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Adapting to Climate Change and Water Security in Asia

Proceedings from the Regional Meeting
for IDRC-funded partners in Asia
working on climate change adaptation research



Canada

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This meeting took place in Kathmandu, Nepal on June 19-20, 2013 and was co-hosted by IDRC and the South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATeRs).

Executive Summary

Economic and social development across Asia is being hindered by climate change. While growth has been rapid in many countries, limited or no adaptive capacity has led some communities to be negatively exposed to various impacts of climate change, including flooding, drought, and increasing temperatures. The role of multi-disciplinary research in specifying such impacts, understanding community based responses, and influencing policy is increasingly being acknowledged.

The International Development Research Centre (IDRC) co-hosted a regional meeting with the South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATeRs) in Kathmandu, Nepal on June 19th and 20th, 2013. The meeting brought together partners from 20 research projects in Asia (see Annex 1) that are funded through IDRC's Climate Change and Water (CCW) program. These projects are exploring climate change adaptation through a range of different thematic entry points, including coastal vulnerability, peri-urban and urban water security, disaster risk reduction, and water governance. The primary objective of the meeting was to enable knowledge sharing between researchers on lessons learned in using key methods -- economic analysis, social vulnerability assessment, and biophysical modeling -- and to explore how effective results can be produced from research to strengthen adaptation policies, plans, and actions in the Asia region.

The two-day program included three plenary panels on methods, two plenary panels on the role of communicating research and engaging policymakers, and two sets of parallel roundtables. The structure of this report follows the meeting agenda (see Annex 2), with sections outlining the plenary panel presentations and ensuing discussions, the insights that were captured during the parallel roundtables, and a summary of the salient points raised throughout the meeting.

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Introduction

The impacts of climate change on water security, livelihoods, and the environment in Asia have been well-documented by the Intergovernmental Panel on Climate Change (IPCC 2007), as well as international and national research institutions. Asia is home to more than four billion people and, according to the IPCC, is likely to experience a range of acute impacts from climate change, which include sea-level rise in densely populated low-lying coastal areas, retreating glaciers in mountainous regions, an increase in the incidence of climate-related tropical diseases, changes in precipitation patterns and decreasing crop yields, as well as temperature fluctuations across the region. While it is challenging to discern whether particular impacts can be attributed to human-induced climate change or to natural climatic variability (IPCC 2007), it is clear that Asia has seen a significant increase in the frequency and intensity of extreme weather events. Recent examples include the devastating floods in Pakistan (2010, 2011), China, and India (2011, 2012, 2013), and cyclones in Bangladesh (2007).

IDRC's Climate Change and Water (CCW) program was launched in 2010 to support applied, policy-relevant research aimed at helping vulnerable populations adapt to the water-related impacts of climate change. The CCW program currently has 20 active research projects in the Asia region that focus on climate change adaptation, which draw on one or more of the following thematic entry points: water security in peri-urban and urban environments, coastal vulnerability, changing water availability in mountain ecosystems, disaster risk reduction, and water governance (Annex 1 lists projects and partner institutions). The projects employ a variety of methods that cut across disciplines, including climate and hydrological modeling, social vulnerability assessment, and economic analysis. CCW's portfolio of projects in Asia represent the work of high caliber institutions that are engaged in collaborative research across borders and disciplinary boundaries. Despite this, there have been few occasions for these partners to meet, share emerging research results, or discuss common challenges.

In June 2013, CCW and the South Asia Consortium for Interdisciplinary Water Resource Studies (SaciWATERS) co-organized the first regional meeting for partners working on climate change adaptation in Asia, which took place in Kathmandu, Nepal on June 19th and 20th, 2013. The main objectives of the meeting were:

- To share emerging results from CCW-funded projects in Asia;
- To compare and contrast methods and approaches for climate change adaptation research;
- To learn and apply best practices in communicating research results; and
- To facilitate opportunities for collaboration, networking, and policy advocacy at a regional level.

The meeting was structured around three plenary panels on methods, namely: (i) the economics of climate adaptation, (ii) climate and hydrological modeling, and (iii) understanding vulnerability (see Annex 2). A fourth panel focused on communicating research findings and the implications for informing climate change policy. The panel presentations were complemented each afternoon by two sets of parallel roundtables, facilitated by lead researchers and/or IDRC Program Officers. These roundtables provided an opportunity for in-depth discussion around the points raised in the presentations, and also encouraged partners to think about areas of collaboration. The final session focused on generating ideas for regional networking, management, and knowledge dissemination relating to climate change adaptation research.



Mark Redwood, Program Leader for IDRC's Climate Change and Water Program, provides opening remarks at the meeting.

Scope of Adaptation Research in Asia

It is apparent that the impact of climate change on water quality and availability is linked closely to development challenges in Asia. The poor are particularly reliant on water for income generation, and their socio-economic vulnerability is further exacerbated by the impacts of climate change on this valuable resource (Shaw 2012). Water quality and availability is affected by climate change in numerous ways, although the main impacts that are expected in the Asia region are the following (ibid.):

- Coastal regions affected by sea level rise, leading to loss of land and possible migration;
- High levels of water salinity and storm surges in coastal areas, negatively impacting agriculture, aquaculture, and drinking water;
- Decreasing surface water availability, leading to increased water stress in rural and urban areas;
- Changes in rainfall patterns across the region, resulting in increased frequency and intensity of floods and drought periods; and
- Greater surface runoff in urban areas, overwhelming existing storm water drainage.
- Damaged infrastructure creates environmental sanitation issues in cities, leading to greater incidences of water-borne disease.

Local and region-specific research is required to explore ways for adapting to the above changes. A study commissioned by IDRC and United Kingdom's Department for International Development (DfID) (ISET 2008) identified a number of research gaps for climate change adaptation across China, South Asia, and South East Asia (regions within Asia where the CCW program is active). Identified gaps include the need for improved knowledge of the factors that enable and constrain adaptation – both planned and

autonomous – and better understanding of the governance implications. A recent experts' review of climate research and its applications in South Asia was commissioned by DfID, which included a series of consultations with key stakeholders. The review identified three particular challenges for South Asia, which are likely also applicable to South East Asia and China (New et al. 2011, modified):

- The scattered nature of research capacity, research projects, initiatives, and institutions [in South Asia] leads to uneven quality for research results and data, as well as uneven distribution within and across sectors and regions.
- The infrequent application of research findings stems from poor communication of research outputs, limited availability of key datasets, and the lack of data visualization in forms that are easily accessible to both researchers and end-users.
- End users such as national and local governments, communities, and sector professionals have limited awareness and capacity with which to access, interpret, and act on adaptation research results.

Climate change impacts pose complex problems that no singular approach can address. Recent IDRC-supported work on adaptation indicates that modeling, vulnerability assessment, and economic analysis are key methods to address some of the aforementioned research gaps and to generate relevant results for a wide range of stakeholders. Biophysical models are valuable in that they indicate possible future climate scenarios and show the influence this may have on the hydrology of a particular area. Vulnerability assessments, especially those that consider coupled human-environment systems, can produce information about particular climate risks and be illustrative of the adaptive capacity of a given area. Such an integrated analysis is beneficial for designing, implementing, and prioritizing adaptation strategies that take into account the social and biophysical conditions of a specific community. Adaptation strategies can be assessed through economic analysis to evaluate the relative costs and benefits of a particular course of action, which can help to inform decision-making when comparing different investments for adaptation.

Although results from these methods are very promising, there are knowledge gaps concerning how they can be applied at different scales and for varying contexts. This document synthesizes the challenges and lessons learned from IDRC-supported researchers working with these methods on climate change adaptation in Asia.

Panel 1: Economics of Climate Adaptation

Moderator: Bhim Adhikari (IDRC)

Discussant: Bui Dung The (SEARCA)

Presentations

1. **Impact of Climate Change on Agriculture in Pakistan – A District Level Analysis**
Project title: Climate Change Adaptation, Water, and Food Security in Pakistan (106857 - Component 3)
Project partner: Pakistan Institute of Development Economics (PIDE)
2. **Knowing what Farmers Know- Understanding Risk Management and Untangling Climate Change Adaptation in the Agricultural Sector of Pakistan**
Project title: The Determinants, Impact, and Cost Effectiveness of Climate Adaptation in the Indus Ecoregion (106857 – Component 1)
Project partner: Lahore University of Management Sciences (LUMS)
3. **Water Resources and Adaptation to Climate Change in North China Plain and Poyang Lake Region in China: Preliminary Findings and Research Plan**
Project title: Water Resources and Adaptation to Climate Change in Vulnerable North China and Poyang Lake Region in China (107093)
Project partner: Center for Chinese Agricultural Policy (CCAP), Chinese Academy of Sciences
4. **Fish farming, water and climate in northern Thailand**
Project title: Inland Aquaculture and Adaptation to Climate Change in Northern Thailand (107087)
Partner institution: Chiang Mai University
5. **From Vulnerability Assessment to Economic Analysis of Adaptations – Findings and Lessons learned from a Cross-Country Project in Cambodia, Philippines and Vietnam**
Project title: Building Capacity to Adapt to Climate Change in Southeast Asia (106326)
Project partner: EEPSEA (Hue College of Economics, Royal University of Phnom Penh, University of the Philippines Los Banos / SEARCA)

Hydrological and agricultural systems are highly sensitive to the impacts of climate change (IPCC 2007), and adaptation is constrained by insufficient investment in engineered and non-structural options, inadequate policies, and a lack of appropriate financing mechanisms (UNEP 2010, AIT-UNEP RRC.AP 2011). Economic analysis can be a valuable tool in monetizing the costs of inaction, thereby informing decision-makers about potentially effective policies and assisting them in prioritizing investments (IIED 2010). However, economic analysis of adaptation is a relatively new field of study and there are many knowledge gaps that need to be addressed.

Five CCW projects in Asia are integrating economic analysis in their adaptation research, and their findings to date were presented during the first panel discussion. The projects span six countries –

Cambodia, China, Pakistan, Philippines, Thailand, and Vietnam – and incorporate various economic models to analyze climate change adaptation options in agriculture, aquaculture, and infrastructure. Economic analysis methods include cost-benefit and cost-effectiveness analysis, valuation methods, the Ricardian-production model, and behavioural models.

The first presentation by the Pakistan Institute of Development Economics (PIDE) outlined the methods and initial results from an ongoing study in the Punjab, Sindh, and Khyber Pakhtunkhwa provinces of Pakistan. This study is analyzing the impacts of changes in temperature and precipitation on agricultural activities for 67 districts, drawing on 30 years of temperature data (1980-2010). Separate regression analysis was performed for different types of crops, using crop yield as the dependent variable. The explanatory variables included temperature and precipitation among others (such as conventional inputs and infrastructural variables). Preliminary results indicate that farmers are in fact adapting to changes in climatic conditions by using a range of different options: deep tillage to conserve moisture, building small check dams and wells in water stressed areas, planting mustard crops which have deeper roots and delaying their planting time by 15 to 30 days, sowing wheat 20 to 30 days later, and adopting water conservation technologies which include ridge sowing and intercropping combinations (i.e. cotton and mustard).

Another project studying farmers' perceptions and adaptation strategies is finding that climate change impacts are influencing agriculture in Pakistan. This study, led by the Lahore University of Management Sciences (LUMS) in partnership with the World Wildlife Fund for Nature - Pakistan (WWF-Pakistan),



Researchers from the Pakistan Institute for Development Economics (PIDE) visit tunnels used for agriculture in the Punjab region of Pakistan. From the project "Climate Change Adaptation, Water, and Food Security in Pakistan."

focuses on a micro-econometric analysis of autonomous adaptations. A total of 1200 household surveys were taken across seven sites in order to identify the adaptation options that are being adopted by the farmers. Preliminary results indicate that farmers are trying to gain alternative off-farm employment, so as to compensate for increased uncertainties in agricultural production due to climate change. A political economy study will be undertaken within the project to review historical access to food, stability of food supply, history of institutions involved in food security issues, and the evolution of environmental laws in Pakistan. An important capacity building piece of this project will involve farmer field schools, where master-trainers will learn about environmental entrepreneurship and techniques for reducing water usage.

Similar adaptation options are being adopted in certain regions of China, as the Centre for Chinese Agricultural Policy (CCAP) illustrate through their project results. The team assessed farmers' perceptions of climate change by conducting 2250 household surveys with farmers across the North China Plains (15 counties) and Poyang Lake Region (10 counties). The researchers also conducted an econometric analysis of the determinants for adopting different adaptation measures in those two regions.

Researchers noted that temperature perceptions were influenced by several factors, including information and extension services provided by the government, social capital, and some characteristics of households and communities, such as access to productive assets. The precipitation perceptions were mainly influenced by characteristics of households and communities, including the presence of water infrastructure and the incidence of disasters. Adaptation measures for addressing drought included investments in, and maintenance of, infrastructure, adopting water saving technologies, risk management, and adapting farm management practices. Specific adjustments to farm management included changing crop varieties, delaying sowing and harvesting dates, reseeding strategies, changing the intensity and timing of irrigation, as well as modifying levels of inputs such as seed, fertilizer, and pesticides. A few communities have established Water Users Associations (6.7% of the sample) and

Farmers Production Associations (28% of the sample). In addition, local governments have supported farmers through instituting early warning information systems, as well as providing financial, technical, and material support.

Researchers from Chiang Mai University in Thailand presented the initial results from their work, which focuses on how climate change impacts exacerbate production risks for pond-raised Nile Tilapia in the Phan district of Northern Thailand. Preliminary findings indicate that pricing is cyclical and can increase to Thai Baht 60/kg (USD \$1.87/kg). Researchers suggested that insurance schemes and effective water management could be used as potential risk management strategies.

A vulnerability assessment and economic analysis of adaptation options was undertaken for a cross-country project led by Hue College of Economics, in collaboration with the Royal University of Phnom Penh and the University of the Philippines Los Banos. The overall objective of this study was to build capacity for research, planning, and action with respect to climate change adaptation in the provinces of Kampong Speu in Cambodia, Languna in the Philippines, and Thua Thien Hue in Vietnam. Researchers characterized the exposure, hazards, sensitivity, and adaptive capacity of the study areas, as well as the household and livelihood vulnerability by topographical area. Adaptation options that were selected for Cost-Benefit Analysis (CBA) included: a water reservoir construction to address drought problems in Odong district (Cambodia), a technology-based early warning system (Philippines), and upgrading a flood control system in Quang Dien district (Vietnam). The CBA yielded the following results:

	Net Present Value	Benefit-Cost ratio
Cambodia	USD 1.5 Million	3.9
Philippines	USD 82.5 Million	43
Vietnam	USD 5.2 Million	2.1

These results demonstrate that all of the adaptation options studied have greater benefits than costs. Interestingly, the highest Benefit-Cost Ratio (\$43 in benefits for every \$1 in cost) was for a non-structural option (e.g. an early warning system in the Philippines) as compared to engineered infrastructure (e.g. a water reservoir and flood control system in Cambodia and Vietnam, respectively). This suggests that non-structural adaptation options can offer excellent return on investment and should be carefully considered by policymakers as an essential part of risk reduction, particularly in resource constrained countries that may not be able to afford investments in infrastructure.

Summary

There are a number of challenges regarding the use of economic methods for evaluating different adaptation responses, which include:

- How to capture autonomous adaptations in economic models (e.g. integrating adaptation options into production function models explicitly; capturing dynamic and socio-economic variables; and the characterization and analysis of adaptive capacity into models);
- Difficulties associated with monetizing adaptation options (benefits are often more challenging to estimate than costs) and how to handle imperfect markets (i.e. where there are distorted input prices and these distortions are not uniform);
- A lack of data for some model parameters which forces the researcher to rely on their own judgment, thus increasing the uncertainty of the results and posing challenges for more disaggregated analysis;
- Challenges in distinguishing between development and climate change issues in economic models (there is a thin line between what are referred to as “adaptation options” and “traditional rural development projects”); and
- A lack of consensus on what constitutes adaptive capacity.

Cost-benefit analysis (CBA) is a useful tool in the context of determining how to invest public or private money. There are, however, serious limitations to CBA. For example, while costs are relatively easy to determine, benefits are more difficult to assess. In addition, behavioral factors are not always “rational”, particularly when it comes to climate change. Behavioral economics may be the next frontier in work that can help understand why people choose to live in areas of high climatic risk, such as flood plains and low-lying coastal settlements. An additional point of discussion emphasized the benefits of combining data from the economic models with qualitative data, so as to triangulate findings and enrich the analysis. Combining large scale survey data with context specific case studies – as some of the aforementioned projects have done – can be an effective method to add strength to findings.

Panel 2: Climate and Hydrological Modeling

Moderator: Charlotte MacAlister (IDRC)

Discussant: Philippus Wester (ICIMOD)

Presentations

1. **Building Effective Water Governance in the Asian Highlands**
Project title: Building Effective Water Governance in the Asian Highlands (107085)
Project partner: Kunming Institute of Botany/HELVETAS Swiss Intercooperation
2. **Strengthening Livelihood Security and Adapting to Climate Uncertainty in Chilika Lagoon, India**
Project title: Strengthening Livelihood Security and Adapting to Climate Uncertainty in Chilika Lagoon, India (106703)
Project partner: Wetlands International
3. **Improving Food and Livelihood Security through Water-Energy-Agriculture Management in Punjab under Climate Change and Variability**
Project title: Improving food and livelihood security in Punjab through Water-Energy-Agriculture Management in Punjab under Climate Change and Variability (106591)
Project partner: Punjab Agricultural University and Columbia Water Center
4. **Adapting to Climate Change in Urbanizing Watersheds: Situation in Arkavathy Basin**
Project title: Adapting to Climate Change in Urbanizing Watersheds (107086)
Project partner: Ashoka Trust for Research in Ecology and the Environment (ATREE)

Hydrological and climate models are essential tools in adaptation research since they assess the observed and predicted impacts of climate change on various systems (IPCC, 2007). However, there tends to be greater uncertainty when models are used at a regional and local scale, which may decrease the confidence of various stakeholders in the data outputs and thus hinder efforts to take action (IPCC, 2007). This panel session discussed challenges and successes of using hydrological and climate models at a regional and watershed level. The session highlighted a variety of modeling tools used by four projects in Asia to study water resource vulnerability induced by climate change across a variety of different habitats and communities. It raised important questions about the ways in which models can be used to support community level adaptation strategies.

The presentation from the Ashoka Trust for Research in Ecology and the Environment (ATREE) highlighted issues of water quality and quantity in an urbanizing watershed (Arkavathy) in Karnataka, South India. There are numerous stressors influencing this watershed, including unplanned urbanization, production of water-intensive crops, increased temperature leading to greater levels of evapotranspiration, and excessive groundwater pumping which reduces base flow. In addition, there is no transparency regarding the allocation of water between municipal and industrial uses. Researchers are working on a model that takes into account parameters related to declining water quality, reduced

surface and groundwater availability, and socio-economic vulnerability in communities. The session discussant suggested that ATREE should pay more attention to the concept of a hydro-social cycle. Additional recommendations from participants included equal weighting of social and political factors in the model, as well as developing a water budget or balance for the watershed. The latter information would be helpful to determine the drivers that are influencing change in the system. The presenter indicated that the research team is currently working with a surface water balance that is linked to a 3D groundwater model, in order to help identify stressors in the system. To minimize uncertainty with the climate data, the researchers are using climate scenarios rather than downscaled climate data.

Punjab Agriculture University, together with the Columbia Water Center, is trying to improve water-energy management in agriculture through crop diversification and more efficient irrigation. Free electricity, chemical fertilizers, submersible hand-pumps, and government minimum support prices under the Green Revolution have led to intensive, inequitable and unsustainable agriculture development in Punjab. Researchers are looking at incentive mechanisms for water saving technologies such as tensiometers, drawing on farmer co-operatives to facilitate interventions. In an effort to improve water use efficiency, they are also undertaking capacity building programs to disseminate knowledge and share techniques for direct seeding of rice within the farming community. Along with capacity building programs, they are using hydrological modeling to create an energy-use model. Using the online 'formhub' data collection tool and the local mobile phone network, they are collecting and disseminating information on weather, soil, water, and irrigation scheduling, as well as market prices for farm inputs such as fertilizer. Results suggest that water savings of around 30% can be achieved using direct seeding of rice, compared with the traditional approach of rice cultivation. Researchers have also calculated that 2.3 million litres of water can be saved by moving from growing rice to equally lucrative alternative crops with lower water demand. As a focus for future research, they shall undertake isotope rating of water, develop value chains for different crops, and work towards reforms in the power sector by spreading awareness about the negative aspects of providing free electricity in agriculture among the policymakers.

Kunming Institute of Botany in China presented in collaboration with HELVETAS Swiss Intercooperation in Nepal and Pakistan. While the project is built on four interlinked modules, the presentation focused on the first module, namely the use of scientific data to assess the impacts of climate change at the regional, basin, and local level within and across the three project sites. Climate projections and scenarios were selected from the Representative Concentration Pathway (RCP) models used in the IPCC's 5th Assessment Report (IPCC AR5), downscaled to get an accurate picture using the Delta method of spatial distribution. A key success of the project is that they have been able to downscale to a resolution of 1 km², which helps when looking at cropping patterns and land use change in mountain eco-systems. Discussion focused on the limitations of the model, the use of publicly available data in the research, and whether "ground-truthing" (i.e. validating the accuracy of the model with location-specific climate data) of the results was possible. Participants were particularly interested in understanding the cost and time required to use publicly available data, how scenarios were selected from the IPCC, and how data extremes were removed. The presenter indicated that the scenarios used in this project are the median results from within each RCP outlined in the IPCC AR5.

The last presentation was from Wetlands International South Asia, on how climate change is likely to affect hydrological balances in the Chilika lagoon, important Ramsar designated wetlands in Orissa, eastern India. The project seeks to identify management response options and strategies for reducing risks, as well as increasing community preparedness for changes in wetland eco-systems due to climate change. The team working with the Chilika Development Authority has developed scenarios for the



Fishing communities rely on services provided by wetlands in the Chilika Lagoon. From the project “Strengthening Livelihood Security and Adapting to Climate Uncertainty in Chilika Lagoon, India”.

lagoon area, which are based on a biophysical assessment of change in key ecological processes and services, including land use. Results suggest that some processes are critical, such as the salinity gradient which influences the migration patterns of various fish and shrimp species. Although the lagoon is in relatively good condition, it has been noted that wetlands are declining within the catchment. During the discussion, the impacts of changes in the wetland on fisheries and communities that rely on fishing were of particular interest. For example, the freshwater system had started to turn brackish in the 1970's, leading to a decline in fisheries until a blocked artificial artery was cleared in the year 2000. Additionally, public outreach strategies were discussed and the presenter indicated that research results should be framed in a positive manner to engage more stakeholders in wetland issues.

Summary

The presentations in this session broke some of the ‘myths’ around the high cost of modeling by demonstrating how freely and widely available tools can be used to develop advanced models. In the follow-up discussion, the participants discussed and shared a number of free/open sources of data and programming code.

The session also emphasized the challenges of integrating qualitative and quantitative data in the modeling process to address biophysical and socio-economic aspects of the system. Hydrological models alone are insufficient; their effectiveness is much greater when integrated with socio-economic models that can help pinpoint how changes in hydrology will impact various communities of water users.

Panel 3: Understanding Vulnerability

Moderator: Carrie Mitchell (IDRC)

Discussant: Emma Porio (Ateneo de Manila University)

Presentations

1. Project title: Climate Change Adaptation, Water and Food Security in Pakistan (106857)
Project partner: Social Development Policy Center (SDPC)
2. **Gender, Security, and Sanitation – Action Research on Women’s Rights and Access to Water and Sanitation (2009-2011)**
Project title: Women’s Rights and Access to Water and Sanitation in Asian Cities (105524)
Project partner: Jagori and Women in Cities International
3. **Learning for an Uncertain Future vulnerabilities of Agricultural Production to Flood in the Sangkae River Basin, Northwest Cambodia**
Project title: Food Security and Climate Change in Cambodia (106291*)
Project partner: The Learning Institute (TLI)
4. **Understanding Vulnerability: Increasing Adaptive Capacity and Resilience Among the Most Vulnerable to Climate Change Effects and Disasters**
Project title: Coastal Cities at Risk (CCaR): Building Adaptive Capacity for Managing Climate Change in Coastal Megacities (106372-11**)
Project partner: Ateneo de Manila University
5. **Adapting to Climate Change in Peri-Urban Southeast Asia**
Project title: Adaptation to Climate -Induced Water Stress in Peri-Urban Southeast Asia (106960)
Project partner: Asian Institute of Technology (AIT)

*This project is part of IDRC’s Agriculture and Food Security program.

**This project is part of IDRC’s Challenge Fund program.

The presentations in this panel focused on assessing dimensions of vulnerability that are created and/or exacerbated by the impacts of climate change and changing water availability. Other themes discussed include assessing the adaptive capacity of men and women in different contexts, formulating policy recommendations to build community resilience, as well as building awareness among relevant stakeholders and mobilizing them. The projects explored the interaction between social, environmental, and institutional factors in shaping people’s differential vulnerabilities. The emphasis was on capturing the intersection of different stressors, though it was not always clear how this was being accomplished methodologically.

The first presentation from Social Policy Development Centre (SPDC) noted a number of key findings from their research in Pakistan, including: increased rainfall and extreme temperature during summer and winter seasons in the disaster prone areas of Sindh; local perceptions connecting rising temperatures with the soil becoming less moist; a decrease in the yield of most crops; destruction of fish ponds due to frequent floods; and an increasing work burden for women during and after floods. Though there is distrust and often negative impressions of government support during disasters, non-governmental organizations have built upon social networks to strengthen social capital and cohesion, two key factors underlying adaptive capacity. Questions from participants focused on how the researchers were integrating biophysical data in their analysis. The presenter described that respondents may perceive the effects of climate change differently based on their spatial location, therefore in this study the household respondents were divided into four groups in accordance with where they live; the group of households closest to the floodplain was considered the most vulnerable. Participants were also interested in understanding the challenges with data collection that occurs when working at a community level in Pakistan. Researchers emphasized that building trust with respondents is of the utmost importance for community-level research, because people fear giving answers in public, especially to strangers.

The presentation from Jagori highlighted differential access to water and sanitation services for women and marginalized groups in two re-settlement colonies at the periphery of New Delhi, India. Not only is there a high opportunity cost in terms of time spent by women collecting water, they also suffer from exclusion, discrimination, and often violence when trying to access community sanitation services. Researchers indicated that the declining expenditure on water and sanitation services by the municipal government has forced poor communities and women to depend on inadequate and expensive private services such as water tankers. For example, the water and sanitation budget of the New Delhi government in 2009 was Rs.930 (USD \$14.96) per person, which was reduced to Rs.880 (USD \$14.15) in 2011-12. The Jagori research team has been able to demonstrate that safer, gender sensitive infrastructure is possible when local communities are engaged in monitoring and participate in decision-making processes on resource allocation and/or siting of water stand posts and public toilets.

The Learning Institute (TLI) in Cambodia is supporting eight research projects on climate change, food security, and natural resource management with cross-sectional analysis on vulnerability underlying each initiative. The presentation focused on one of the projects, namely the design and implementation of a methodology for understanding vulnerability of agricultural production in the Sangkae river watershed, part of the larger Tonle Sap Basin in Cambodia. The team has used a variety of physical, social, and institutional indicators to assess exposure, sensitivity, and resilience to floods at the commune (village) and household level. Preliminary findings suggest that there is no correlation between deforestation and water level fluctuation. At the inter-household level, socio-economic differentiation in terms of access to resources, labour, and capability endowments (e.g. education, skills, and health) are deemed to be critical factors in characterizing vulnerability. The presenter emphasized in the discussion that interventions should be targeted and based on the socio-economic drivers that create inequality.

The presentation by Ateneo de Manila University highlighted the challenges that Manila faces as a result of climate change and increasing frequency of extreme events. Impacts include increased rainfall associated with tropical cyclones as well as an overall increase in the number of days with heavy rainfall, ground subsidence, land use densification, and a rise in the mean sea level. Unplanned urban expansion, particularly in flood plains, is leading to growing social and economic inequality – a major problem when discerning which populations are affected by floods and how they are managed. Sixty per cent of

Manila's informal poor (3.5 million people) lack access to basic services or security of tenure. Research is assessing the interconnectedness of bio-physical and socio-economic factors underlying a systemic approach to understanding vulnerability and governance responses.

Using a political ecology approach, the Asian Institute of Technology (AIT) is leading a regional research project assessing peri-urban vulnerability in three low lying sites in Thailand, Vietnam, and the Philippines characterized by poor infrastructure, weak institutions, and increasing competition for land and water resources. The project seeks to understand gender differentiated drivers of vulnerability and adaptive responses, as well as build technical capacities of urban development professionals to better understand these dynamics. Preliminary findings from all research sites suggest an increase in annual precipitation (Pathumthani, Thailand), an increase in surface temperatures and longer dry spells (Van Mon Commune, Bach Ninh Province, Vietnam), and higher incidence of flooding (Sta Rosa, Laguna, Philippines). This work engages city planners to add their perspective as to how technical, climate centric planning can incorporate social protection measures that build resilience. Following the presentation, participants were keen to understand how the government and citizens typically respond during and after an extreme weather event. It was noted that most action is taken after a crisis has occurred. In general, community-based organizations become more involved in advocacy, even though members of government often protect their own villages first.



Flooding in the City of Santa Rosa, The Philippines. From the project "Gendered Adaptation to Climate-Induced Water Stress in Peri-Urban Southeast Asia".

In the ensuing discussion, participants raised a number of questions for a future research agenda:

- What are the mutually reinforcing dynamics between climate change effects and development issues?
- How can sensitivity and adaptive capacity in peri-urban areas be described and can there be more forward thinking in this regard?
- How can improvements be made for techniques that isolate and prioritize vulnerability and interventions at the community and household levels, as well as within a given household?
- At the household level, do people have a common understanding of climate change and adaptation?
- What are some examples of vulnerability research influencing policy change?
- How does flood risk policy facilitate military assistance to flooded communities?
- What are the implications of being deemed vulnerable?

Summary

Researchers use a variety of “richly textured and multi-layered” methods to assess vulnerability to the impacts of climate change on water resources at different scales, levels, and units of analysis (see Figure 1). Underpinning all climate change adaptation research is understanding who is vulnerable to what kinds of impacts and where. While there is no one size fits all approach to vulnerability assessment, most of the projects are looking at the intersection of bio-physical stressors with everyday vulnerability defined by social exclusion, poverty, and gender. Methods employed range from focused group discussions, structured household interviews, participatory mapping, and shared learning dialogues to developing quantitative vulnerability indicators. However, while indicator based approaches (i.e. vulnerability indexes) are useful to categorize vulnerability – particularly at scales that are important for policymakers – they do not necessarily help in understanding vulnerability unless they are combined with qualitative analysis. A further challenge that is present in this work is the limitations of case analysis in deriving broader conclusions. Vulnerability analysis can nevertheless be powerful in generating a narrative and corroborating observations from bio-physical scientists.

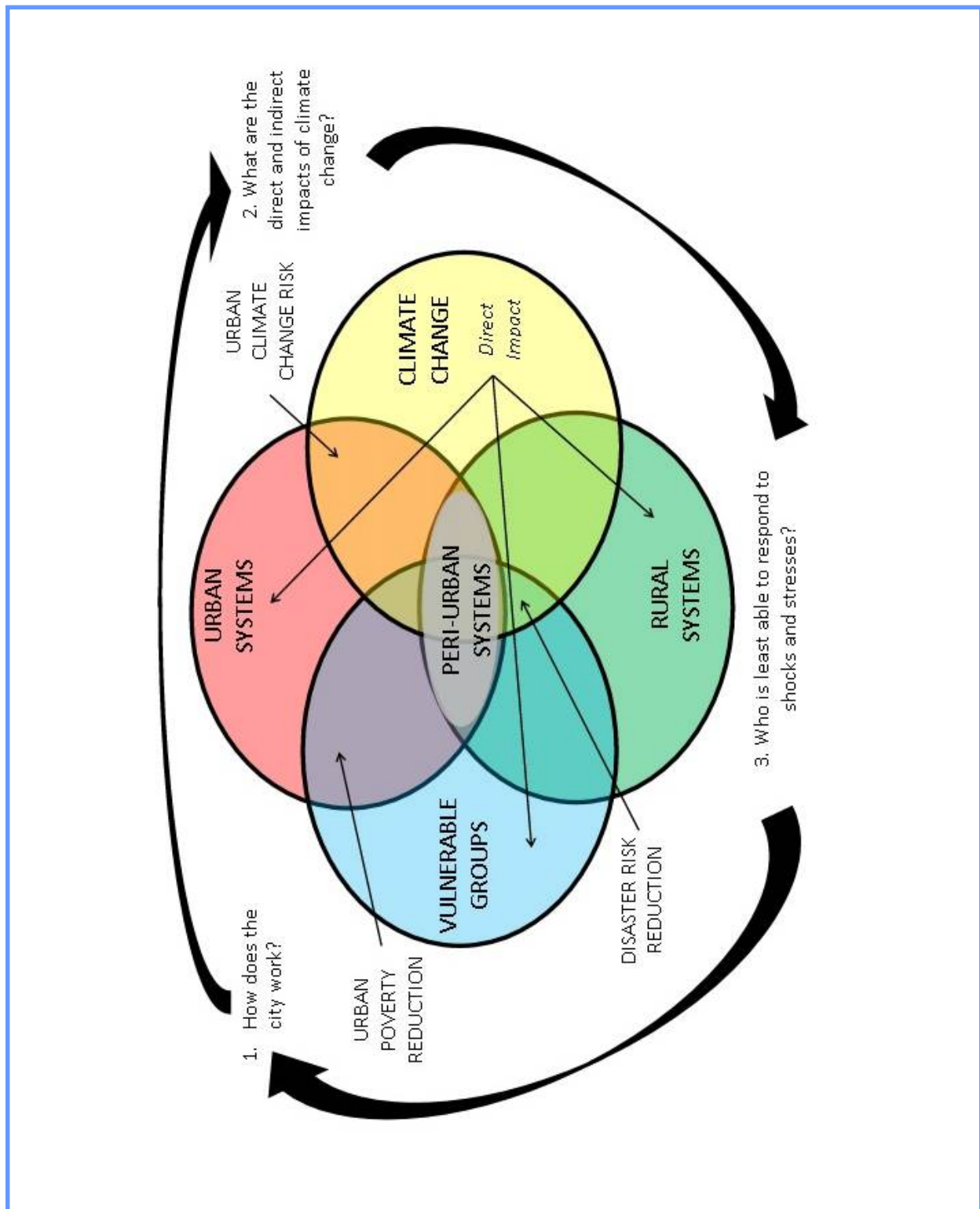


Figure 1: Climate impacts: A compound effect combining direct impacts, indirect impacts and pre-existing vulnerabilities (Source: Porio, 2013 modified from Jo da Silva, Sam Kernaghan & Andrés Luque, 2012).

Panel 4: Re-Thinking Climate Change Policy

Moderator: Sara Ahmed (IDRC)

Discussant: Bhaskar Karky (ICIMOD)

Presentations

1. **Climate Change and Water Governance in Cambodia**
Project title: Improving Water Governance and Climate Change Adaptation in Cambodia (107088)
Project partner: Cambodia Development Resource Institute (CDRI)
2. **Climate Change Policy Making: Case Study of Nepal's LAPA**
Project title: Understanding the Cross-Scale Implications of Forest and Water Management for Adaptation-Mitigation and food Security in the Nepal Himalaya (106034)
Project partner: Institute of Social and Environmental Transition - Nepal (ISET-Nepal)
3. **The Causes of 2011 Flood and Management Institutions in Thailand**
Project title: Improving Flood Management Planning in Thailand (107094)
Project partner: Thailand Development Research Institute (TDRI)
4. **Communicating Climate Change Risks for Adaptation in Coastal and Delta Communities in Vietnam: The case of Policy Makers in Quy Nhom City**
Project title: Communicating Climate Change Risks for Adaptation in Coastal and Delta Communities in Vietnam (106707)
Project partner: National Institute for Science and Technology Policy and Strategy Studies (NISTPASS)

In this last panel, four groups presented progress on climate change policy research, highlighting common ground across their respective study sites in Cambodia, Nepal, Thailand, and Vietnam.

The Cambodia Development Resource Institute (CDRI) has found that central and local governments in Cambodia have had limited success in adequately implementing national climate and water laws. The country has a strategic climate change plan as well as a legal framework for implementation; nevertheless, implementation is poor. Actions are often uncoordinated between the multiple parties that are charged with policy actions on the ground. Another key issue is that local communities do not know much about climate change policy so they are not prepared to assist with implementation, and the government has also done little to educate local villagers about climate issues. With leadership from CDRI, a stakeholder partnership between seven groups has been formed – which includes participation from three government ministries, two national universities and other research institutes – to assess vulnerability in the Tonle Sap Lake and to facilitate policy convergence between different levels of government engaged in climate adaptation planning.

In the wake of the Chao Prya flooding in 2011, researchers from the Thailand Development Research Institute (TDRI) are assessing issues of water governance under climate change and extreme events. The floods highlighted key problems, including lack of control around land-use (especially concerning



A household located at the bank of the Chao Phraya River in Thailand copes with severe flooding. From the project "Improving Flood Management Planning in Thailand."

development in floodplains) and poorly-planned physical infrastructure. The research team is using analysis of existing land-use regulations, socioeconomic costs, and the role of stakeholder participation to examine reforms that are now in the government pipeline. Evidence so far shows that flooding is made worse by institutional fragmentation and top-down planning. River basin councils have been set up, but they lack authority, and there are not enough meetings within government bureaus or between government and local people to discuss the issues. Overall, the Thailand (national-level) and Bangkok (city-level) governments have low capacity to deal with extreme water events such as floods, considering that they are often too focused on physical infrastructure and do not sufficiently address land-use decisions and related socio-economic issues.

Research from Vietnam on climate change policy conducted by the National Institute for Science and Technology Policy and Strategy Studies (NISTPASS) also shows that flooding risks are exacerbated due to poor links between government policy and implementation. Researchers are using the innovative tool of Shared Learning Dialogues to explore solutions to these problems. There are opportunities to use learning dialogues with different groups, including government officials, local communities, media, academics, and city planners. Preliminary results show that building on what local people already understand about floods is important when communicating about climate change and extreme events, and will help to reduce knowledge gaps between authorities and villagers.

Research on the process of climate change policymaking was the focus of a case study for Nepal's Local Adaption Plan for Action (LAPA), presented by the Institute for Social and Environmental Transition (ISET) in Nepal. Building on Nepal's historical experience in decentralized natural resource management, researchers and donors engaged in the National Adaptation Plan for Action (NAPA) process realized that a more decentralized approach is needed. Preliminary results show that this approach has addressed



Shared learning dialogue with members of households in Can Tho City, Vietnam. From the project “Communicating Climate Change Risks for Adaptation in Coastal and Delta Communities in Vietnam.”

local climate impacts, vulnerabilities, and adaptation priorities. There are now 70 LAPAs in 14 districts, but implementation is just beginning. The innovative Integrative and Implementation Sciences (IIS) framework is being used to analyze the LAPA process, which is helping practitioners to see that differences in values (e.g. environmental, social, and political) between participants in the development of LAPAs can be negotiated, despite often being difficult to assess. However, consensus building (i.e. through a Shared Learning Dialogue) needs proper facilitation. There are also some methodological challenges around setting boundaries for research on LAPAs and how to obtain funding to conduct research on policy processes in Nepal. Yet there are many research opportunities to test pilot projects at the village level, to use Shared Learning Dialogues with groups at multiple levels of governance, and to spread the use of the IIS framework to analyze policy in South Asia. In Nepal, the link between the NAPA and LAPAs remains obscure in terms of who has power to do what during implementation.

Summary

Common themes across all of the research sites include poor government planning, weak policy frameworks, problems with implementation, and a lack of interaction between civil society and government. Until these governance issues are improved, it is unlikely that funding support and programming on climate change adaptation will yield strong results. Researchers are using different frameworks to analyze climate policy in the region which limits comparative analysis and the transfer of good policy options. Most fundamental, the lack of adequate climate policy is evident due to inadequate government capacity, and poor education in affected communities that limits adaptation. These structural issues go beyond any single climate change research effort and until they are resolved, little implementation will exist on the ground.

Conclusions

In September 2013, the IPCC issued the report of Working Group 1, part of the ongoing Fifth Assessment Reports, titled “Climate Change 2013: The Physical Science Basis”. A shorter “Summary for Policymakers” maintained that evidence of the warming of the atmosphere and the ocean system is unequivocal, and that it is extremely likely that human influence has been the dominant cause. While climate modeling has improved and there is greater confidence in scientific evidence since the Fourth Assessment Report was released, translating research into action on the ground to reduce risk – particularly for vulnerable communities – requires significant effort. As the presentations and discussions at this workshop illustrated, mutual learning and collaborative partnerships are critical if climate adaptation policy and practice are to be improved. However, while researchers can often cross disciplinary boundaries, doing this is harder for government institutions and key decision-makers. Interdisciplinary approaches to applied research are crucial in order to enable a comprehensive response to such a far-reaching challenge. Local and national adaptation plans and planning processes, as well as iterative approaches such as shared learning dialogues, provide opportunities for constructive bottom-up engagement. These need to be supported by political will, adequate resources, and capacity building exercises.

The scale and frequency of extreme water-related events that Asia has witnessed in the last six months – from floods to typhoons, cyclones, and hurricanes – has made it apparent that we need to strengthen opportunities for learning and create mechanisms for knowledge management that can respond to risks and uncertainty. Learning from what has worked in terms of reducing vulnerability is as important as preparing scenarios for likely climate change at local levels or assessing the costs and benefits of different adaptation options. The question remains: how do we best do this? At the meeting, participants called for more interactive workshops on a variety of research methodologies and to help with improving communication skills. It was also suggested that ideas be shared using new web-based platforms.

CCW believes that communities of practice are critical and that these can be forged in several ways to combine the best of technical know-how with space for physical interaction and idea-sharing. We also understand that we are not alone in this endeavor, and that the sheer magnitude of climate change and increasing frequency of natural disasters means that we need to consult with other donors and build partnerships that can be sustained.

References

- Asian Institute of Technology-United Nations Environment Programme Regional Resource Centre for Asia and the Pacific - AIT-UNEP RRC.AP. (2011). *The Desktop Study on Assessment of Capacity Gaps and Needs of South East Asia Countries in Addressing Impacts, Vulnerability and Adaptation to Climate Variability and Climate Change*. Retrieved 05/09/2013 from http://www.climateadapt.asia/upload/publications/files/4e1aba053931aDesktop_Study_Vulnerability_&Adaptation.pdf
- Chambwera, M. & Stage, J. International Institute for Environment and Development - IIED. (2010). *Climate Change Adaptation in Developing Countries: Issues and Perspectives for Economic Analysis*. Retrieved 06/09/2013 from <http://pubs.iied.org/pdfs/15517IIED.pdf>
- Da Silva, J., Kernaghan, S., & Luque, A. (2012). A Systems Approach to Meeting the Challenges of Urban Climate Change. *International Journal of Urban Sustainable Development*, 4 (2), 125-145.
- Intergovernmental Panel on Climate Change - IPCC. (2007). *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007*. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC (2013) Climate Change 2013: The Physical Science Basis, available at: <http://www.ipcc.ch/report/ar5/wg1/#.UnDdnXBmiSo>
- Institute for Social and Environmental Transition - ISET. (2008). *Enabling Adaptation to Climate Change for Poor Populations in Asia through Research, Capacity Building and Innovation*, Report from the Adaptation Study Team to the International Development Research Centre, Coordinated by ISET, Published by ISET-Nepal at Format Graphics, Kathmandu, July 2008, pp. 126.
- New, M., Agarwal, P., Dixit, A., Gosain, AK, Huq, S., Mujumdar, P., Srivastava, S. and J. Srinivasan (2011) Climate Research Coordination in South Asia: Issues, Opportunities and Recommendations – Expert framing paper prepared for DFID.
- Porio, E. “Understanding Vulnerability: Increasing Adaptive Capacity and Resilience Among the most Vulnerable to Climate Change Effects and Disasters” International Development Research Centre’s Regional Meeting – Adapting to Climate Change and Water Security in Asia. Soaltree Plaza Hotel, Kathmandu, Nepal. 20 June, 2013. Plenary Panel Presentation – Understanding Vulnerability Session.
- Shaw, R. (2012) Information and communications technologies (ICTs), climate change and water: Issues and research priorities in Asia, in Adera, E. and Finlay, A. (eds) *Application of ICTs for climate change adaptation in the water sector – Developing country experiences and emerging research priorities*, International Development Research Centre (IDRC) and Association for Progressive Communications (APC), Montevideo.
- Watkiss, P., Downing, T., & Dyszynski, J. United Nations Environment Programme (UNEP). (2010). AdaptCost Project: Analysis of the Economic Costs of Climate Change Adaptation in Africa. Retrieved 05/09/2013 from <http://www.unep.org/pdf/SEI.pdf>

Annex 1: Participants

The full participant list for the meeting is available [here](#). Representatives from the following IDRC-funded projects participated in the conference:

1. Improving Water Governance and Climate Change Adaptation in Cambodia
[Cambodia Development Resource Institute \(CDRI\)](#)
2. Inland Aquaculture and Adaptation to Climate Change in Northern Thailand
[Chiang Mai University](#)
3. Adapting to Climate Change in Peri-urban Southeast Asia
[Asian Institute of Technology](#)
4. Communicating climate change risks for adaptation in coastal and delta communities in Vietnam
[National Institute for Science and technology Policy and Strategy Studies](#)
5. Strengthening livelihood security and adapting to climate uncertainty in Chilika Lagoon, India
[Wetlands International - South Asia Society \(REGD\)](#)
6. Improving water and energy management under climate variability in Punjab, India
[Punjab Agricultural University](#)
7. Improving Flood Management Planning in Thailand
[Thailand Development Research Institute \(TDRI\)](#)
8. Water Resources and Adaptation to Climate Change in Vulnerable North China Plain and Poyang Lake Region in China
[Center for Chinese Agricultural Policy, Chinese Academy of Sciences](#)
9. Building Capacity to Adapt to Climate Change in Southeast Asia
[Hue University - College of Economics](#)
10. Adapting to Climate Change in Urbanizing Watersheds
[Ashoka Trust for Research in Ecology and the Environment \(ATREE\)](#)
11. Building Effective Water Governance in the Asian Highlands
[Kunming Institute of Botany, Chinese Academy of Sciences](#)
12. Climate Change Adaptation, Water and Food Security in Pakistan
[Lahore University of Management Sciences](#) and [Social Policy and Development Centre Pakistan](#)
13. Water Security in Periurban South Asia : Adapting to Climate Change and Urbanization
[South Asia Consortium for Interdisciplinary Water Resources Studies \(SACIWATERS\)](#)

14. Coastal Cities a Risk (CCaR): Building Adaptive Capacity for Managing Climate Change in Coastal Megacities
[Ateneo de Manila University](#)
15. Gender, Security, and Sanitation – Action Research on Women’s Rights and Access to Water and Sanitation
[Jagori](#)
16. Learning for an Uncertain Future Vulnerabilities of Agricultural Production to Flood in the Sangkae River Basin, Northwest Cambodia
[The Learning Institute](#)
17. Forest and Water Management for Mitigating the effects of Climate Change in the Middle Hills, Nepal
[Institute for Social and Environmental Transition - Nepal](#)

Annex 2: Meeting Agenda

Session Times	Day 1	Day 2
8:30-10:30	<p>Introduction to Asia Regional Meeting (Sara Ahmed)</p> <p>Panel 1: Economics of Climate Adaptation <u>Moderator:</u> Bhim Adhikari (IDRC) <u>Discussant:</u> Bui Dung The (SEARCA)</p> <p><u>Presentations from:</u> PIDE, Pakistan LUMS, Pakistan CCAP, China EEPSEA Chiang Mai, Thailand</p>	<p>Panel 3: Understanding Vulnerability <u>Moderator:</u> Carrie Mitchell (IDRC) <u>Discussant:</u> Emma Porio (Ateneo de Manila University)</p> <p><u>Presentations from:</u> SPDC, Pakistan Jagori, India AIT, Thailand Ateneo de Manila University, Philippines The Learning Institute, Cambodia</p>
10:30-11:00	Tea-break	Tea-break
11:00-13:00	<p>Panel 2: Climate and Hydrological Modeling <u>Moderator:</u> Charlotte McAllister (IDRC) <u>Discussant:</u> Philippus Wester (ICIMOD)</p> <p><u>Presentations from:</u> KIB / HELVETAS, China /Nepal Wetlands International, India PAU/CIPT, India ATREE, India IRIACC project</p>	<p>Panel 4: Re-thinking climate change policy <u>Moderator:</u> Sara Ahmed (IDRC) <u>Discussant:</u> Bhaskar Karky (ICIMOD)</p> <p><u>Presentations from:</u> CDRI, Cambodia TDRI, Thailand ISET, Nepal NISTPASS, Vietnam</p>
13:00-14:30	LUNCH	LUNCH
14:30-16:00	<p>Roundtable on Methods 1) Using economic methods for assessing adaptation options 2) Understanding the implications of climate change on water security</p>	<p>Roundtable on Methods 1) Assessing vulnerability: Tools 2) Why institutions matter tools of climate change on water</p>
16:00-16:30	Tea-break	Tea-break

16:30-17:00	Communicating Research <u>Moderator</u> : Mark Redwood (IDRC) <u>Short presentations from</u> : Charlotte McAllister (IDRC) Prof MS Khan (BUET) Bach Tan Sinh (NISTPASS)	Next steps: Pathways for Collaboration <u>Moderators</u> : Sara Ahmed (IDRC), Anjal Prakash (SaciWATERS)
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