CLIMATE IN ASIA AND THE PACIFIC:

A Synthesis of APN Activities

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Asia-Pacific Network for
Global Change Research

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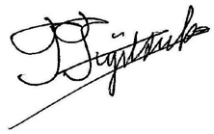
Message from the Director

Work for the present Synthesis – Climate in Asia and the Pacific: A Synthesis of APN Activities began in November 2009 with a scoping workshop followed by an authors' workshop in August 2010. The work entailed summarizing over fifty scientific research and capacity building projects funded by the APN that had a climate-related element – whether natural climate variability and/or climate change. The contributing authors of the present synthesis report are leaders in their field and many of them are authors for the next Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCCAR5). The present report will be a useful tool not only for the IPCC, but also for scientists, decision-makers and educators as it identifies both research gaps and future research activities for the Asia-Pacific region in the context of natural climate variability and climate change.



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Executive Summary

The adverse effects of climate change and natural climate variability pose a significant threat to humanity, with the poorest communities being the most vulnerable. Scientific understanding of our climate is advancing at a significant rate, with new information emerging about the likely impacts of climate change, the options to adapt to these changes, and new approaches to mitigation.

Through national and international fora, it is becoming clear that climate is one of the most pressing issues in the political arena today. This has been evident in government and stakeholder meetings such as the 34th G8 Summit (Japan, 2008) and the most recent United Nations Framework Convention on Climate Change (UNFCCC) 16th Conference of the Parties (COP) Meeting (Cancun, Mexico, 2010) and the Copenhagen Accord, where commitments to climate change have been underscored, particularly the need to support developing countries for financing and transferring knowledge and skills to respond effectively to climate change.

IPCC is the Intergovernmental Panel for Climate Change and its Fourth Assessment Report (AR4) states that "warming of the climate system is unequivocal" and that climate change will interact at all scales with other aspects of the global environment and aggravate existing concerns about the provision of natural resources including water, soil and air pollution, health hazards, disaster risk, and deforestation. Their combined impacts may be compounded in the future in the absence of integrated mitigation and adaptation measures [IPCCAR4 (SPM), 2007].

With this background, it comes as no surprise that the majority of projects funded by the APN since its inception have had a climate component.

The present synthesis report is part of the APN's larger aim to contribute, from the science perspective, to the development of policy options for appropriate responses to climate vulnerability and impacts, including adaptation and mitigation, which in turn will contribute to sustainable development. The timing of this publication also leads into three major activities of the "Planet Under Pressure: New Knowledge Towards Solutions Conference" and the "Rio+20 United Nations Conference on Sustainable Development," both taking place in the first half of 2012, and the work of the current IPCC fifth assessment with the report scheduled for release in 2014.

The present synthesis report indicates that, while there is much activity at the global level, there is a great need to intensify investigative research of climate change and climate variability and trends at the regional level, as these are still poorly understood. Consistent socio-economic data collection is

needed, as is the need for an interdisciplinary approach to solving complex climate change problems. The increasing frequency and severity of floods, droughts and extreme temperatures requires the use of appropriate indices to improve monitoring and prediction of extreme events.

The effects of climate on water resources have been studied in APN projects but many issues remain unclear. There is a need for models to better predict the effects of seasonal to inter-annual climate on water availability and quality. Coastal communities continue to be highly vulnerable to sea level rise and research is needed in identifying appropriate adaptation measures, strategies, and policies. Small islands are especially vulnerable and research is required into relocation options or alternatively, where relocation is not an option, into engineering solutions. APN has supported international workshops to reduce vulnerability and devise coping strategies for agriculture to climate variability and change. These have built the knowledge-base for developing predictive capacity to manage climate variability and climate change-related vulnerability, strengthen overall climate responses and build resilience to socio-economic and environmental shocks, which is one of the region's urgent development needs.

APN projects have contributed substantially to the building of regional capacity to include climate change in national sustainable development strategies and action plans. APN workshops on trends in climate extremes have provided a framework for international trend analysis in developing countries around the world. However, what is abundantly clear is that open access to climate data, including relevant socioeconomic data, will be essential for countries in the Asia-Pacific region to carry out risk assessments of their vulnerability to trends in climate within a regional framework. It is, therefore, in the interest of all countries of the APN to promote the open exchange of climate-related data.

The need for climate change adaptation is increasingly recognized by communities, with an initial focus on assessing vulnerabilities and identifying adaptation options. The complexity of adaptation due to the multidisciplinary nature of the required solutions and the lack of long-term data poses a great challenge. Approaches at the grassroots levels (including the identification of local champions) that involve communities and local governments to incorporate climate change adaptation practices into development planning will be needed, and Integrated Assessment Models (IAMs) will need to be customized for local to regional and sectoral levels.

Modelling the effects of climate on agriculture and fishery production needs to be refined. Critical to climate adaptation research, practice and policy are downscaled climate data. Developing Regional Climate Models (RCMs) in Asia has helped provide more detailed information on monsoon circulation; and high-resolution regional/local information from RCMs can be used in impact, vulnerability and adaptation studies. There is a need for further work on RCMs and statistical downscaling methods to help localize Global Climate Model (GCM) results and to quantify the uncertainties associated with these results. Especially problematic in the Asia-Pacific region are Small Islands States and areas with rough and steep terrain like the Himalayas.

The investments by APN in projects aimed at improving the Asia-Pacific region's understanding of climate in the region, at assessing the risks to society and nature from climate variability and change, and at raising awareness of these issues to decision-makers and the public are well justified in terms of need and benefits. Formal assessments and literature citations have demonstrated that these activities have been effective and of high quality.

Given the high quality of APN projects and the potential of many to yield longer-term benefits through the provision of marginal resources, there should be an investigation of innovative means to *sustain* such projects beyond the term of initial APN support.

Strategic planning of APN would benefit by ensuring that it maintains close contact with relevant international developments on indicators of the impact of research and capacity building. The APN should continue to recognize the benefits of applying appropriate models to assist in the integration of information in complex systems. The APN recognizes that effective application of climate knowledge to practical problems of societies across the Asia-Pacific region requires effective dialogue across the traditional boundaries of science, technology and policy.

The APN has a role to play in promoting research in the region that defines the strategies that lead to true sustainable development. The Asia-Pacific region has a rich variety of cultures, and the APN has been effective in promoting connections and alliances across all these cultures. This effectiveness comes from the recognition of cultural differences and not imposing a monolithic approach. These sensitivities to culture will be especially important as the APN continues to promote exchanges of knowledge on climate-related issues across disciplines and sectors.

Clearly, the most important aspect of interactions across a region is the human factor. The APN has been effective in promoting innumerable networks of participants in its projects related to climate. One potential element in the future development of sustained networks is through the engagement of early-career researchers who can carry their scientific and social networks into the future.

Finally, while substantial progress has been made by APN-supported projects on climate science, capacity building and policy outreach, much remains to be done in the Asia-Pacific region. Among the key trends impacting the region are rising population, increasing urbanization, rapid economic development, rising energy demand, massive land use and cover change, increases in temperature, heatwaves, floods and droughts, and globalization. APN may wish to invest in some of these areas in its future strategies and research agendas.

Michael Manton and Linda Stevenson

1 Background of APN

1.1. Introduction

Established in 1996, the Asia-Pacific Network for Global Change Research (APN) is a network of twenty-two member governments in Asia and the Pacific whose vision is to enable countries in the region to successfully address Global Change (GC) challenges through science-based response strategies and measures, effective science and policy linkages, and scientific capacity development.

Societies' ability to respond to GC depends on the resilience of human and environmental systems in the face of these changes. Improving understanding of the interactions and feedback of physical climate systems with human and environmental systems, improving predictions of longer-term causes and trends, and preparing nations for future events are grand challenges. The APN, now in its third strategic phase (2010-2015), continues its mission to enable countries in the region to address these challenges.

Financially sponsored by the Governments of Japan (Ministry of Environment [MOEJ] and Hyogo Prefectural Government), New Zealand (Ministry for the Environment), Republic of Korea (Ministry of Environment [MEV]) and the United States (National Science Foundation [NSF]; United States Global Change Research Program [USGCRP]), the twenty-two full member countries of the APN are:

- Australia
- Bangladesh
- Bhutan
- Cambodia
- China
- Fiji
- India
- Indonesia
- Japan
- Lao PDR
- Malaysia
- Mongolia
- Nepal
- New Zealand
- Pakistan
- Philippines
- Republic of Korea
- Russian Federation
- Sri Lanka
- Thailand
- USA
- Viet Nam

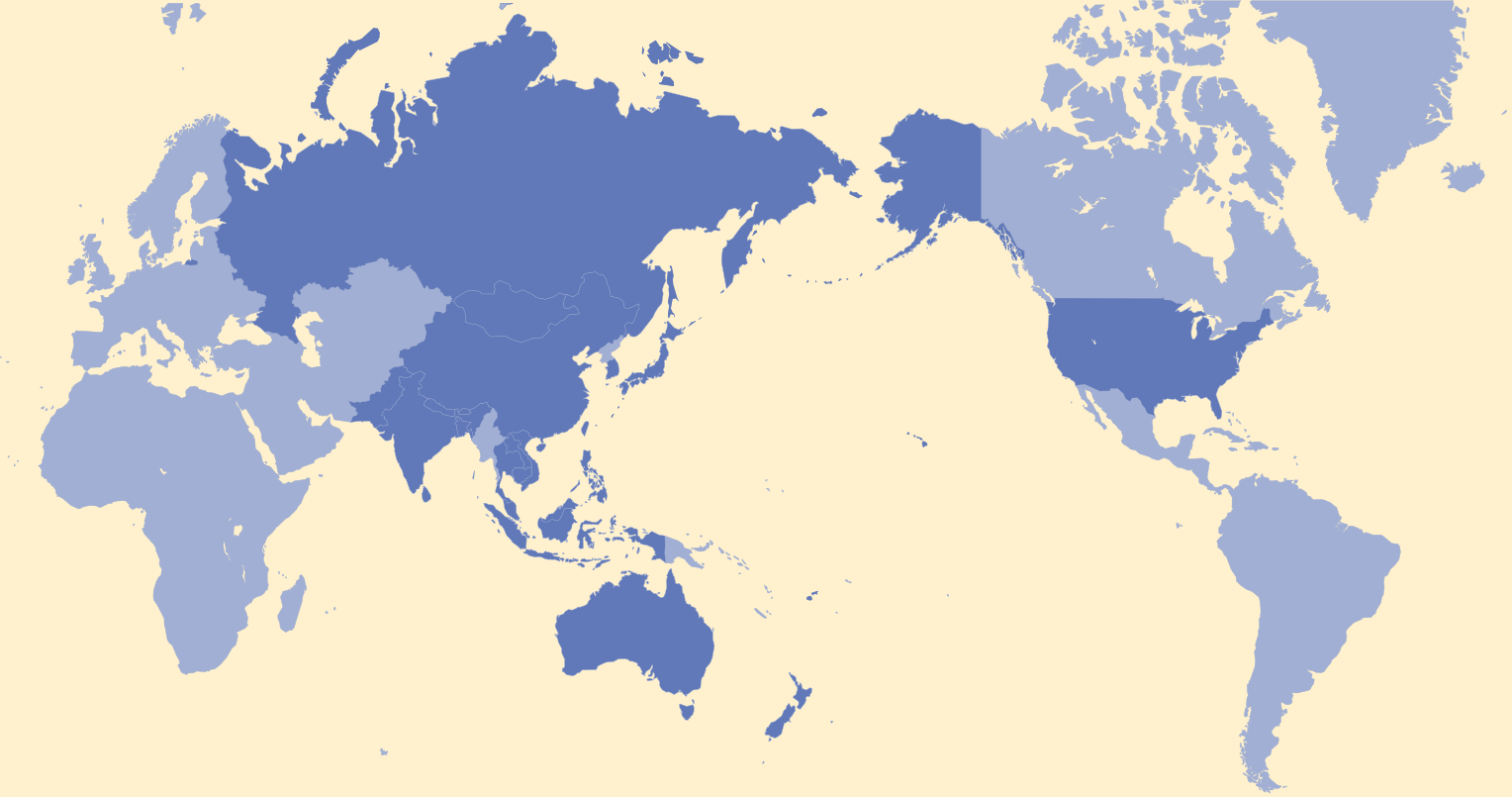

Figure 1: Geographic distribution of APN member and approved countries

The geographical distribution of current members of the APN is shown in ***Figure 1***. While the Pacific Island Countries (PICs) and Singapore are not member countries, they have "approved country" status allowing them to be actively involved in APN funding mechanisms and APN projects and activities.

The Secretariat of the APN is hosted in Japan by the Hyogo Prefecture Government and located in Kobe City.

1.2. APN Objectives

APN defines GC as the set of natural and human-induced processes in the Earth's physical, biological and social systems that, when aggregated, are significant at a global scale. In order to foster GC research in the region, APN implements three core strategies of: (i) Promoting and encouraging policy-relevant regional GC research; (ii) Promoting and encouraging activities that will develop scientific capacity and improve the level of awareness on GC issues specific to the region; and (iii) Identifying and helping address, in consultation with policy-makers and other end-users, present and future needs and emerging challenges. To this end, APN has four main goals:

Goal 1. *Supporting regional cooperation in GC research on issues particularly relevant to the region*

Goal 2. *Strengthening appropriate interactions among scientists and policy-makers, and providing scientific input to policy decision-making and scientific knowledge to the public*

Goal 3. *Improving the scientific and technical capabilities of nations in the region, including the transfer of know-how and technology*

Goal 4. *Cooperating with other GC networks and organizations*

1.3. APN Activities

The APN goals are achieved through a number of activities selected from the APN's two main programmes, which involve two annual open Calls for Proposals in which scientists based in APN member or approved countries can submit proposals for support. The two main programmes are the *Annual Regional Call for Research Proposals (ARCP)* and the *Scientific Capacity Development Programme (CAPaBLE)*. Particularly encouraged to submit APN proposals are researchers working in collaboration with the APN's four international core GC partners of the International Programme on Biodiversity (DIVERSITAS), International Geosphere-Biosphere Programme (IGBP), International Human Dimensions Programme on Global Environmental Change (IHDP), World Climate research Programme (WCRP) and their related core and joint projects, including the global change SysTem for Analysis, Research and Training (START) and the Earth System Science Partnership (ESSP). The APN has also established a strong partnership with the Group on Earth Observations (GEO) following the launch of its 10-year implementation plan in 2005.

Research and capacity building activities under the ARCP, CAPaBLE and other related initiatives of the APN focus on four scientific themes identified in the APN's Science Agenda. These are: (i) Climate Change and Climate Variability; (ii) Ecosystems, Biodiversity and Land Use; (iii) Changes in Atmospheric and Terrestrial Domains; and (iv) Resources Utilization and Pathways for Sustainable Development. Under these scientific themes, the APN supports activities that are interdisciplinary in nature and cut across natural, social, economic and political sciences.

Examples of the kinds of activities APN undertakes are:

- Promoting and strengthening GC research, including identifying gaps via syntheses and assessment work
- Identifying and developing existing methodologies and developing new methodologies and tools for effective transfer of scientific knowledge
- Strengthening the interface of policy- and decision-making processes and society in general for mainstreaming environmental concern
- Encouraging initiatives from developing countries for place-based, integrative research
- Aligning with programmes of the GC community

As APN is an inter-governmental network, a high priority goal is to produce sound scientific results that can be made available as a supportive tool for policy-making processes. Accordingly, the APN conducts regular synthesis and assessment activities of the projects it supports in order to identify important outcomes, research gaps and/or emerging issues that could be used to support policy development.

1.4. APN Climate Synthesis

It is with the above background that the present Climate Synthesis activity was undertaken. Of particular relevance is the IPCC Fifth Assessment Report (IPCCAR5) and the APN aims to ensure that the present report is not only relevant to the IPCC, but also published in time to be a useful resource for the fifth assessment.

The synthesis encompasses all of the APN-supported projects in which climate change and climate variability are featured as a major theme. This allowed the authors to identify knowledge gaps and help prioritize research goals and programmes relating to climate in the Asia-Pacific region as well as provide knowledge on climate issues for the policy- and decision-making communities at local, national, sub-regional and regional levels. In essence, the Climate Synthesis activity endorsed by the APN's 14th Inter-Governmental Meeting (IGM) in March 2009 had the following objectives and intended outputs:

Objectives

- » Address the relevance, achievements and present status of APN climate activities by synthesizing APN climate-related projects conducted under the ARCP and CAPaBLE programmes.
- » Highlight significant problems of climate change, including impacts and vulnerabilities, and identify urgent research needs and, in so doing, allow the APN to identify gaps between research needs and APN activities.
- » Identify a future research direction for climate change & climate variability that is relevant to the region.
- » Report the results to the IGM and Scientific Planning Group (SPG) Meeting to review and determine future APN policies and initiatives in the climate arena.
- » Disseminate the results to the global scientific community (via international journals, websites, relevant fora, etc.); the policy and decision-making community (via policy-briefs; a synthesis summary report and information exchange at relevant fora); and to the public (via social media and general publications).
- » Discuss the activity at relevant policy-related fora, and ensure relevance for policy processes including the IPCC (particularly AR5), UNFCCC/COP16 (and beyond) and UNFCCC SBSTA34 (and beyond).

Products

- » APN Synthesis Report: Climate in Asia and the Pacific: A Synthesis of APN Activities (Publication: Mid-2011)
- » Peer Reviewed Journal Paper (Publication: End-2011)
- » A Special Journal Edition and/or an Academic Book (Publication: Mid-2012)

The present Synthesis Report is the third APN synthesis activity. The two previous syntheses are on "Land-Use Cover Change: An Initial Synthesis (2003)" and "Global Change and Coastal Zone Management: A Synthesis Report (2004)". The latter synthesis resulted in a number of citations in the IPCC Fourth Assessment Report (AR4) as well as the publication of APN's first book on "Integrated Coastal Zone Management," published by Springer in 2006.

It is important to point out that the present synthesis provides a focus for climate-related research results, scientific capacity development and future directions identified from APN-supported projects. These are placed in the context of the extensive climate research that has already been conducted, or is currently being undertaken, in the Asia-Pacific region.