Scoping Assessment for National Implementation in Thailand

Summary

October 2010

ADAPTATION KNOWLEDGE PLATFORM

REGIONAL CLIMATE CHANGE ADAPTATIONKNOWLEDGEPLATFORM for Asia

Acknowledgements

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This scoping study of climate change in Thailand draws on work in progress related to the Adaptation Knowledge Platform to disseminate and exchange adaptation knowledge with a wider audience. We thank the countless institutions, organizations, and individuals that have provided key inputs and their insights. The report greatly benefited from comments and suggestions to report the state of climate change adaptation in Thailand.

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ABBREVIATIONS & ACRONYMS

ADB	ASIAN DEVELOPMENT BANK
AIT	ASIAN INSTITUTE OF TECHNOLOGY
AIT-UNEP RRC.AP	ASIAN INSTITUTE OF TECHNOLOGY/UNITED NATIONS ENVIRONMENT PROGRAMME REGIONAL RESOURCE CENTRE FOR ASIA AND THE PACIFIC
AP	ADVISORY PANEL
ASEAN	ASSOCIATION OF SOUTHEAST ASIAN NATIONS
BCAS	BANGLADESH CENTRE FOR ADVANCED STUDIES
BCCSAP	BANGLADESH CLIMATE CHANGE STRATEGY AND ACTION PLAN
BMA	BANGKOK METROPOLITAN ADMINISTRATION
CCA	CLIMATE CHANGE ADAPTATION
CCAI	CLIMATE CHANGE ADAPTATION INITIATIVE
CEGIS	CENTRE FOR ENVIRONMENTAL AND GEOGRAPHICAL INFORMATION SYSTEMS
COP	UNITED NATIONS CLIMATE CHANGE CONFERENCE IN COPENHAGEN
CSR	CORPORATE SOCIAL RESPONSIBILITY
DDPM	DEPARTMENT OF DISASTER PREVENTION AND MITIGATION
DRR	DISASTER RISK REDUCTION
DWR	DEPARTMENT OF WATER RESOURCES
GCCA	GLOBAL CLIMATE CHANGE ALLIANCE
GEF	GLOBAL ENVIRONMENT FACILITY
GOV	GOVERNMENT
GTZ	GERMAN AGENCY FOR TECHNICAL COOPERATION
EKH	ENVIRONMENTAL KNOWLEDGE HUB
EU	EUROPEAN UNION
HMS	HYDRO-METEOROLOGICAL SERVICE
ICCCAD	INTERNATIONAL CENTRE FOR CLIMATE CHANGE AND DEVELOPMENT
ICT	INFORMATION AND COMMUNICATION TECHNOLOGIES
IGES	INSTITUTE FOR GLOBAL ENVIRONMENTAL STRATEGIES
IIED	INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT
INGO	INTERNATIONAL NON-GOVERNMENTAL ORGANIZATION
ISET-N	INSTITUTE FOR SOCIAL AND ENVIRONMENTAL TRANSITIONS–NEPAL
IT	INFORMATION TECHNOLOGY
IUCN	INTERNATIONAL UNION FOR CONSERVATION OF NATURE
IWRM	INTEGRATED WATER RESOURCES MANAGEMENT
KP	KYOTO PROTOCOL
LDC	LEAST DEVELOPED COUNTRIES
MARD	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

MOEF	MINISTRY OF ENVIRONMENT AND FOREST
MMF	MANGROVES FOR THE FUTURE
MONRE	MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT
MOST	MINISTRY OF SCIENCE AND TECHNOLOGY
MPI	MINISTRY OF PLANNING AND INVESTMENT
MRC	MEKONG RIVER COMMISSION
NAPA	NATIONAL ADAPTATION PLAN OF ACTION
NCS	NATIONAL COMMUNICATIONS
NDWC	NATIONAL DISASTER WARNING CENTRE
NEA	NATIONAL ENVIRONMENT AGENCY
NGO	NON-GOVERNMENTAL ORGANIZATION
NISTPASS	NATIONAL INSTITUTE FOR SCIENCE AND TECHNOLOGY POLICY AND STRATEGY STUDIES
NOCCOP	NATIONAL OFFICE FOR CLIMATE CHANGE AND OZONE PROTECTION
NSEP	NATIONAL STRATEGY FOR ENVIRONMENTAL PROTECTION
NTP	NATIONAL TARGET PROGRAM
NWP	NAIROBI WORK PROGRAMME
ONEP	OFFICE OF NATURAL RESOURCES AND ENVIRONMENTAL POLICY AND PLANNING
OVI	OBJECTIVELY VERIFIABLE INDICATOR
PPCR	PILOT PROGRAMME FOR CLIMATE RESILIENCE
SAARC	SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION
SEA START	SOUTHEAST ASIA SYSTEM FOR ANALYSIS, RESEARCH AND TRAINING
SEI	STOCKHOLM ENVIRONMENT INSTITUTE
SENSA	SWEDISH ENVIRONMENTAL SECRETARIAT FOR ASIA
SIDA	SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
TEI	THAILAND ENVIRONMENT INSTITUTE
TOR	TERMS OF REFERENCE
UK	UNITED KINGDOM
UKCDS	UK COLLABORATIVE ON DEVELOPMENT SCIENCES
UN	UNITED NATIONS
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNEP ROAP	UNITED NATIONS ENVIRONMENT PROGRAMME REGIONAL OFFICE FOR THE ASIA AND PACIFIC
UNFCC	UN FRAMEWORK CONVENTION ON CLIMATE CHANGE
UNISDR	UNITED NATIONS INTERNATIONAL STRATEGY FOR DISASTER REDUCTION
USA	UNITED STATES OF AMERICA
WWF	WORLD WILDLIFE FUND

EXECUTIVE SUMMARY

The Regional Climate Change Adaptation Knowledge Platform for Asia (hereinafter, referred to as the Adaptation Knowledge Platform) has been developed to respond to demand for effective mechanisms for sharing information on climate change adaptation and developing adaptive capacities in Asian countries, many of whom are the most vulnerable to the effects of climate change. The Adaptation Knowledge Platform supports research and capacity building, policy making and information sharing to help countries in Asia adapt to the challenges of climate change. The Adaptation Knowledge Platform will facilitate climate change adaptation at local, national and regional levels to strengthen adaptive capacity of countries in the region – while working with existing and emerging networks and initiatives.

Through its work the Adaptation Knowledge Platform is working towards building bridges between current knowledge on adaptation to climate change and the governments, agencies and communities that need this knowledge to inform their responses to the challenges that climate change presents to them. This is reflected in the **Platform Goal**, which is to facilitate climate change adaptation in Asia at local, national and regional levels and strengthen adaptive capacity [see Annex 1 for Phase One - Logical Framework (2009-2011)].

The specific **Purpose** of the Adaptation Knowledge Platform is to establish a regionally and nationally owned mechanism that facilitates the integration of climate change adaptation into national and regional economic and development policies, processes and plans, strengthens linkages between adaptation and the sustainable development agenda in the region and enhances institutional and research capacity.

In order to achieve this purpose, the Adaptation Knowledge Platform will bring together policy-makers, adaptation researchers, practitioners, and business leaders and will work through a range of activities to achieve three components:

a. **Regional knowledge sharing system:** a regionally and nationally owned mechanism to promote dialogue and improve the exchange of knowledge, information and methods within and between countries on climate change adaptation and to link existing and emerging networks and initiatives.
b. **Generation of new knowledge:** to facilitate the generation of new climate change adaptation knowledge promoting understanding and providing guidance relevant to the development and implementation of national and regional climate change adaptation policy, plans and processes focused on climate change adaptation.
c. **Application of existing and new knowledge:** synthesis of existing and new climate change adaptation knowledge to facilitate its application in sustainable development practices at the local, national and regional levels.

In collaboration with a wide range of national and regional partners, the Adaptation Knowledge Platform will aim at establishing a regionally and nationally owned information exchange mechanism that facilitates the integration of climate change adaptation into national and regional economic and development policies, processes and plans, strengthening linkages with the development agenda and enhancing research and institutional capacity.

The need for such an initiative is clear: the form it should take, less so. The initial partners in the Adaptation Knowledge Platform (Stockholm Environment Institute (SEI), Asian Institute for Technology/United Nations Environment Programme Regional Resource Centre for Asia and the Pacific (AIT-UNEPRRC.AP) and UNEP Regional Office for Asia and the Pacific (UNEP ROAP), supported by the Swedish Environmental Secretariat for Asia (SENSA) consequently agreed that the initial stages of the Platform's development, during 2009, should be an inception phase during which the management and implementation modalities were established, contacts with and the ownership of stakeholders at both national and regional levels were developed, needs for knowledge generation and sharing and capacity building were assessed and plans for the implementation of the Adaptation Knowledge Platform in 2010-2011 were prepared.

Overall, the activities implemented in 2009 achieved these aims. Activities have been initiated in the five pilot countries, Bangladesh, Cambodia, Nepal, Thailand and Viet Nam, with local partner's mobilized and key knowledge and capacity gaps identified. The management arrangements for the long-term development of the Platform are in place and the structure of the regional knowledge sharing mechanism has been defined. Effective communications are initiated, leading to awareness of the Adaptation Knowledge Platform's development that culminated in its successful, high profile launch on October 3rd 2009 together with the Asia Pacific Climate Change Adaptation Network (hereinafter, referred to as the Adaptation Network). Capacity development activities include training for officials and researchers from across the region and substantial progress has been made in the inventorying of existing and generation of new knowledge products. Sharing of knowledge on climate change adaptation has been initiated, focusing on the impacts of climate change on high altitude ecosystems. Linkages and collaboration with other relevant initiatives has been initiated, with the agreement reached with the Asia Pacific Adaptation Network and the Southeast Asia Network of Climate Change Focal Points for delivery of country needs on climate change adaptation in South and South-East Asia.

The most significant outcome of the inception year is the strategy for the future development of the Adaptation Knowledge Platform, presented in this report. The strategy details the activities that will be undertaken for each of the three components identified in the programme framework, along with a number of specific communications activities. These three components, along with the main focus of planned activities, are:

Regional knowledge sharing system: a regionally and nationally owned mechanism to promote dialogue and improve the exchange of knowledge, information and methods within and between countries on climate change adaptation and to link existing and emerging networks and initiatives. This will include the development of a Platform website and communications products to reach stakeholders across the region, an annual Asian Climate Change Adaptation Forum, a number of training and capacity development activities, the synthesis and dissemination of information and global experiences on adaptation actions and the development of national-level knowledge sharing and capacity development activities.

Generation of new knowledge: to facilitate the generation of new climate change adaptation knowledge promoting understanding and providing guidance relevant to the development and implementation of national and regional climate change adaptation policy, plans and processes focused on climate change adaptation. This will include the development of generic knowledge products, focused on the analysis of resilience and vulnerability, understanding the links between disaster risk reduction and climate change adaptation and downscaling of climate change and impact assessment data. It will also include four new studies that address key gaps in knowledge and understanding for the mainstreaming of adaptation into development planning. These four studies are: (i) Understanding Planning; (ii) Perceived and Actual Knowledge Gaps; (iii) Comparing Adaptation and Development; and (iv) How 'Autonomous' are Autonomous Responses?

Application of existing and new knowledge: synthesis of existing and new climate change adaptation knowledge to facilitate its application in sustainable development practices at the local, national and regional levels. The focus here is where knowledge is applied: within the countries of the region through mainstreaming adaptation into development planning. Follow-up activities are planned for the five pilot countries listed above and, in addition, in 2010 and 2011 the Adaptation Knowledge Platform activities will be initiated in the remaining eight focal countries: Bhutan, Sri Lanka, China, the Philippines, Myanmar, Indonesia, Lao PDR and Malaysia. In all of these countries, the Adaptation Knowledge Platform will work through partnerships with local institutions and 30% of the budget for 2010-2011 will be dedicated to these partners. There will also be activities to develop generic knowledge-to-practice products at the regional level.

Together with the dedicated **communications** activities, these components will achieve the objectives of this phase of the Regional Climate Change Adaptation Knowledge Platform for Asia. They will also build a base for the long-term development of the Platform as a knowledge-based, demand-driven structure through which planning for and capacities to address climate change adaptation as a core challenge for the future development of Asia. It is anticipated that this legacy will be carried forward through new phases of the Adaptation Knowledge Platform if and when there is demand for the services the Platform provides from the countries of Asia.

Adaptation to climate change is a relatively new problem domain for Thai Government policy-making. Most policy, therefore, remains exploratory and generic or in form of individual projects.

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SCOPING ASSESSMENT FOR NATIONAL IMPLEMENTATION IN THAILAND

INTRODUCTION

The purpose of this summary report is to offer background analysis and suggestions for the design and implementation of a Climate Change Adaptation Knowledge Platform in Thailand. It was prepared as an input to a roundtable consultation on "Implementing a Climate Change Adaptation Knowledge Platform in Thailand".

The Adaptation Knowledge Platform in Thailand is intended to benefit from, and contribute to, a regional Platform already established. The Adaptation Knowledge Platforms are supported by a partnership between the Stockholm Environment Institute (SEI), the Swedish Environment Secretariat for Asia (SENSA), the United Nations Environment Programme (UNEP) and the UNEP/Asian Institute of Technology (AIT) Regional Resource Centre for Asia and the Pacific (RRC.AP) with funding support from Swedish International Development Cooperation Agency (SIDA). Thailand was selected as one of the initial countries to support national-level activities.

This scoping assessment is based on a review of official documents and statements, interviews with stakeholders, a roundtable workshop, and reflections on personal interactions with other stakeholders in Thailand on climate change issues over the past decade and a half. It offers general suggestions on improving the linking of knowledge and action for adaptation to climate change in Thailand, and recommendations on options and priorities for the Adaptation Knowledge Platform activities of SEI and partners.

POLICY, PROGRAMS AND ORGANIZATIONS

Adaptation to climate change is a relatively new problem domain for Thai Government policy-making. Most policy, therefore, remains exploratory and generic or in form of individual projects.

The main focus was initially on building capacity to understand issues better in the Thai context and meet international obligations for emission inventories and reporting. Adaptation is only just beginning to enter agendas of many organizations.

Virtually all government departments and agencies could claim to be relevant to building adaptive capacity or taking specific adaptation actions. The following selection is not comprehensive but gives some idea of the

organizational and institutional settings into which an Adaptation Knowledge Platform must fit.

National strategies, plans and projects

Thailand's Five-Year Strategy on Climate Change (2008-12) ordered relevant Ministries to form subcommittees, follow progress, and coordinate activities (1). The strategy has six components the first of which was building capacity to adapt and reduce vulnerability to climate-change impacts. The emphasis is on capacity-building, from research through public awareness and in the bureaucracy. Greater emphasis also needs to be placed on cooperation among government ministries and departments as there is a tendency to compartmentalize climate change analyses and reactions, whereas most research-based evidence underlines its' cross-cutting nature.

A 10-year Strategic Plan on Climate Change (2010-2019) including a three-year Action Plan (2010-2012) has been drafted and under review by relevant sectoral experts. It will eventually be submitted to National Climate Change Board and Cabinet before being made public (2). Documents provided at consultation meetings to draft the plan (3) highlight building adaptive capacity as one of the two primary goals.

The main focus was initially on building capacity to understand issues better in the Thai context and meet international obligations for emission inventories and reporting

The National Economic and Social Development Board (NESDB) is also working to include climate change as part of the next national strategy (4). Several activities are planned including using models to assist in assessment of vulnerable areas and addressing issues of food security. The possibility of including climate risk management or climate change adaptation concerns in a planned 130 village survey in preparation of the strategy is also being considered (5)

There is pressure for more action on climate change. A cabinet resolution on September 2009 recognized a set of detailed recommendations made by the National Economic and Social Advisory Council (4). Many suggestions are reasonable and fit current activities or work plans of Ministries but others overlap or challenge current operations including the 10 year plan now before cabinet. It is not clear how government and the bureaucracy is taking these different lines of advice and integrating them into policy.

Although a lot of hope has been pinned on the Strategic and Action Plans it is not clear that a strategy based on a single over-arching policy for climate change adaptation is the most effective way forward. Nor is it clear that it will change the fragmented and sectoral situation that currently exists in government response. A lot still depends on actions by individual Ministries who in some instances are already working on their own strategies that fit with their areas of normal work.

The Office of Natural Resources and Environmental Policy and Planning (ONEP) within the Ministry of Natural Resources and the Environment (MONRE) was initially designated as the formal contact and coordination point for climate change policy in Thailand. Several other departments in the Ministry are also active. The Department of Water Resources, for instance, has assigned the Research and Development Office to work on the climate change adaptation issues (6).

Several agencies in the Ministry of Interior are directly or indirectly important to building adaptive capacities. The Department of Disaster Prevention and Mitigation (DDPM) established in October 2002 now has a potentially stronger role in coordinating inter-agency planning following the passing of the 2007 Disaster Prevention and Mitigation Act (7). Climate change adaptation has not been prominent in the agency's work until the most recent National Disaster Plan (8).

The Bangkok Metropolitan Administration (BMA) has been particularly active on climate change issues. In 2009 the BMA issued a climate change assessment report. The main adaptation policies proposed were to undertake risk assessments at various administrative levels and identify high risk areas and "incorporate potential climate change adaptation actions into strategic city planning, where appropriate" (9). The assessment was carried out with assistance from GreenLeaf Foundation, a consortium including government agencies like the Tourism Authority of Thailand and the Demand Side Management Office of the Electricity Generating Authority of Thailand, and a private sector group, the Thai Hotels Association, and the United Nations Environment Program.

The Ministry of Science and Technology has some technical capacity for training and assessing adaptation options scattered across groups and departments.

An important step to bringing together some of this expertise is the creation of the Climate Change Knowledge Management Center. The Center, partly virtual, has a mission to collect, synthesize and disseminate knowledge on climate change to support strategic planning of government agencies, private sector as well as the local community, to strengthen coping capacity to climate risk. It is under The National Science and Technology Development Agency (NSTDA)(10).

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Another relevant agency is the Hydro and Agro Informatics Institute originally established under an initiative of His Majesty the King Bhumibol Adulyadej to help develop a coherent plan to improve water resource management in Thailand (11) and since 2009 a public organization under the Ministry of Science and Technology. They have a history of bringing scientific understanding and technologies to communities. Recent work on risk management argues the importance of including assessment of risks in planning and developing water resources (12).

The Ministry of Agriculture and Agricultural Cooperatives has some activities relevant to adaptation. In 2009 the Office of Agricultural Economics formed a committee to study climate change, dealing with emissions, impacts and adaptation issues (13). The Department of Agriculture recognizes that it's routine work on species selection and variety improvement, for example, related to drought or flood tolerance is important for adaptation (4, 14). The Rice Department and Department of Agriculture have already taken actions to promote and support conservation of local plant varieties tolerant to variable conditions (4). There may be some scope for improving national-level spatial planning for research and development of crops given more information about climate change projections (14).The Royal Irrigation

Department has an important role in managing water resources for agriculture in Thailand and also flood protection for many cities and towns. This experience is an important foundation for considering climate change and needs for adaptation (15-17).

The Thailand Research Fund (TRF) was established after the 1992 Research Endowment Act (18). It is a juristic body outside the normal government administrative bureaucracy. It helps build capacity of the research community, supports research significant to national development, and promotes dissemination and use of research findings. Its relative independence has allowed it to play an important on-going role in developing and supporting the growing network of climate change experts in Thailand as well as providing significant public policy support. A climate change assessment activity with working groups on climate, energy and adaptation is now underway with support from TRF and is expected to report at the end of 2010.

Adaptation to climate change is a relatively new policy issue for the Thai government and so far most responses by individual Ministries or Departments have been modest. Nevertheless several pilot projects and initiatives are under-way and there are opportunities for the Adaptation Knowledge Platform activities to compliment and link to these.

International initiatives

The Thai government also participates in several international agreements and other collaborative initiatives relevant to adaptation.

The United Nations Framework Convention on Climate Change (UNFCCC) initially downplayed out fear that it would hamper efforts to get countries to agree on mitigation actions. More recently, for example, in the Bali Action Plan arising from the Conference of the Parties in 2007 adaptation has achieved higher prominence, in particular, around issues of financing which remain highly contentious.

In 2007 Thailand signed the Singapore Declaration on Climate Change, Energy and the Environment with leaders from ASEAN and several other states. MONRE works with ASEAN's Climate Change Initiative which includes a working group on adaptation (2). Another example of regional institutionalized cooperation is that between the lower Mekong river basin countries (Laos PDR, Cambodia, Thailand and Vietnam) under the Mekong River Commission (MRC). The MRC, for example, has promised to integrate flood management considerations in its new Climate Change Adaptation Initiative (19).

The Asia Pacific Network for Global Change Research (APN) is an inter-governmental body (20). It has played a catalytical role in funding collaborative activities among researchers in different countries and the region, as well as stimulating meaningful interactions between practitioners, policy-makers and researchers through workshops, roundtables and dialogue activities. The research and parts of the bureaucracy in Thailand have been active participants in APN activities for many years.

Non-state actors

Non-state actors have been active in promoting understanding and analysis of climate change impacts and possible responses in Thailand. Expansion of activities from small, local, individual projects – either through

institutionalization or mobilization through looser networks – is still very modest.

The Raks Thai Foundation established in 1997 has focused on assisting poor and disadvantaged communities (21). In 2008 the Raks Thai Foundation began introducing climate change adaptation into its disaster preparedness work with local communities (22). Oxfam, an international confederation of non-profit organizations, works directly with communities to empower them and improve livelihoods.

In Thailand Oxfam has undertaken some work on climate change adaptation with local communities in Yasothon Province (23). The starting point has been on improving risk management with respect to climate variability, in particular, droughts. These experiences underline the significant local capacity for adaptation (23).

The Thailand Environment Institute is a non-profit non-governmental organization that works in partnerships with private and public actors on environmental issues and conservation (24). It has been active on climate change issues since establishment in 1993, with its studies contributing to the National Action Plan in 2000 (25) and to the 2007-8 National Strategy on Climate Change described above (26). The Thai Environment Institute with technical support from the Asian Disaster Preparedness Centre is leading an initiative to help cities in Thailand adapt to climate change as a contribution to the Asian Cities Climate Change Resilience Network (ACCCRN) funded by the Rockefeller Foundation. Its second phase of activities will focus on Chiang Rai and Hat Yai.

The Sustainable Development Foundation (SDF) is a non-governmental organization initially established in 2000 with support from the Danish Cooperation for Environment and Development (DANCED). Key support continues through Danish International Development Assistance (DANIDA). Much of the work of the organization is now focused on empowering non-state actors and their networks to pursue sustainable development. In contributions to the 2nd Roundtable a strong recommendation was made to the Platform to target capacity building activities in support of networks of vulnerable groups (27). Three types were highlighted: the Sustainable Agriculture Network, Community Forestry Networks in particular in upland areas in northern Thailand, and Small-scale Fisher Associations, primarily in southern Thailand.

Many of the scientific and capacity building activities supported by APN have built on and been influenced by the START international scientific program (28). START has a strong presence in Southeast Asia region for more than a decade, helping stimulate, coordinate and synthesize research on a wide variety of global change topics (29, 30). Research networks in Thailand have been strong contributors to this program. A feature of much of the work under the START umbrella is the integration of concerns with climate with other large scale environmental changes as well as more local development and environmental management problems.

The experimentation by non-state actors in Thailand, often working closely with local communities and sometimes also local governments, is crucial to developing more effective strategies for building adaptive capacity. Central government agencies should look to learn from these experiences in developing their plans and policies at higher administrative levels.

Adaptation Knowledge Platform – institutional mechanism

The best option for developing an institutional mechanism for the Adaptation Knowledge Platform in Thailand is a collaboration and contribution to the newly formed national Climate Change Knowledge Management Centre under MOST.

Working with the centre and it's links with many different government agencies in Thailand could be conceived given cross-cutting nature of adaptation. At a minimum the Knowledge Platform should also create links with key departments in MONRE (e.g. ONEP), MOI (e.g. BMA, DDPM) and MOAC (e.g. RID and DOA). Links with non-state actors are also needed and should be selected based on target locations and sectors (e.g. Oxfam, RaksThai, TEI).

STATE OF KNOWLEDGE

Most research on climate change so far carried out in Thailand has focused on understanding potential impacts, vulnerabilities and sensitivities. Much less has been directly about adaptation although some of the work on sensitivities will become very useful guide for strategic planning of specific adaptation actions and more broad initiatives to build adaptive capacity.

Climate change

A fair amount is known about recent changes in climate at larger scales across Asia (31). There is overwhelming evidence for warming: annual mean temperatures have increased in many locations, there are more hot days and warm nights, glaciers are retreating, and snow-cover is decreasing (31). Observed trends in precipitation are more complex and uncertain, but include 7drying trends, changes among seasons and inter-annual variations as well as more intense rainfall events (31).

Most research on climate change... has been directly about adaptation although some of the work on sensitivities will become very useful guide for strategic planning of specific adaptation actions and more broad initiatives to build adaptive capacity.

Some clear trends have been recorded in Thailand. For example data from six stations in central Thailand indicate that annual rainfall between 1951 and 2001 declined 180mm (32). Two recent studies focused on urban and coastal Thailand give evidence of more intense daily rainfall (33, 34). Trends vary in direction and magnitude among studies. Aggregating observations over much wider region hides some of this internal variation which can be due to, for example, changes in land-cover; an extreme example of which is the heat island effects around large metropolitan areas like Bangkok (35).

The future of precipitation over Thailand under global warming remains uncertain. The most common and best supported expectations usually based on wider regional analysis are: more intense precipitation events; increased tropical cyclone intensities; increased droughts and floods associated with El Nino-Southern Oscillation events; increased Asian summer monsoon precipitation variability (31, 36). Several studies focused on Thailand or surrounding Southeast Asia region have now been carried out (37). The main findings were that the hot season – defined as days with maximum over

33C – would be 2-3 weeks longer and increased precipitation Projections for precipitation to increase are strongest after middle of this century especially in east and south (38, 39). But exactly how global warming will affect climate processes important for rainfall patterns in Thailand like tropical cyclones, ENSO and the Asian monsoon, is still the subject of intense research and debate (31, 32, 40, 41). These knowledge uncertainties are unlikely to disappear and need to be considered as part of responses to climate change in Thailand.

Biodiversity

Climate change has potentially significant implications for biodiversity in Thailand, especially given the often tremendous pressure native species populations are under already, as a result of other human activities, in particular, infrastructure development and habitat modification. Most of the detailed understanding of possible impacts within Thailand comes from studies of forest trees. Changes in distribution of major tree species or vegetation types can be expected to strongly influence distribution of other organisms.

Globally climate change is already having an impact on biodiversity and is expected to exacerbate challenges arising from other human activities...

Globally climate change is already having an impact on biodiversity and is expected to exacerbate challenges arising from other human activities like changes in land-use, pollution, habitat loss, fragmentation in (forest) landscape and introductions of non-native species (42). Changes in phenology have already been observed. The habitats of many species will move to higher elevations or poleward; whether they can migrate or not depends on rates of change and species attributes. Species with restricted ranges, for example, on islands or mountaintops will often be at even greater risk of extinction (42).

In Thailand, the monsoon has major influence on current distributions of forest trees and plants. Shifts in amounts and patterns of rainfall could have major implications for species which often now have restricted ranges because of impacts of human land-uses, for instance, conversion to agriculture.

Hydrological regimes of wetlands are sensitive to changes in climate with impacts on individual species and ecosystem productivity (42). Seasonality produces changes not only in water volumes but also water quality in wetland ecosystems that are important for ecological structure and function. Changes in temperature and precipitation due to climate change would alter these relationships.

Likely effects of mean global temperature increase on freshwater systems include higher water temperatures, lower dissolved oxygen levels and higher toxicity of pollutants. Freshwater fish life histories have evolved to particular flow regimes and temperatures and thus likely to be impacted (43). Typical adaptation measures, for instance, water storage and diversion, could make challenge of shifting ranges and otherwise coping even more difficult. The impacts of climate change on fisheries and aquaculture are likely to be significant with both positive and negative impacts (44). Impacts on fisheries, because of importance in feeds, would also impact aquaculture (45).

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Mangrove forests are resilient in part because of large below-ground nutrient stores, rapid rates of decomposition and nutrient flux, functional redundancies, and many self-organizing feedbacks (46). Mangroves successfully responded to changes in sea-level and shoreline movements during the Holocene and appear to be keeping up with current changes in sea-level. Mangrove forests recover from natural disturbances like severe storms, cyclones and tsunamis. The main threat remains deforestation and habitat conversion (46).

Recommendations for natural forests in the Initial Communication by Thailand to the UNFCCC in 2000 included reforestation with drought and heat tolerant species, conservation areas for vulnerable species, and gene banks (47). The communication also called for capacity building and further research. The current protected area system may be inadequate to protect biodiversity from climate change. Several options for adaptation to reduce impacts of climate change on biodiversity and ecosystems have been suggested in IPCC reports (42) that are relevant to Thailand. For example, it has been suggested that corridors which link reserves could assist migration as climate shifts. Obviously such a strategy is only possible if regional land-use planning and development incorporates such ideas well in advance.

Captive breeding may be necessary for some species which are unlikely to maintain viable populations in the wild (42). The Fourth Assessment Report states that protection from fires, insects and diseases could reduce vulnerability of forests to climate change (48). The report also argues for more sustainable logging practices including longer rotational cycles, reduced waste and minimizing impact on remaining trees (48). Prioritization of conservation efforts depends on understanding of vulnerabilities to climate change. Detailed understanding of the vulnerability of individual species or assemblages to climate change appears to be critical to designing

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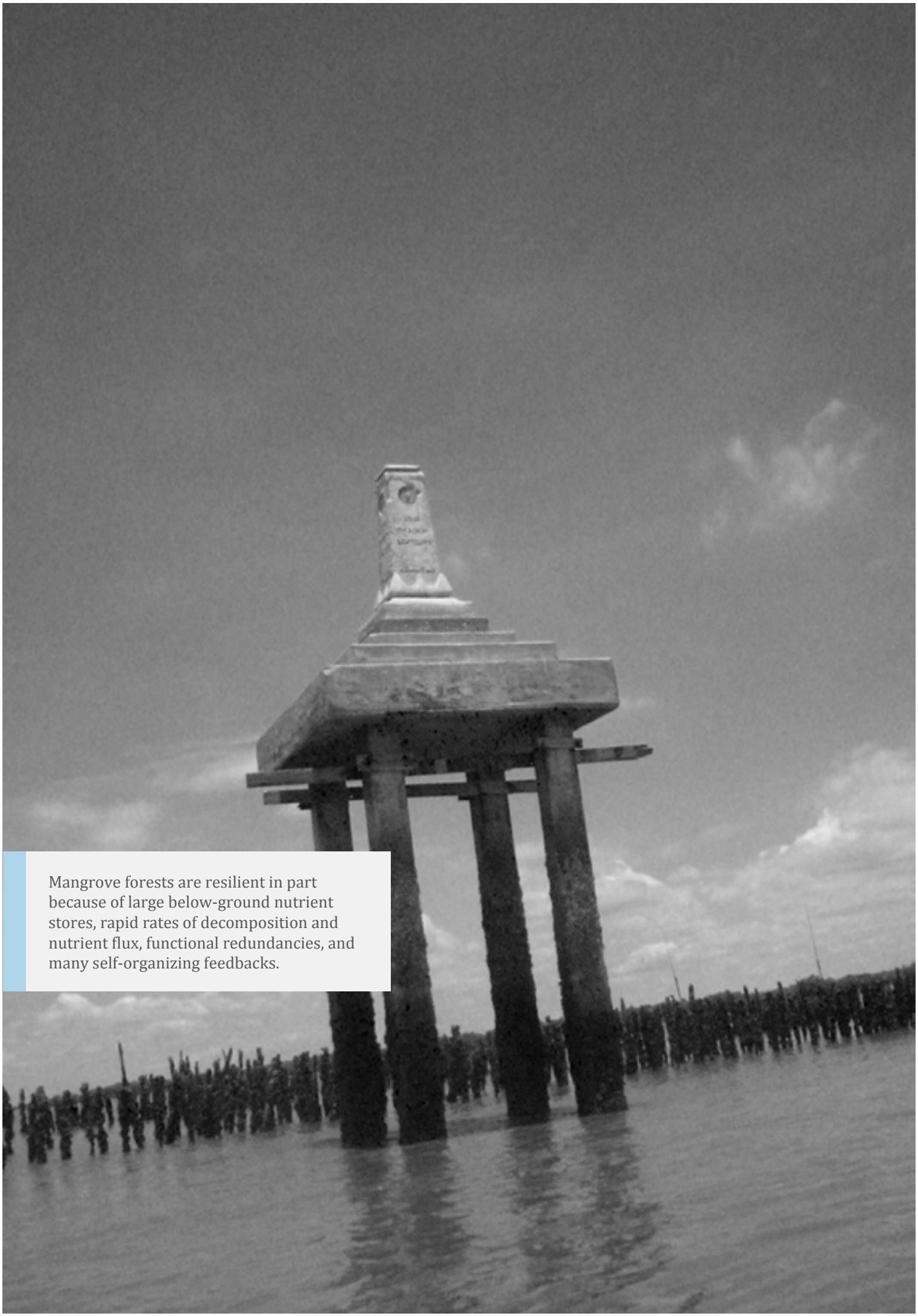


Mangrove forests are resilient in part because of large below-ground nutrient stores, rapid rates of decomposition and nutrient flux, functional redundancies, and many self-organizing feedbacks.

Photo credit: AIT-UNEP RRC.AP/Lekha Ratnayake

effective management responses, but unfortunately is rare in Thailand. The importance of ecosystem resilience to adaptations to climate change should not be under-estimated.

Water resources

For water resources the challenges are substantial and strongly influenced by land- and water-use. Droughts, floods and storms already have major impacts in Thailand. More systematic learning from these experiences could be highly relevant to dealing with future climate variability. The diversity of interests among different water users makes interventions to alter flow regimes complex. Public deliberation appears to often be critical to negotiating sustainable solutions.

Growth in water demand combined with changes in climate will challenge the effectiveness of current water infrastructure and water management practices.

Globally, both observational records and modeled projections imply water resources are vulnerable and likely to be impacted by climate change (49). Increased frequency of intense precipitation events will result in more floods (50, 51). One of the main impacts of increased frequency of intense rainfall events on water resources will be degradation in quality, through for example, contamination (49). Higher temperatures as well as extremes, both floods and droughts, also imply more problems with water pollution. Growth in water demand combined with changes in climate will challenge the effectiveness of current water infrastructure and water management practices (49, 50, 52).

Droughts, floods and storms already have major impacts in Thailand. Changes in rainfall could easily exacerbate water resource management challenges (53). Experiences in dealing with flood events may be highly relevant to dealing with future climate. Unfortunately effective systems for evaluating disaster management responses and thus learning from past events and responses are frequently weak (54) reducing opportunities to learn. An over-emphasis on emergency response in much disaster management work is, institutionally, another limitation (55).

Floods are a problem when they are unusual in timing or severity. Global warming is likely to cause changes to flood regimes that depend on flood type and interact with land and water-use changes (56). Farmers for example may respond to changes in flood regimes with adjustments of their own in watering patterns, crop choices, and micro-infrastructure affecting return flow to rivers from their fields and groundwater recharge (56). Changes in risk unfold in a dynamic context in which other factors like access to resources and wealth are also shifting. The combined effects may work to cancel each other out or exacerbate problems for some social groups.

An assessment made of the Mekong River basin to 2030 projected that dry season rainfall would increase in northern and decrease in eastern Thailand (57). Shifting interactions among different water uses could be one of the major types of challenges for water resource management arising from climate change. Studies of the impacts of climate change on water resources in the Chi river basin also suggest a variety of interactive effects with crop growth and land-use (39, 58) allowing current patterns of crop production to continue, but with more complicated dry season water management (58). Changes in climate, land use and regulation of stream-flow by dams interact with each other in complex ways (59).

In the water sector advice offered by the Initial Communication of Thailand included: demand-side management through water pricing and rights, integrated watershed management, community-based management and water conservation in agriculture (47). Ensuring current climate variability is taken into account in designing water infrastructure and operational management will make adaptation to future climate easier (50). Both demand and supply-side strategies are needed (49) to increase resilience. Again, integration of climate change consideration with a variety of development activities in different sectors is essential. In global and regional assessments of adaptation costs water supply and flood management rank high (60-62). Droughts, floods and storms already have major impacts in Thailand. More systematic learning from these experiences could be highly relevant to dealing with future climate variability (63). The diversity of interests among different water users makes interventions to alter flow regimes complex. Public deliberation will increasingly be critical to negotiating sustainable solutions (64).

Agriculture and rural livelihoods

The vulnerability of agricultural production to changes in climate, nevertheless, may be quite high. Small increases in temperature are often predicted to cause reduces in yield as many crops are already grown at near their thermal optimum. Changes in precipitation and sea-level rise also pose important risks. Most agriculture in Thailand, especially outside the central plains irrigation region, is rain-fed.

Small increases in temperature are often predicted to cause reduces in yield as many crops are already grown at near their thermal optimum.

Rice farming is particularly sensitive to climate variability. Rain-fed rice yields are sensitive to rainfall and temperature. At the regional level the period for sowing and transplanting is wide due to variable water, soil conditions and toposequence; in contrast the period for heading and harvesting is narrow due to widespread use of similar photosensitive varieties (65). The vulnerability of rice to climate change for example through droughts, floods, changes in rainfall and salinity intrusion from sea-level rise was acknowledged early (66) although resilience of agriculture to severe floods in mid-90's was also noted (66).

Chinvanno and colleagues (67) studied impacts on rice yields and vulnerabilities in 18 villages in Ubon Ratchathani province. The simulations using the scenarios - cooler than other projections made for the region by the IPCC (31) - suggested mild positive impacts on average climate due to elevated CO2, increased rainfall and modest projected temperature increases. Taking into account flooding and timing of rainfall, as risks farmers are concerned about, suggest more mixed outcomes (67). The two most important climate risks according to farmers are prolonged midseason dry spells after sowing or transplanting seedlings and flooding near harvest time (68). Rice farmers in Ubon Ratchathani use standard rather than local varieties and have relatively limited scope to adjust crop calendars. Off-farm income, in particular, through seasonal or more permanent migration with remittances back, is the primary household measure to deal with climate risks. Chinvanno and colleagues (68) argue that community-level measures have declined whereas national level responses are still relevant but often insufficient. This experience to manage climate risks provide a foundation

The vulnerability of agricultural production to changes in climate, nevertheless, may be quite high. Small increases in temperature are often predicted to cause reduces in yield as many crops are already grown at near their thermal optimum.

Photo credit: SEI/ Rongchai Kongmuang

on which to consider options for adapting to climate change (68), but clearly much more also needs to be done.

Another recent study that links crop growth and economic models suggests that rice farmers may cope with or even benefit from small increases in rainfall whereas more extreme changes have clear adverse impacts on yields (69). Poor farmers are less able to adjust inputs to cope. The study also suggested there may be a trade-off between reducing risks of crop failure and maintaining high yields (69).

Recent work supported by the Thailand Research Fund and the International Consortium for Agricultural Systems Applications has led to development of a functional tool-box of decision-support models suitable for studying impacts of climate change on food systems (70). Pannangpetch and colleagues in a recent major study assessed the impacts of climate change on four key annual crops – rice, sugarcane, cassava and maize (71). They used datasets from the ECHAM4 A2 GCM model downscaled with the PRECIS regional climate model. Simulated yields for 2090-99 of cassava and maize fell by 43% and 15% respectively whereas those of sugar to increased by 6% (72). As a national level assessment this is a very significant step forward from past history of site-specific studies as it allows consideration of vulnerable areas through "hot-spot" analyses (72). Yield projects were highly variable across the country reflecting interactions between climate and soil. The report also makes suggestions about how to adjust crop production systems to adapt (71). Further exploration of these tools for other crops and locations will allow Thai researchers to expand understanding of these vulnerabilities and risks in the food system (72)..

Rural livelihoods are often dependent on access to water for agricultural production and associated services like fisheries. These pathways are sensitive to climate. Rain-fed rice farmers may be among the most vulnerable groups to climate change, as they do not have many adaptation options available if climate variability goes beyond their range of coping mechanisms to the monsoon. Diversification of livelihood strategies appears key to maintaining resilience and often includes off-site migration. Climate change related impacts on health are another area of concern especially for poor populations that may migrate to and from areas with poor living standards in urban areas for employment for part of the year.

The central place of rain-fed rice in the economy and culture of Thailand implies that any significant changes arising from climate change could have major impacts on food production, rural incomes and thus security more broadly (53). Food security at the national level would require large shifts in climate to be seriously challenged given Thailand is currently a major producer and exporter of food (73).

The Initial Communication by Thailand offered the following for the agricultural sector: conserving and developing drought-resistant crop varieties, promoting crop diversification, and water conservation (47). Local initiatives to improve soil and water management, including water harvesting and storage for climate-vulnerable groups should be considered (74). Private investments in drought- and flood-tolerant crop varieties and water-saving technologies should be encouraged, where appropriate, in partnership with public research and extension agencies. The draft 10-Year Master Plan also promotes research on crop varieties and genetics as well

as efficient use of natural resources (3). Building climate resilience in the Thai agricultural sector will require shifts in investments (75). Maintaining or increasing levels of food production will be an important way to deal with issues of food security, not just nationally, but also regionally, as Thailand is a key food exporter. This will imply shifts in investment that take into account new risks (75).

Climate insurance instruments have been recommended under the United Nations Framework Convention on Climate Change but have not yet progressed very far (76). An important exception is the World Bank pilot project in Pak Chong district of Nakhon Ratchasima province. The project was carried out with maize farmers and implemented in full first in 2007 to handle risk from drought (77). In 2008 the scheme was expanded further. Activities like these should be an integral part of a wider package of business risk management tools that could help smaller farms deal with risks from variable and changing climates (74).

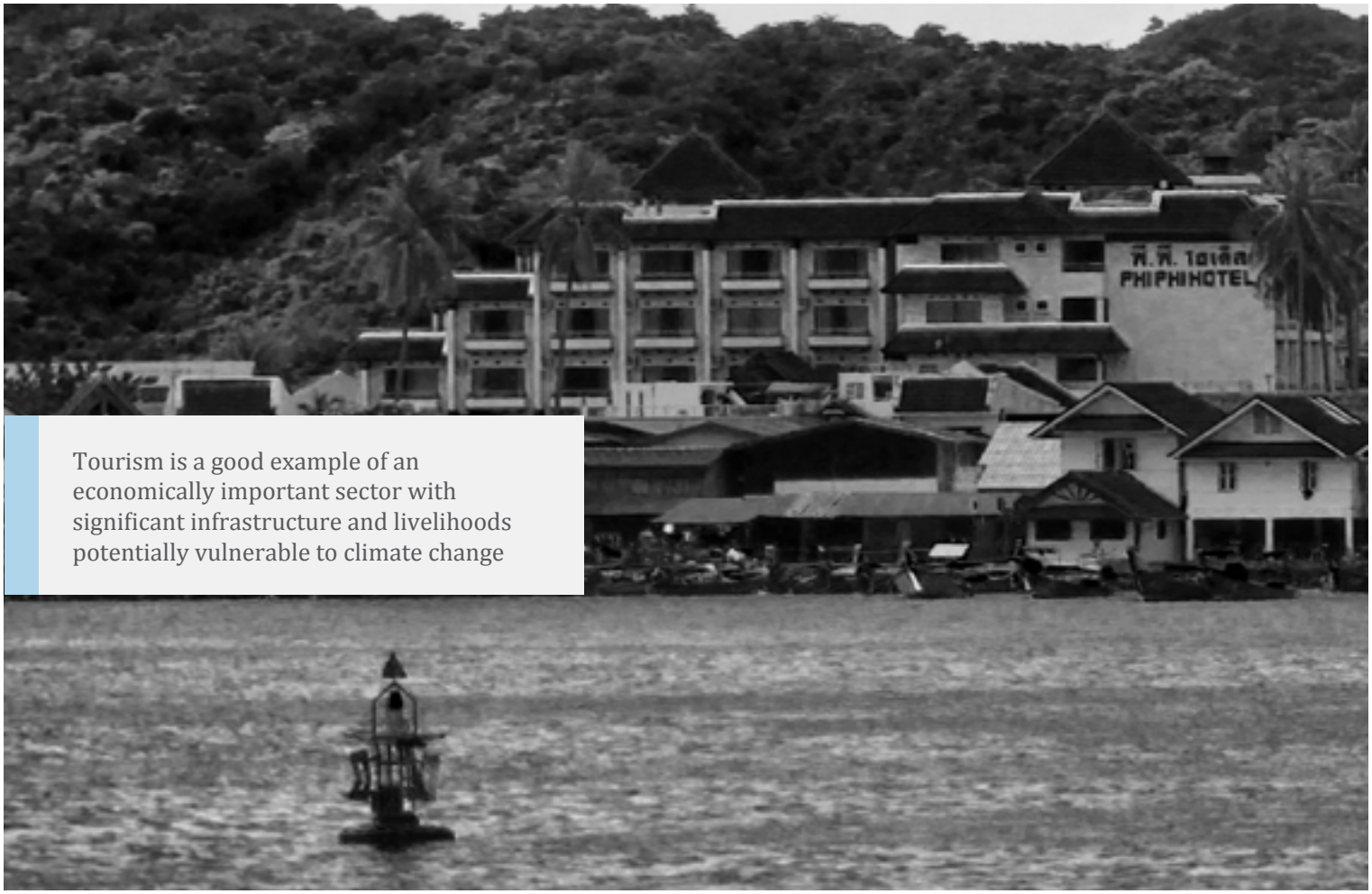
Reducing the vulnerability of disadvantaged rural groups will require analyses of the benefits, burdens and risks of alternative development pathways that take into account the often distinct interests, capabilities and needs of such groups. Issues of rights to water, land, fish and forest resources are often particular critical for people even as they move to take advantage of opportunities for employment in urbanizing regions as well. Diversification of income sources for rural households often contributes to resilience and might be encouraged by investments in training and improved access to credit. A focus on improving livelihood security will need to also give critical attention to the impacts of proposed adaptation measures themselves. Public deliberation is likely to be very important, especially for larger infrastructure projects with long-term implications for water, land use and social development (64, 78).

Human settlements, health and infrastructure

Over the past thirty years the number and impacts of flood disasters has increased (79, 80). This has occurred despite vastly improved abilities to monitor, warn and describe floods. In Thailand this in part reflects growth in absolute numbers of people living in flood-prone areas and higher values of infrastructure at risk (81). Around Bangkok and many other urbanizing regions new flood-sensitive settlements and land-uses have expanded into low-lying wetlands and rice paddy landscapes.

Flood waters are increasingly managed primarily to protect cities and related infrastructure (54, 82). Flood protection measures to protect central business districts may redistribute risks and burdens to neighboring urban areas or surrounding rural locations. In the absence of effective insurance or transparent compensation schemes managing flood disaster risks in Thailand is often a social justice issue.

Infrastructure interventions in the delta of the Chao Phraya river around Bangkok are particularly extensive including embankments, dams, irrigation and drainage canals (83). Local rainfall in the lower central plains is prevented from draining naturally by roads and irrigation infrastructure also increasing risks of deeper and longer flooding in flood-prone areas (83). Bangkok's canal system which had supported a lifestyle that fitted the monsoonal pulse has been partially converted to allow road expansion (84). The loss of resilience has been compounded by groundwater extraction and land subsidence (85).



Tourism is a good example of an economically important sector with significant infrastructure and livelihoods potentially vulnerable to climate change

Thailand has a monsoonal climate. Floods are a normal part of the seasonal cycle and critical for agriculture. Thailand is the world's no.1 exporter of rice and also among the largest exporters of food products overall. Many rural households still recognize the benefits floods bring to ecosystems and their livelihoods (86). Floods are most likely to become disasters when they are unusual in timing or severity (56). Individual flood events pose risks and may contribute to disasters, but in the medium and long-term, it is changes to flood regimes that re-define what is unusual.

Changing rates and patterns of epidemics of dengue is potentially one of the more important health impacts from climate change in Thailand.

Flooding may be of particular concern in areas with poor sanitation. Changing rates and patterns of epidemics of dengue is potentially one of the more important health impacts from climate change in Thailand. Climate change may also increase risk of food and water-borne diseases (53).

The dynamics of dengue fever epidemics is complex with weather and climate having important roles. An analysis of Thai provincial level data on dengue cases and monthly climate variables between 1978 and 1997 found differences among regions (87). Strong relationships with season are overlain by inter-annual variability and other factors (88). Peri-urban populations are most affected by dengue because of the provision of mosquito habitat and proximity of people. There is also evidence that prevalence of malaria in Thailand is also associated with rainfall (89). At practical level this means surveillance and control activities need to be enhanced during periods with high rainfall. Land-use changes are important for both dengue and malaria because they impact on mosquito habitat, and how humans and mosquitoes interact (90).

Photo credit: SEI

Overall, the extent and significance of impacts of climate change on distribution of infectious diseases remains contentious, especially when consideration of effects relative to, and interactions with, other factors are taken into account (91, 92). The draft 10-Year Climate Change Plan calls for support for additional studies on health impacts of climate change and improve networks for monitoring diseases (3).

Tourism is a good example of an economically important sector with significant infrastructure and livelihoods potentially vulnerable to climate change(93) Many tourist destinations in Thailand are in low-lying coastal areas. Sea-level rises, increases in storm surges or cyclone intensities, and river-based flooding could all have serious impacts. A trend towards more intense daily rainfall along the Gulf of Thailand coast has been observed and are consistent with strengthening of the north-east Monsoon (33). Chulalongkorn University recently completed an assessment of potential impacts of climate change on the tourism sector in Thailand for the Ministry of Tourism and Sports (94). The study looked at 14 different clusters ranging from eco-tourism, northern cultural to beach tourism. The study noted that clusters were sensitive to different climate variables and in ways that depended on where those activities took place. Suggestions were also made in this study about resilience of clusters could be increased so that tourism activities could continue.

Adaptation Knowledge Platform options – foundations

Global warming poses significant risks and burdens to development and the environment in Thailand through its expected impacts on temperature, seasonal rainfall patterns and extreme events. Significant impacts are anticipated in many domains. Ecosystems and biodiversity are often already under severe pressure from human activities and climate change is likely to make their management even more difficult. Agriculture is crucial to both economic development and security and sensitive to changes in both water availability and temperature. Many of the risks from climate change are likely to be exacerbated by water insecurities, which in a monsoonal climate, can mean both too much and too little depending on the time of year, with impacts on both rural and urban livelihoods.

Ecosystems and biodiversity are often already under severe pressure from human activities and climate change is likely to make their management even more difficult.

Scientific knowledge about the risks posed by climate changes in Thailand has expanded substantially in the past decade but major gaps persist and many adaptation options remain unexplored. Most research has focused on understanding potential impacts, vulnerabilities and sensitivities. Much more work is needed on adaptation options and building adaptive capacities.

The Adaptation Knowledge Platform in Thailand cannot hope to make a large contribution in all domains.

Based on the capacities of SEI, UNEP and other likely Platforms partners and expectation of institutional mechanism that links the Platform to the new MOST Climate Change Knowledge Management Centre the initial technical focus can be in two areas: (1) water resources management and rural livelihoods; (2) disaster and climate risk management in human settlements.

KNOWLEDGE-ACTION

Scientific knowledge of how climate change may impact ecosystems and human wellbeing in Thailand is expanding. At the same time much more research oriented towards management and policy is needed, especially concerning ways of building adaptive capacity or resilience to climate variability and change. Public policies in Thailand have only just begun considering how incorporate climate change considerations – for example, management of climate risks – and for most organizations the current emphasis is still on getting better understanding of what climate change is and what sort of options have to be considered for building adaptive capacity or taking specific adaptation actions on particular risks. Bringing together knowledge and practice is a significant challenge.

A lack of research may be a result of ways agendas are set and lead to insufficient investment..

Knowledge-action gaps have several causes (95). The knowledge needed may be missing, inaccessible, or available but not acted upon. Gaps may arise from both the knowledge and action sides of a problem as well as combinations.

Knowledge-action gaps can arise because knowledge is missing, inaccessible or unused and actions are therefore ignorant, poorly informed or irrelevant.

Knowledge may be missing because there is no research, or, research has been carried out but without discovering salient solutions. A lack of research may be a result of ways agendas are set and lead to insufficient investment. Some problems in adaptation are inherently complex and, despite substantial research effort, may remain intractable until the research questions are reframed. Some important topics are simply under-researched. Actors with needs may have no influence or authority over research and action agendas.

Knowledge may be inaccessible because of problems of communication or understanding. Access difficulties may also arise from insufficient capacities to acquire knowledge. Problems of poor communication and insufficient capacity largely explain why some knowledge exists but remains inaccessible. Climate change poses some specific challenges for communication and identifying salient knowledge. Uncertainties about future climate and appropriate responses are large. Adaptive policy and policy-making are likely to be crucial for effective responses.

Knowledge may exist but remain unused because the incentives for its adoption and change in practices are inadequate. Key knowledge claims may be legitimately contested, but nevertheless, through gridlocks prevent informed decision-making and actions. Improve links between knowledge and action cannot ignore politics. Knowledge claims are frequently contested. Open deliberation will often be crucial.

User needs

The potential and actual users of knowledge about climate change and adaptation are diverse. For simplicity we consider two levels: national policy makers and local level practitioners.

From the beginning of climate change as a policy issue, Thai experts and policy makers have highlighted lack of knowledge and uncertainties as crucial barriers. In Thailand's Initial Communication to the UNFCCC uncertainties were identified as hindering effective responses: (47). The response was technical capacity building (47, 96).

At the first Roundtable on 'Improving the Links between Knowledge and Action for Adaptation to Climate Change in Thailand' organised by the Adaptation Knowledge Platform, CCKM and USER brought together more than 50 individuals from many government agencies, civil society organizations, development agencies and academia (14, 15, 23, 97, 98). Discussions at the roundtable identified several needs.

First, was for further capacity building to improve level of understanding of potential changes to climate and impacts as well as vulnerabilities of key systems and how they might be addressed. Many agencies have substantial experience in dealing with mitigation issues but have only just begun considering adaptation (98). Overall understanding about adaptation is much weaker than for mitigation and it is hard to set priorities.

This was highlighted by a DWR expert at the first roundtable: "We've heard a lot about climate change initiatives/projects but we are not able to identify what are the main issues. It would be very good if CCKM could help identify important issues. For example, with temperature increase of about 2 degree Celsius, how would water resources in Thailand be affected? With this information, DWR could plan its strategies for the water resources use countrywide and cooperate with DOA for water use in agricultural sector."(97)

Second, was the need for improved coordination and collaboration among agencies, including, but not restricted to sharing of data. Many organizations had some positive experiences in linking knowledge with practice which could be built upon for addressing adaptation noting the importance of two-way communication as the foundations of co-production of knowledge.

The need to understand local context is often emphasized by Thai officials and experts (99) - "We know that concrete action needs to take place locally, and in order to act effectively, we need information about the impact of climate change and possibilities for adaptation to these changes at regional and local levels" (100).

While it is true that detailed understanding of specific risks and vulnerabilities is modest, there is substantial global knowledge for Thai policy to draw on in the first instance and to guide future research within the Thai context. There is also a significant body of local knowledge and experience in dealing with climate variability associated with the Monsoon that is relevant to managing climate risks and thus likely to be useful for adaptation (68, 101).

For government and civil society actors information is also needed about projections and plausible impacts as these may help with policy and planning (22). Capacity building for policy makers is also needed, as they are in position to make decisions that effect local levels where many adaptation actions take place.

To date public involvement in exploring ways to build adaptive capacity and design effective adaptation measures has been very limited especially at levels above small, local projects.

Photo credit: AIT-UNEP RRC.AP/Lekha Ratnayake

To date public involvement in exploring ways to build adaptive capacity and design effective adaptation measures has been very limited especially at levels above small, local projects. Public engagement is also needed at the national level otherwise strategies are likely to be inappropriate and harder to implement even if well thought out.

In their early efforts to bring understanding about climate change adaptation into their work with disadvantaged local communities The Raks Thai Foundation saw local access to knowledge and monitoring the environment as crucial (22). While respect for local knowledge and capabilities is high there is also a recognition that sometimes information is needed from other sources and that capacities to deal with rapidly changing contexts and new kinds of problems is also important and may need outside help (22).

Knowledge of adaptation is very necessary for people and communities. They should have perception that climate change is real; climate variability has had impacts on them. Thus, their capacities have to be strengthened.

Strengthening knowledge at local levels was often seen as important to adaptation: "Knowledge of adaptation is very necessary for people and communities. They should have perception that climate change is real; climate variability has had impacts on them. Thus, their capacities have to be strengthened."(102) Information needs of local people are primarily about climate phenomenon and trends, including seasonality, as this is critical to their livelihood needs and possibly also livelihood changes (22, 23, 102). Work by Oxfam in Thailand also emphasizes the importance of local knowledge and actions while also value of introducing and exploring alternatives, for example, successful practices from elsewhere (23). Financial resources will often be needed to support building local adaptive capacities.

Knowledge-action gaps have many causes. Here we divide our observations into two groups those related to understanding and capacity and those more concerned with issues of coordination.

Understanding

Understanding of climate change and adaptation among officials is often modest. With some exceptions, notions like managing risks under uncertainty or building resilience to perturbations have not been well thought out in particular sectors or areas of practice. Even where they have the links between managing risks under current climate variability or other portfolio of challenges with future risks under a changed climate have usually not been made. The value of experienced-based knowledge in local communities and bureaucracies with planning and management responsibilities is acknowledged but far from fully utilized. As a consequence there are significant gaps in bringing knowledge and action closer together to address how to maintain resilience, build adaptive capacities or take specific adaptation actions at all levels in most domains.

Understanding of sensitivities is a robust form of knowledge that should help deal with a region of uncertain future climates. More work on understanding sensitivities would yield high, long-term benefits. Closely related to understanding sensitivities are notions of climate proofing or understanding sources of resilience. There is an urgent need to understand the sources of resilience to climate variability and change in specific social-ecological

systems. Maintaining and strengthening resilience may often be a more appropriate way of framing adaptation strategies.

Scientists in Thailand often find that notions of climate change are incorrectly mapped out to ideas about changes in the weather. The idea of long-term shifts in patterns of events requires careful communication to both policy-makers and general public. Moreover, in the Thai context the most relevant elements of climate change may have little to do with mean average temperatures or annual total precipitation, variables which are projected to change only modestly compared to many other locations in the world, but much more to do with issues of timing and extreme events.

Uncertainties in projections are also not well understood. Officials often request more precise estimates of what will happen to rainfall but seem uncomfortable or unsure how to handle high and sometimes widening uncertainties. In part this is a failure to treat the problem in terms of risks. A risk-oriented focus help place emphasis more on resilience building strategies and analyzing vulnerabilities rather than attempting to match infrastructure or other interventions precisely to predicted changes in rainfall or sea-level and so on.

Communication about risks can be difficult, even when dealing with current ones, but especially so when talking about uncertain, dynamic, future risks. As a whole the research community working in Thailand has not been very successful in explaining climate change risks to government officials or wider public and a consequence a lot of misunderstandings persist. The communication effort remaining is still substantial and will require those with good knowledge of issues to re-examine the ways in which they explain and discuss climate change as well as the venues and frequency of interaction with government agencies. In the first steps just communicating that past climate may not be an accurate guide to the future is important. But eventually skills in incorporating climate risks into planning, often using tools similar to those used for considering other risks and uncertainties, will be needed.

Communication about risks can be difficult, even when dealing with current ones, but especially so when talking about uncertain, dynamic, future risks.

Coordination

Although ONEP is mandated as a central coordination agency for information about climate change several officials from other agencies have expressed that they still need a strong support from other organizations to fulfill this role otherwise the gap in others' expectations will increase as demand for understanding of climate change in general and adaptation in particular increases (6).

At the same time there are also significant problems with sharing information among line agencies that hold key datasets and expertise that have repercussions for building adaptive capacity and taking specific adaptation actions. The need for improved coordination and collaboration among agencies, including, but not restricted to sharing of data was highlighted by many participants at the first roundtable. The Director of the National Disaster Warning Centre put it succinctly: "Within Thailand, the strength is that each agency has its own information; but they keep it when we need information sharing and coordination"(103).

According to the Raks Thai Foundation "There should be an organisation that could coordinate all relevant government offices, research institutes and NGOs working [on issues] related to adaptation to climate change. It was quite difficult for Raks Thai to coordinate with local government and regional government offices in the provinces since they were not aware of the climate change adaptation issue." (22). Many others interviewed often expressed similar views.

The widespread support for an agency that cuts across Ministries is significant given the expecting of the Ministry of Natural Resources and Environment to take major responsibility for climate change work in the past. If other more powerful Ministries took climate change adaptation seriously then prospects of more pro-active planning and activities and budgets seems high. At the same dealing with the long-history of sectoral and uncoordinated activities by different Ministries will be a tough challenge.

A much greater emphasis on starting with current activities and looking closely how risks are managed and knowledge acquired is needed. This experience will be valuable to including considerations of climate change in current practices at all levels, from local community-based management activities through to activities of planning agencies at the national level. At the same time there is a need for creative exploration of alternatives – too often there are simply not enough options being considered.

Adaptation Knowledge Platform – options for meeting user needs

Better ways for linking knowledge and action for adaptation are needed. The relationships between conventional 'users' and 'producers' of knowledge can vary widely and for how and what knowledge is acted upon (104).

At the first Roundtable many organizations had some positive experiences in linking knowledge with practice which could be built upon for addressing adaptation noting the importance of two-way communication as the foundations of co-production of knowledge.
Practice has two sides. On the one hand, when considering strategic long-term planning for large areas, it usually, implies decision-makers and action-takers in government agencies. On the other hand, when it comes to local planning and implementation, the mix of practitioners will often be dominated by resource managers and users – farmers, fishers and urban residents.

Expertise, especially as they move towards more interactive forms of engagement with practice, is not restricted to researchers in academia but can also include the experience-based expertise in local communities and government bureaucracies.

In the case of Thailand we suggest that this will often mean bringing together the knowledge of policy-makers, resource managers, users and researchers. Efforts aimed at building adaptive capacity, actions and strategy for adaptation to climate change need to understand the knowledge needs of planners and decision makers. This is because the experience, learning by doing, and knowledge embedded in current social practices like habits and lifestyles may each be important building adaptive capacities or taking adaptation actions. The links between knowledge and action are often much

more complex than direct linear flows of information from research to policy then practice.

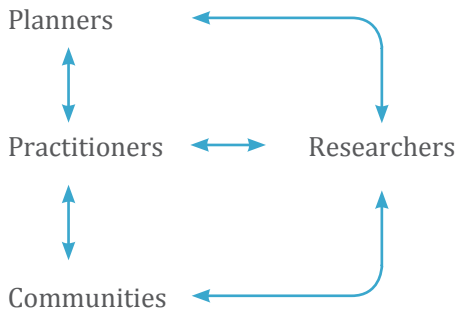
We suggest that the most effective way to build adaptive capacity is to start with the current routines and capabilities. These can be built on by looking closely at how risks are managed, knowledge acquired and experiences learnt from under the current climate.

Participants in the Roundtable expressed their strong interest to collaborate and support the Adaptation Knowledge Platform's activities in Thailand.

TOWARDS AN ADAPTIVE CAPACITY DEVELOPMENT STRATEGY

The previous sections of this report hinted at and highlighted several areas where capacity development needs with respect to knowledge issues are high. In this section these observations are extended and organized so as to help imagine what an adaptive capacity development strategy might look like for Thailand and what specific role and contributions the Adaptation Knowledge Platform might play in that strategy.

FIGURE_1 Four types of actors with particular areas of expertise, knowledge and needs relevant to building adaptive capacities



Source: Author

The general perception is that capacities for adaptation planning action or building adaptive capacities are limited at most levels and in most sectors (47, 105). The needs for capacity building are large and long-term. The investments needed for successful adaptation, therefore, are likely to be substantial (60, 61). In interviews and discussion in the 2nd Roundtable (Appendix 6.3 of the full report) it was clear that many experts believe that adaptive capacity development should prioritize the development needs of vulnerable and otherwise disadvantaged groups. The most effective means to do so, however, is not always clear and likely depend on context and require responses at several levels. Knowledge-related issues are important but certainly not the only set of factors that need to be considered in building adaptive capacity. In this scoping assessment the focus has been on what an Adaptation Knowledge Platform can contribute, so we maintain an emphasis on knowledge dimensions.

Who should receive assistance

That adaptive capacity development should prioritize the development needs of vulnerable and otherwise disadvantaged groups is clear from statements of priorities of many actors and documents. What is more open to debate is the most effective means to do so – should capacity development focus on government officials, experts, non-state actors, local communities, or some combination?

Understanding of climate change and adaptation among senior government officials in Thailand is often modest. Improving understanding and helping expand capacities to make technical and more participatory assessments with stakeholders in different places and sectors is potentially a high leverage activity. Capacity building for think-tanks, individuals that often take on policy advisory roles and strategic planners in the bureaucracy could have high-multiplier effects as well as ensure that there is tough reality check on what information is salient to planning and policy development. The type of assistance needed ranges from highly specific needs in some departments, for example, those involved in managing water or responsible for vulnerable transport infrastructure to more generic building adaptive capacity strategies for departments more generally responsible for poverty alleviation and rural development. In the latter case the Ministry of Interior, although unlikely to be directly concerned with climate change, may be the most important agency to work with. Planning processes whether spatial or more strategic may be particularly useful to target as there are needs to consider risks in this work.

Among the scientific community in educational and research institutes as well as more technical divisions of the bureaucracy, knowledge needs are often more specific and diverse. Meeting these needs in a comprehensive way is a major challenge. One strategy could be to work with individual or particular section champions within a few agencies in different Ministries and build-up from there. Helping Ministries partner with technical experts within Thailand should be the main priority, but sometimes it may necessary or helpful to draw on international scientific networks like those of START to bring in additional ideas and expertise especially in for example in training or writing background briefings. Much of the interaction will need to take place in Thai language, using Thai language documents.

The possibility of working more closely and directly with non-state actors, both in the private sector, and in local communities should be considered as an alternative or complement to working with government and hoping to trigger multiplier effects in some problem domains. Non-governmental organizations of various forms may be themselves the target for training or more two-way dialogue activities or their networks and engagement skills may be drawn upon for more direct engagement with farmers, residents and other local stakeholders. Although high spatial coverage with these sorts of approaches is unlikely, high quality initiatives may have demonstration value and might be marketed to others for replication and adaptation by other communities and stakeholder groups.

In short capacity building can directly engage those vulnerable or with low adaptive capacity or with others with authority and resources to reduce vulnerabilities and build capacities. The later may have more leverage but can be less effective if interests of vulnerable people tend to be over-looked by the normal procedures and routines of work. Some of the limitations of focusing capacity-building efforts in knowledge areas with government officials might be reduced if the exercises are not just simple trainings but include a significant component of consultative needs assessment so that the specificity of needs are assessed and thus priorities for capacity building are established for target beneficiary populations.

Which capacities need to be developed

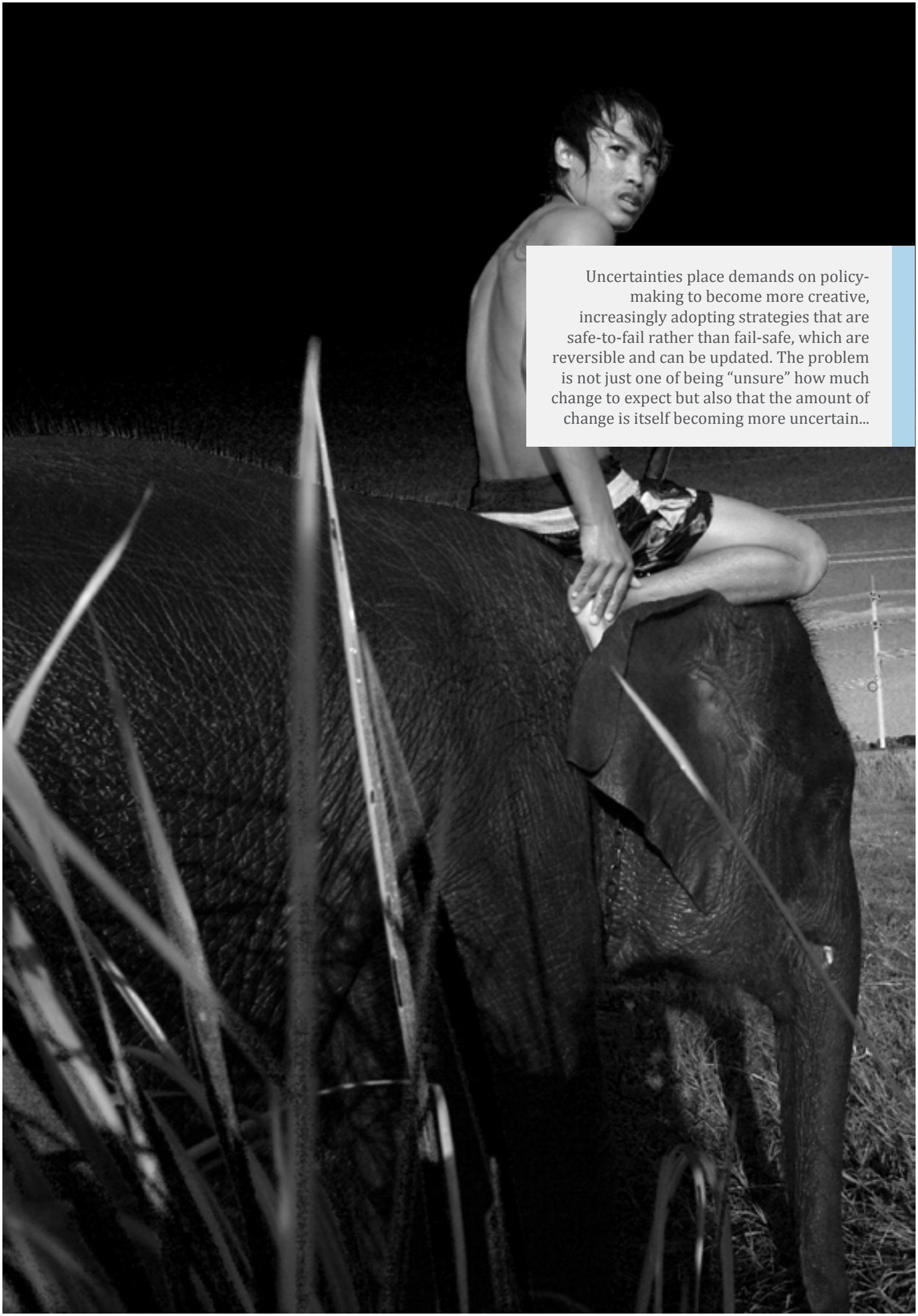
Many activities are not very specific about which "capacities" exactly are being strengthened (106). Too often when made explicit the skills are often overly framed in the language and issues of priority concern to the research community. This may be in the form of how-to-use particular equipment or models that have to be imported and continually supported. But what is often most needed are organizational, analytical and deliberative skills rather than frameworks and pieces of narrow research puzzles (107). Skills if properly developed should be capable of mounting challenges to research agendas, re-defining goals and approaches, and making observations which might over-turn key assumptions in "global" models.

Capacity building should be about expanding not narrowing horizons of inquiry. Moreover it is not just basic scientific capacity which needs to be transferred from experts to recipients, but also skills in communication, issue identification and public engagement. Some of the skills for this can flow in surprising directions, from recipients to the experts providing the "training". Sometimes by more explicitly asking about which capacities we should be building will lead to a re-defining of whose capacities.

For strategic planners and policy advisors there may be existing capacities in risk assessment and in handling uncertainties, but in many cases these planning tools and logics will need to be extended through capacity development activities. Scenario planning and risk assessment are likely to be important entry points for beginning to incorporate climate change into development planning activities. Uncertainties place demands on policy-making to become more creative, increasingly adopting strategies that are safe-to-fail rather than fail-safe, which are reversible and can be updated. The problem is not just one of being "unsure" how much change to expect but also that the amount of change is itself becoming more uncertain as emissions continue to rise further and further (108). The implications of persistent large uncertainties for policy-making and investments in adaptation are profound and demand new strategies. Some of which have been explored include: no regrets which yield benefits even if climate does not change; buying safety margins in new investments; favoring reversible and flexible options, promoting soft strategies, and reducing decision time horizons (109).

Development practitioners, in both government and non-government agencies, need access to salient knowledge about climate changes, its impact and vulnerabilities to come up with practical measures to respond. Enabling frameworks from policy and planning and the fiscal support that goes with it is of course also crucial, but from the knowledge perspective the challenge is getting insights about problems and possible strategies mainstreamed into normal development practice. Building capacities to implement policy effectively and with sensitivity to the diversity of local contexts is a recurring challenge in development and also important for adaptation to climate change.

For scientific and technical communities there is a need to be able to facilitate and support – for example through reviews and models – the sorts of scenario-building and assessment activities that can inform strategic planning described above. Capacity building with respect to specific areas on how to interpret climate change model outputs and so on may also be targeted at this community. Specific attention could be placed on capacities to



Uncertainties place demands on policy-making to become more creative, increasingly adopting strategies that are safe-to-fail rather than fail-safe, which are reversible and can be updated. The problem is not just one of being "unsure" how much change to expect but also that the amount of change is itself becoming more uncertain...

Photo credit: SEI/ Rongchai Kongmuang

use climate information, with medium-term climate or seasonal forecasting an area with promise for benefits to some groups in shorter-term but also developing the sorts of skills which could be useful for dealing with longer-term trends in climate (110, 111). The scientific community not directly involved in climate change but with expertise in particular ecosystem or social-ecological systems or built environments often has knowledge about sensitivities to climate that can be useful for assessing climate risks. The interactions between those with expertise about climate and those with understanding of biophysical and social processes in particular systems should thus be two-way. At the same time there is substantial scope for stimulating additional research in adaptation, resilience to climate variability and the dimensions of adaptive capacity. Insufficient work has been done on these topics in Thailand.

Capacity building and research should probably evolve together as one of more effective ways for expanding skills in design, analysis and reporting of research through collaboration (112). Collaborations are needed not just to experts working in different institutions and disciplines but more importantly between academic and practitioner and policy planning communities. Very little such collaborative reflection or analysis has been carried out, but where it has, most participants find the experience highly rewarding (16, 17). Joint assessments and fact-finding processes provide a means to generate such interaction and learning as well as useful products for policy. Adaptation as a practical challenge in development is particularly well-suited and dependent upon integrative approaches (113, 114). Overall, financial support for collaborative studies within Thailand is not sufficient and some effort should be made to stimulate greater investment in global change research including but not restricted to climate change.

For communities the most fundamental kind of understanding that needs to be shared is related to risks and development opportunities. The knowledge needs with respect to climate in these instances are likely to be related to management of risks, which to varying degrees, often already include some attention to climate variability. Relating these risks to livelihood security and opportunities is also crucial and will help actors gauge the level and forms of responses that are needed in ways external experts could have no hope of assessing.

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Across different kind of knowledge users there is a need to consider a range of strategies from general building of adaptive capacity versus making specific adaptation actions for a particular climate risks. In latter case are often huge lists of possible adaptation options that are often, in practice, sector or place specific in relevance. In the former, links to climate change may be secondary or tenuous.

At all levels there is a need to strengthen human resources and institutional capacities to use information and knowledge about climate change and adaptation. It is not clear in Thailand that a single agency or initiative will be sufficient to build the necessary capacity; nor is it clear that any single agency

can really provide the coordination and oversight that would be desirable given the diverse capacity needs.

How capacity might be built

Building adaptive capacity will require extensive participation by stakeholders (56, 113). In particular, it is imperative that vulnerable peoples are consulted in exploring and formulating adaptation policies. Disenfranchised groups (migrants, minorities, women, and children) are often among the most vulnerable to extreme climate events and also have a history of being poorly represented. Empowerment should expand the options, opportunities, and quality of local adaptation. Farmers, fishers, and other natural resource-dependent peoples need social, economic, and political space in which to exercise their expertise and rights in order to adapt (115, 116).

There is a need to engage the proposed beneficiaries in assessing needs and evaluating adaptive capacity efforts holds even if the most strategic level for capacity-building intervention in particular projects is one or more layers removed – for example trainings or dialogues with local government officials or civil society organizations.

This applies to capacity of research and technical communities as much as it does to governments and local communities. There are many kinds of activities that have been tried in the global environmental change programmes to "build capacity" (106). Each has its own strengths and weaknesses. Short, but intense training workshops are often preferred because the activity can be got over with quickly. On the other hand, many of our colleagues suggest that it is the longer-term relationships between mentors and "students" that turn into more symmetrical "collaborations" which have the largest impact on global environmental change science (106). The expectation is that this will also be true when dealing specifically with adaptation issues.

One of the surprising elements of careful review of past capacity building efforts in global change research is that treating interactions as mutual learning opportunities may be a better way to look at capacity building relationships than assuming simplistic teacher-trainer type interactions.

Building adaptive capacity will require attention to existing institutions, knowledge and capacities both within and outside government. Mainstreaming adaptation to climate change into various areas of normal development appears to be the most appropriate solution, but will require pro-active analysis and efforts at integration.

As a consequence of the many different needs for capacity and desirability of achieving some integration between them, building networks across research and practice domains will be an important complimentary activity to the more targeted capacity building needed for different stakeholder groups and government departments. Networks among researchers have proven robust and would be more effective if better supported. The value of scientific and policy networks is under-estimated in the Thai bureaucracy especially for problem and issue domains which are relatively new – like adaptation to climate change – and for which, therefore, established institutional mechanisms are often inadequate.

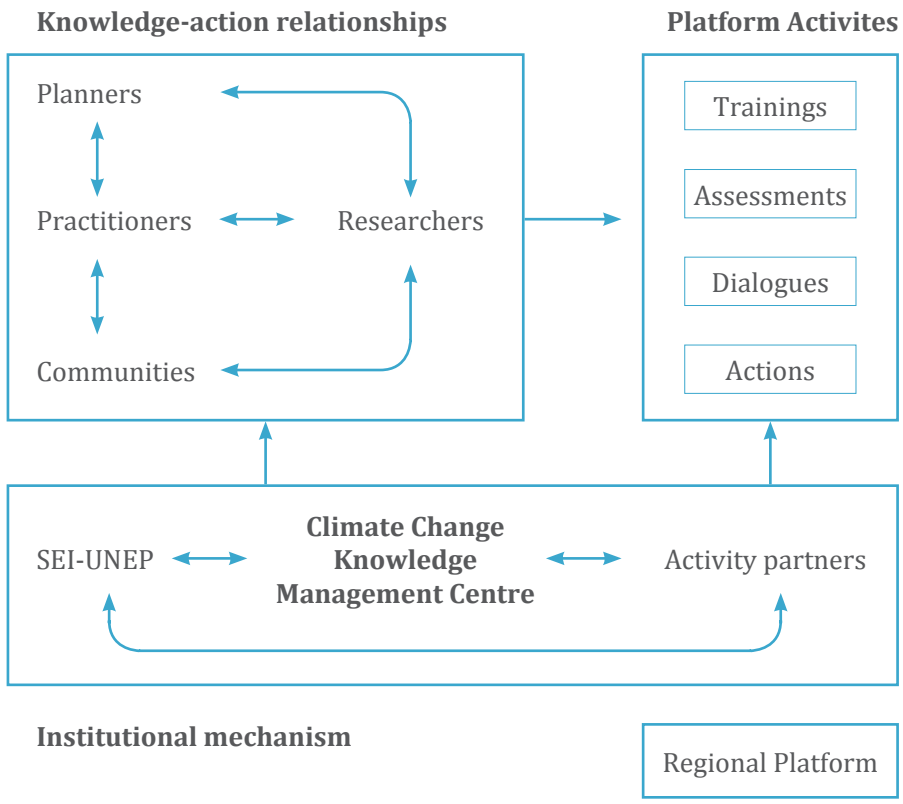
One of the surprising elements of careful review of past capacity building efforts in global change research is that treating interactions as mutual learning opportunities may be a better way to look at capacity building relationships than assuming simplistic teacher-trainer type interactions. Good relationships have reciprocity and some room to negotiate for both sides (106). Just because something is labelled as "capacity building" does not mean that the true real beneficiaries are those listed as "recipients" of training and other assistance. Many capacity building activities carried out as part of the global environmental change science programmes would benefit from more explicit consultation with the intended targets on their real needs and explicit recognition of what is "in it" for both parties.

Finally, once strategic policies are launched, their effects (or lack of) will need to be scrutinized. Monitoring and evaluation are critical because of the large uncertainties associated with both climate change and the impacts of newly formulated policies. There is no secret formula for building adaptive capacity so some experimentation is warranted and also a willingness to learn from engagement. Adaptive planning and management will be an important feature of building adaptive capacities in Thailand for some years to come.

Adaptation Knowledge Platform – capacity building priorities

Given the large needs for capacity development and the modest financial and human resources of the Adaptation Knowledge Platform of SEI and its partners must be strategic in which activities it attempts. A small set of tangible actions with high demonstration value is probably the best approach for the Adaptation Knowledge Platform in Thailand. These should focus on elements that can be supported by the Platform activities, the proposed institutional mechanism, and which fit in reasonably with current policy and institutional conditions in Thailand.

FIGURE_2 A possible form of the Adaptation Knowledge Platform in Thailand



Source: Author

During the review and consultations several options have arisen. Four simple options for focused activities under the Platform project in the coming 2 years are:

First, develop a modular training package for local government authorities like municipalities, TAOs or the BMA. These should focus on strategic planning.

Second, carry out an assessment focused on a river basin making partnerships with relevant local government actors, non-governmental organizations and local community representatives.

Third, help facilitate participatory actions to build adaptive capacities in a specific local community likely to be highly vulnerable to climate change.

Fourth, convene and contribute to dialogues and forms that bring together different mixtures of researchers, practitioners, planners and community representatives to share experiences, for instance, in trainings, assessment activities and pilot actions.

These are simple options. Others more complex schemes could be imagined. Many other target beneficiaries for capacity building activities could also be imagined. But SEI and partners cannot do everything and strategic, high leverage or high demonstration activities should be selected building on existing relationships and links. The information gained from these pilot activities can and should be widely disseminated to stimulate others to carry out capacity building activities more effectively.

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