a participatory research approach over a period of three decades, this study examines the risks and impacts of current climate variability and temporary sea level rise (SLR) (i.e., high tide) in the case study area. It also identifies the vulnerable socio-economic groups among the coastal population, and examines their current adaptation strategies, both autonomous and planned, as well as their adaptive capacity to cope with the risks and impacts. Likewise, an assessment of the key factors that affect their vulnerability to such impacts is presented. Under a future scenario of a one-meter accelerated sea-level rise (ASLR), the study examines the potential impacts on the urban coastal population and ecosystem. In the context of poverty reduction and sustainable development, this study suggests a local operational framework for mainstreaming community-based adaptation strategies and actions into integrated coastal management (ICM). The study also further puts forward policy and institutional reform, capacity building and improved knowledge management as essential requisites for making these coastal communities climate risk-resilient and sustainable in the long term.

RISKS AND ADAPTATION TO CLIMATE CHANGE IN THE MEKONG REGION

FRANK MURRAY

Human-induced climate change is a serious development issue with major implications for agriculture, water supplies, rural livelihoods and other sectors of the economy. The Intergovernmental Panel on Climate Change (IPCC, 2007a) states that warming of the planet in unequivocal observed changes in climate are already affecting ecological, social, and economic systems, and sustainable development is threatened by climate change. Climate change may have serious consequences for the livelihoods of rural populations in the Mekong region. For rural economies in the Mekong region, the additional stresses imposed by climate change could threaten goals related to poverty alleviation. The challenges to agriculture and water supply may be further aggravated by changes in rainfall regimes, hydrology and the frequency and intensity of extreme climate events, leading to threats to economic development. Furthermore, climate change may also affect the viability of infrastructure investments such as hydropower plants. Little research has been conducted in the Mekong sub-region to understand impacts, risks, vulnerability and adaptation to climate change here. This paper considers some of the issues being investigated by a research project funded by the Asian Development Bank under the Greater Mekong Sub-region Core Environmental Program, especially focused on risks and potential adaptation measures. The project will conduct policy-relevant assessments to be discussed during workshops of government decision-makers. Some of the outcomes of this study are likely to be relevant for many countries in Southeast Asia outside of the Mekong sub-region.

ADAPTATION TO CLIMATE VARIABILITY AND CLIMATE CHANGE: THE SOCIO-ECONOMIC ASPECT

RIZALDI BOER AND PERDINAN

Indonesia is becoming more vulnerable to climate hazards as are other developing countries. It is predicted that global warming will lead to an increase in the frequency and intensity of extreme climate events. Without developing adaptive capacity, the economic loss due to extreme climate events will have serious impacts on community livelihoods. Funds to assist developing countries in adapting to climate change are far from enough. Developed countries that contribute the most to global emissions should increase their contributions to adaptation funds through various innovative mechanisms.

VULNERABILITY AND ADAPTATION ASSESSMENT IN CAMBODIA

HENG CHAN THOEUN

This study assesses the potential impacts of climate change under two emission scenarios, SRESA2 and SRESB1, on Cambodia's agriculture, forests, human health, and coastal zones. Variability in rice production in Cambodia is significantly correlated with climate variability, primarily due to the occurrence of floods and droughts. Data from the past five years shows that production losses have been mainly due to flooding (more than 70% losses), followed by droughts (nearly 20% losses). Production losses due to pests and disease are insignificant. Increased flooding will cause serious damage to rice crops and expose farmers producing wet season rice to greater risks; thus research on developing flood-resistant varieties is very important. The impacts of climate change on Cambodia's forest types are also discussed, but the impacts on forest productivity could not be analyzed due to lack of data. Under changing climates, the study found that the area under wet forests will decrease while that for moist forests will increase with the dry forest area remaining the same or decreasing. This indicates that forest productivity and biodiversity may also change. Cambodia has the highest death rate from malaria in the region and the number of malaria cases is the highest among the infectious diseases commonly associated with changing climate variables. The relationship between malaria cases and ENSO events is, however, not well understood. In some provinces such as Kampot, the number of cases increased significantly when El Nino started but decreased in the La Nina period. Finally, for the impacts of sea level rise, it is foreseen that many coastal areas of Cambodia will be inundated with even a one-meter rise. For example, about 44 sq. km (0.4%) of Koh Kong Province would be under sea water permanently while about 56% of resettlement (city/town) areas would be flooded. The economic loss from damage to city infrastructure would reach about USD 21 million.

VULNERABILITY AND ADAPTIVE CAPACITIES OF LOW INCOME ECONOMIC SYSTEMS TO THE CLIMATE CHANGE THREAT

KHAIRULMAINI OSMAN SALLEH AND FAUZA ABD GHAFFAR

The significance of climate variation or change depends on the change itself and the characteristics of the sector/s of society exposed to it. Global warming and its effects on climate change and sea level rise will severely impact the under-developed and developing nations, the poor and marginalized communities, and those whose livelihood centers on the practice of simple production systems. In Malaysia, the impacts of climate change would be felt more amongst the urban poor, traditional highland communities, peasant farmers, and communities that practice simple day-to-day economic activities such as inshore fishing and subsistence agriculture systems. These communities are spatially distributed across a number of geographical regions in Peninsula Malaysia. The main aim of this paper is to discuss the nature of climate-induced threats on the poor and low

income populations of Peninsula Malaysia which are postulated to be the communities most at risk. The paper discusses the nature of vulnerability and resilience of these communities and the inherent adaptive mechanisms of their systems. Vulnerability and adaptability studies of this nature are greatly needed in Malaysia as the risks imposed on these communities are already in effect and becoming more severe.

VULNERABILITY, ADAPTATION AND RESILIENCE TO CLIMATE CHANGE: EXPERIENCES AND IMPLICATIONS IN VIETNAM

NGUYEN HUU NINH

This paper provides an overview of the predicted/potential impacts of climate change on Vietnam and the country's strategies to cope with and adapt to climate change and variability. The country's Red River Delta, Mekong Delta, and the coastal zones are the most vulnerable areas to climate change. The government of Vietnam recognizes that adaptation is necessary to complement climate change mitigation efforts and planned adaptation must supplement autonomous adaptation. Currently, governmental policies have been issued to reduce stress on resources, improve management of the environment, and increase the welfare of the poorest members of society. Vietnam's efforts to enhance its climate change adaptation capacity have focused on assessing the country's resilience and coping capacity, raising public awareness, developing sustainable livelihoods practices, initiating cooperative efforts, technology intervention, and designing and adopting adaptation measures. There are a number of constraints to coping and adapting to climate change in Vietnam namely, the lack of awareness on climate change and variability among the different levels and sectors, and the lack of communication among national, regional and local levels in implementing adaptation strategies. Most public awareness raising programs focus on the top administrative levels and are confined to the academic community. The groups that capacity building efforts should focus on include government officials, the media, and educational institutions including universities.

THE ECONOMICS AND MANAGEMENT OF GLOBAL WARMING: THE MISSING LINK

VUTE WANGWACHARAKUL

Global warming is not a new concept in environmental economics. Most economic studies on mitigation and adaptation to global warming have been conducted in developed countries. The recent calls for mainstreaming the issues into national development processes, especially in developing countries, raise the need to incorporate socio-economic components. Various studies could be generated. The great challenge to environmental economics is to properly translate scientific findings into national economic development strategies. Addressing global warming issues at the national level are not much of a problem to environmental economists. The greater challenge is at the global

scale. The root of global warming problems which calls for intervention is global equity, but unfortunately, this has not been adequately addressed. Global warming is not merely an issue of “efficiency” for economists, but of ensuring “equity at the least-cost”. The Kyoto Protocol demonstrates the limitations of pure efficiency-oriented mechanisms that, unless supplemented by other mechanisms, could aggravate global equity problems. Managing global common good in general and global warming in particular imposes new challenges on environmental economics researchers as well as provides good opportunities to test economic concepts in real life scenarios at the global and national levels.

CLIMATE CHANGE AND EMERGING POLICY AND SUSTAINABLE DEVELOPMENT OPTIONS FOR FOOD AND WATER SECURITY

ROGELIO N. CONCEPCION

The global climate change phenomenon has been confirmed by IRRI as silently affecting rice crops in the Philippines. Every one degree increase in nighttime temperature translates into a 10 per cent decline in rice yields. Despite technology advances such as improved varieties, genetically modified organisms, and irrigation systems, weather remains the determining factor in agricultural productivity. Under this governing principle, water for sustainable development is discussed within the context of global warming and climate change and according to Integrated Water Resource Management (IWRM) principles and applications. Since today’s state of knowledge of climate change is largely global, the task for scientists in every country is to translate this into local contexts, specific to vulnerable areas and communities. Of utmost importance in managing climate change-related uncertainties and variability is a comprehensive review of the existing infrastructures at risk as well as the need to identify new public and private investments for adaptation measures related to new sets of crops and land management. There is also a need to identify and evaluate the joint and separate impacts of global warming and climate change from the El Nino phenomenon. The penultimate scenario for global warming and climate change is the increasing stress on water access, sources and availability and the emerging requirement for establishing clear win-win policy options for sustainable food and water security. The cost of self sufficiency has direct bearing on the opportunity costs of water with regard to food production, human domestic needs and sanitation.

NEW APPROACHES FOR AN IMPACT AND ADAPTATION REGIONAL STUDY: A CASE STUDY IN NINGXIA, CHINA

LI JIANPING, LIN ERDA, LI JIANPING, LIN ERDA, CHENG NAN AND LIU YULAN

This paper summarizes the key results of a major regional study conducted in Ningxia Province in northwestern China in 2005 and 2007. The study predicted changes in average rainfall, daily

temperatures (minimum and maximum), and CO₂ concentrations in Ningxia using PRECIS, a regional climate change model. The results show that annual mean temperature of whole region would increase by 1.4⁰-1.9⁰ C in the 2020s, 2.5⁰-3.4⁰ C in the 2050s, and 4.0⁰-5.6⁰ C in the 2080s. The increase of temperature is much greater than that of precipitation. The occurrence of abnormal climate events such as high temperatures, droughts, and floods is predicted to increase in Ningxia. Regional crop models were driven by the PRECIS output to predict changes in yields of three of Ningxia's key agricultural crops; maize, wheat, and potato. It was projected that corn yields would increase in by about 20% in the 2020s, and 6-9% on average in the 2050s, but would decrease in the 2080s. Yields of potato and wheat, on the other hand, show a decreasing trend. The study developed an integrated framework that can be used to design adaptation strategies. Adaptation measures that Ningxia has implemented are also discussed. These include restoration of farmlands to forests and pastures; utilization of climate resources like wind and solar energy; weather modifications; adjustment of crop production structures; adoption of water-saving irrigation systems; pollution control and reduction; and using the news media to publicize climate change and its impacts.

ADAPTATION PLANNING IN THE INTERNATIONAL SETTING

LOURDES V. TIBIG

The climate is changing and most of the warming in the last 100 years has been human-induced. More and more, adverse impacts are increasingly and rapidly being observed. Climate change is forcing vulnerable communities to adapt to the unprecedented climate stress, being exacerbated by other stresses. Some adaptation is already occurring now, but the fact that the climate system will be subject to continued warming in the coming decades and the vulnerability of human and natural systems to climate-related risks necessitates planned and integrated adaptation. The global community has agreed to take concerted global action to address climate change through the United Nations Framework Convention on Climate Change (UNFCCC) process. In the years after the Convention entered into force, a number of definitive actions have continued to evolve. One of the landmark responses to the need to adapt to climate change is the Buenos Aires Program of Work on Adaptation and Response Measures. The Convention set up two complementary tracks for adaptation; the development of a structured program of work in the scientific, technical and socio-economic aspects of vulnerability and adaptation to climate change, and the adoption of concrete actions for adaptation to climate change. The agreement arrived at the COP-13 in Bali has also paved the way for intense negotiations on a number of issues vital to ensuring that the two-degree centigrade increase in the global mean temperature is not exceeded.

CLIMATE CHANGE MITIGATION AND ADAPATION IN INDONESIA: THE ROLE OF ENVIRONMENTAL ECONOMIC RESEARCH

SURNA TJAHJA DJAJADININGRAT

This paper provides an overview of the significant role of environmental economic research in decision-making on mitigation and adaptation strategies for Indonesian policy-makers. Decisions about the most effective/efficient mitigation or adaptation measures can be made if the costs and net benefits associated with the adoption of the measures are understood. However, economic assessments of the potential costs and benefits of climate change and climate change responses have hardly been conducted in Indonesia. The methods and tools discussed in this paper are decision support tools. While the outcome of environmental economics analyses can provide useful guidance to decision-makers, the value of such analyses will depend not only on the robustness of the data used and methods applied in the research, but also on the transparency of the assumptions used in the analysis.

SESSION C: ADAPTATION TO SEA LEVEL RISE CLIMATE CHANGE MITIGATION

&

THE SOCIO-ECONOMIC IMPACTS OF SEA LEVEL RISE IN INDONESIA

ARMI SUSANDI, YAN FIRDAUS AND INDRIANI HERLIANTI

Coastal areas and small islands are very vulnerable to climate change. The impact of climate change on coastal areas include sea level rise, land loss, changes in maritime storms and flooding. Indonesia as a coastal country is highly affected by sea level rise. Based on the MAGICC/SCENGEN model, sea level rise is expected to be 1.1 m in Indonesia – this will cause the loss of coastal areas and small islands such as the South Kalimantan coast, South Sumatra, East Java, Central Sulawesi, Nusa Tenggara, the Moluccas and South Papua. By the year 2100, the economic loss caused by sea level rise in Indonesia will be about USD 25.5 billion, taking into account an estimated land value of USD 0.28 million per sq km and the loss of 90,260 sq km of land area.

THE LOWER MEKONG RIVER DELTA AND CLIMATE CHANGE: SITES AND AREAS VULNERABLE TO CLIMATE CHANGE

KY QUANG VINH

By comparing the past and present natural conditions and socio-economic data, this study forecasts the effects of climate change in the low deltaic areas of the Mekong River in Vietnam. It predicts more flooding; crop failures; erosion of roads, riverbanks, and seashores; and water supply shortages in the

wet season. In the dry season, increasing depletion of groundwater, deteriorating fresh water quality, seawater intrusion, and biodiversity loss are forecasted. The areas, style, and scale of the dryness and flooding in the delta are analyzed. Recommendations are to build breakwater dykes on the seashores; flood control dykes and sluices; groundwater recharge facilities; and plain water reservoirs to solve the problems. Enforcing a policy to protect surface water quality is also suggested.

THE ECONOMIC AND SOCIAL BENEFITS OF FLOOD-BASED LIVELIHOODS IN VIETNAM'S MEKONG DELTA: A CASE STUDY IN AN GIANG PROVINCE

NGUYEN VAN KIEN

This paper examines the economic and social benefits of several flood-based farming practices being employed by local people in An Giang Province in Vietnam using content analysis from previous studies, in-depth interviews with key informants, and secondary data from past government reports. The economic values of flood-based crops and aquaculture are measured using farm gate prices for output and wholesale market prices for inputs. The results suggest that flood-based farming and services have contributed significantly to the improvement of local livelihoods in the area. Rice farmers, for example, can grow more than two rice crops in the flooded areas using flood-based farming approaches while prawn farmers can gain a net benefit from 22 to 44 million VND, three times higher than that of rice crops. Small-scale snakehead fish and eel farmers can also gain highly positive net benefits. The net benefits of lotus and water caltrops ranged from 10 to 12 million VND per ha which is twice higher than that of rice crops. Mushroom farming also provided a net return of 560,000 VND per 100 m². In addition to economic benefits, flood-based farming has created many jobs for local people. There were 406,937 jobs created during the flood of 2005, of which 47,000 were in flood-based services. Floods have thus brought many social and economic benefits to the area.

ADAPTATION STRATEGIES FOR COASTAL EROSION/FLOODING: A CASE STUDY OF THE COMMUNITIES IN BANG KHUN THIAN DISTRICT, BANGKOK

RAWADEE JARUNGRATTANAPONG, AREEYA MANASBOONPHEMPOOL

This study aims to determine household adaptation strategies for coastal erosion/flooding in the Bang Khun Thian District of Bangkok. It is based on site visits, discussions with the local residents, literature review, and a household survey. The results indicate that households have individually applied three types of autonomous adaptation strategies: protection (such as stone breakwaters, bamboo revetments, and dyke heightening), retreat, and accommodation. Each household has applied more than one adaptation option, with protection strategies as the most popular. The annual adaptation cost is approximately USD 3,130 per household, which is equal to 23% of the average household income. Furthermore, the average inundated area is about 0.9 hectares per household or 8% of a

household's aquaculture area. The existing government assistance given for coastal erosion/flooding are building stone breakwaters—which are not very effective—and flood compensation. The study reports that individual adaptation strategies, without any collective adaptation strategies, may not be a good solution since negative externalities will result if the neighbors do not build/maintain their protection structures. Secondly, due to low education and lack of professional knowledge, farmers cannot shift to other occupations. This explains why farmers are willing to pay highly to build/maintain their protection structures since they have no other choice. Lastly, for protection structures to be effective, they should be planned for the whole Upper Gulf of Thailand. Thus, action from the national and local government as well as public participation is called for.

IMPACTS OF SEA-LEVEL RISE ON COASTAL LAGOONS: A CASE STUDY OF TAM GIANG-CAU HAI LAGOONS IN CENTRAL VIETNAM

DO NAM

Sea level rise due to climate change is a particularly serious danger for countries like Vietnam with high population densities in coastal and lowlands areas. The Tam Giang – Cau Hai lagoon complex, one of the biggest in the world, located in Thua Thien Hue Province in central Vietnam, has been adversely affected by sea level rise. About 300,000 inhabitants live around the lagoons and on their water surface, and earn their livelihoods directly or indirectly by exploiting natural resources in the lagoons. With abundant natural resources, this coastal area has huge potential for development. Instead, the local people have to face the negative impacts of sea level rise such as inundation of low-lying lands, erosion of beaches, increased flood and storm damage, and salt water intrusion into aquifers and surface waters. Adaptive action is needed to address the situation.

HOUSEHOLD AND COMMUNITY ADAPTATION EXPERIENCES AND STRATEGIES IN RESPONSE TO SEA LEVEL RISE IN NAM DINH PROVINCE, RED RIVER DELTA, VIETNAM

NGUYEN QUOC CHINH

This is a case study of the Giao Thien commune, living in the Giao Thuy District, Nam Dinh Province, Red River Delta, Vietnam. It investigates how the local people living on both sides of sea dykes are affected by sea level rise; what their response is; what the related events are; and what lessons can be drawn out from past experiences to help other communities/households prepare for sea level rise. This study suggests that sea level rise and its related events have many negative impacts on agricultural productivity, infrastructure, houses, and buildings. These negative impacts are huge especially when the local people do not well prepare for them. The people respond to the negative impacts in various ways including reducing agriculture and investing more in fishery (both aquaculture

and fishing), establishing irrigation systems to reduce salt water intrusion, and building better, more solid infrastructure.

LIVELIHOOD VULNERABILITY AND LOCAL ADAPTATION TO NATURAL DISASTERS IN THE HUONG RIVER BASIN: A CASE STUDY IN THUAN AN TOWN, PHU VANG DISTRICT, VIETNAM

LAM THI THU SUU AND PHAN THI HOANG MY

This paper attempts to understand and analyze the effects of climate change on the fishermen and farmers in Thuan An town, Phu Vang District, Vietnam and to study their livelihood activities and adaptabilities to natural calamities. Extreme weather events induced by climate change are happening more frequently with higher intensity here. This study uses a combination of research methods such as sustainable livelihood analysis, vulnerability approach, and stakeholder analysis. The vulnerability of each group, occupation, and village varies by geographical location, ability to access resources, and the living and working environment. Each community has its own adaptive strategies.

COMMUNITY-BASED FLOOD RISK MANAGEMENT IN THE PAMPANGA RIVER BASIN, THE PHILIPPINES

ROSA PEREZ

This paper presents a case study of a community-based flood early warning system (CBFEWS) in the Lower Pampanga River Basin, Philippines. CBFEWS is implemented by the local government units (LGUs) with the Flood Forecasting Branch (FFB) of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) providing the technical assistance and information to implement the system. The target beneficiaries are the local residents of the flood-prone areas. In studying the system, it can be seen that adaptation to future climate change should first seek to identify gaps in the current capacity to address climate variability and extremes. In some instances, formulating a plan anchored solely on climate change is unrealistic, since adaptation encompasses a wide range of vulnerable sectors and populations involving non-climatic concerns. The adaptation strategy should, therefore, address immediate as well as long-term benefits. In the context of climate change, poverty alleviation and national/local economic development remain urgent goals.

VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE: A VIEW FROM HUMAN HEALTH AND POLICY PERSPECTIVES IN VIETNAM

TRAN MAI KIEN, RAJIB SHAW AND NGUYEN HUU NINH

In many developing countries, in the process of identifying and evaluating the risks and impacts of climate change, human health is an often neglected sector, “a white spot” to which little attention is paid and few studies done. In this paper, there is an attempt to provide an overview of the current situation of climate change, disasters and risks in relation to human health in the world, the Asia-Pacific region, and Vietnam. Some current policies are analyzed – the prevalent gap appears to be in relating the health sector and health policies to climate change issues. Also discussed are a multi-disciplinary approach to integration and better collaboration of three key sectors in Vietnam; climate/environmental management, disaster management and human health, in the process of planning and policy-making.

CURRENT STATUS OF PROGRAMS TO REDUCE EMISSIONS FROM DEFORESTATION AND LAND DEGRADATION

NUR MASRIPATIN

This paper addresses the following topics: (1) forests and forestry in Indonesia; (2) forestry sector policy; (3) mainstreaming climate change issues into forestry sector policies; (4) current issues in forestry which focus on Reducing Emissions from Deforestation and Degradation (REDD); and (5) REDD programs in Indonesia. Forest loss in Indonesia increased rapidly from 1997-2000 when Indonesia experienced an economic crisis and was in transition from a centralized to a decentralized system of governance. In response to this, the government of Indonesia has established a long-term policy on the rehabilitation of degraded forest land, the conservation and management improvement of the remaining forests, and curbing illegal logging and illegal trade through law enforcement, inter-sectoral approaches and international cooperation. The current issue of the contribution of deforestation (and land degradation) to global GHGs emissions has put forestry and land use changes at the center of global environmental issues. The deforestation issue came under the agenda of ‘Reducing Emissions from Deforestation in Developing Countries (RED)’ during the 11th session of the UNFCCC Conference of the Parties (COP-11) in Montreal in 2005 and has been responded positively to by most parties. Indonesia has set up a road map for REDDI (Reducing Emissions from Deforestation and Degradation in Indonesia) through three steps: (1) preparation phase, for developing REDD architecture and strategy to address the drivers of deforestation and forest degradation (2007); (2) pilot activities, as a means for a learning-by-doing process on REDD, and testing the architecture and strategies developed during the preparation phase; and (3) full implementation from 2012 or earlier depending on the COP decision and Indonesian readiness.

CLIMATE CHANGE IMPACTS, MITIGATION AND ADAPTION IN THE FORESTRY SECTOR: A SOCIO-ECONOMIC PERSPECTIVE

DANIEL MURDIYARSO

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 4AR) indicates that many natural systems are being affected by increasing regional temperature. In general, developing countries are vulnerable to climate change and yet have low adaptive capacity. In Asia, the treat of glaciers is associated with flooding, especially in mega deltas, and heavily populated cities. The forestry sector as part of the natural system offers both mitigation and adaptation opportunities with some socio-economic implications. A forested peatland ecosystem is selected as an example to demonstrate such opportunities. Reducing emissions from deforestation and degradation (REDD) are discussed. The strategies to mitigate and adapt to climate change in peatland ecosystems should be mainstreamed in the development pathway. A wide array of market mechanisms is envisaged. These could potentially be synergized with adaptation options to reduce the vulnerability of both natural and social systems.

DECOMPOSING CARBON DIOXIDE EMISSIONS FROM FOSSIL FUEL COMBUSTIONS IN INDONESIA

BUDY P. RESOSUDARMO, FRANK JOTZO, ARIEF A. YUSUF AND DITYA A. NURDIANTO

This paper analyzes CO₂ emissions from fossil fuel combustions to ascertain the main driver behind the increase in the amount of these emissions and the challenges in reducing emission levels. Although current CO₂ emissions due to deforestation and land use change are much more than those from fossil fuel combustion, CO₂ emission quantities from the latter (or energy sector) will eventually be higher than those from the former. This paper identifies the main driver behind increasing CO₂ emissions in Indonesia as the increase in carbon intensity, largely due to the rapid use of coal, particularly in the electricity sector. Possible national policies suggested include a carbon pricing policy, reform of electricity policies, and eco-labeling. The main conclusion of this paper is that Indonesia needs to develop a proper low-carbon growth study with the goal of finding strategies to achieve high pro-poor economic growth with low carbon emissions. In doing so, understanding the impacts of clean energy policies on growth, and income distribution and poverty is important.

STRUCTURAL CHANGES IN THE MANUFACTURING SECTOR AND GREENHOUSE GAS EMISSIONS: SOME POLICY CONSIDERATIONS FOR MITIGATION

BUDIONO

This paper analyzes the relationship between the development of the manufacturing sector, its compositional changes, and its demand for energy, and greenhouse gas (GHG) emissions. Various policies and external factors which affect the development of the sector and some policy lessons on mitigating GHG emissions are discussed. The Indonesian manufacturing sector has grown faster than the country's GDP in the last 25 years. During the period 1981-1995, the share of liquids as sources of energy decreased with accompanying increases in the shares of gas and electricity. The use of solid fuel, however, did not change significantly during the period except for a slight increase. The pattern of compositional changes in energy sources used by the manufacturing sector in the period 1996-2005 did not change significantly compared with the previous period. In order to reduce GHG emissions, the government needs to take several courses of action: (1) encourage the development of less energy- and pollution-intensive industries especially in the non-manufacturing sectors, such as services and knowledge-based industries; (2) discourage huge foreign direct investments in the more energy- and pollution-intensive industries; (3) maintain an efficient pricing policy for the energy sector; (4) subsidize research and development activities on more efficient uses of energy in production processes; and (4) relocate energy-intensive industries to areas with strong assimilative environmental capacities to absorb and neutralize pollutants and GHGs.

THE ECONOMY-WIDE AND DISTRIBUTIONAL IMPACT OF REDUCING INDONESIAN CARBON EMISSIONS THROUGH ECONOMIC INCENTIVES

ARIEF ANSHORY YUSUF AND BUDY P. RESOSUDARMO

Greenhouse gases emissions can be reduced when the contributions of carbon intensive sectors and the relatively less carbon-intensive sectors declines and increases respectively. This is called economic restructuring. In a market economy, this climate-friendly restructuring is best induced by introducing economic instruments such as carbon tax. There will be gainers and losers in such restructuring. Some sectors will expand, while others will contract; returns to one factor of production may rise while others may fall; and some groups of households may be affected more than others. Using INDONESIA-E3, a computable general equilibrium model which emphasizes multi-market interaction and distribution of income among households, this paper analyzes the likely economy-wide and distributional impacts of introducing an economic instrument (in this case, carbon tax) to reduce CO₂ emissions. The results suggest that the growth of sectors such as mining, heavy manufacturing, electricity, and transport will slow down, while sectors like agriculture, agriculture processing industries, and services will grow faster. This economic restructuring is progressive as resulting

structural changes and resource reallocations will benefit rural and lower income households. In addition, the expenditure of lower income households, especially in rural areas, is less sensitive to the prices of energy-related commodities. Revenue-recycling through a uniform reduction in the commodity tax rate may reduce the adverse aggregate output effect, whereas uniform lump-sum transfers will be more progressive.

IDRC  **CRDI**
International Development
Research Centre

 **Sida**
Swedish International
Development Cooperation
Agency

Canadian
International
Development
Agency  Agence
Canadienne de
Development
International