APN CAPaBLE

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Scientific Capacity Building & Enhancement for Sustainable Development in Developing Countries

Prototype Training Workshop for Educators on the Effects of Climate Change on Seasonality and Environmental Hazards

Final Report for APN CAPaBLE Project:
2004-CB07NSY-Glantz
Project Leader: Michael H. Glantz

Prototype Training Workshop for Educators on the Effects of Climate Change on Seasonality and Environmental Hazards

Held 6–9 March 2006 in Bangkok, Thailand

Ambassador Hotel

2004-CB07NSY-Glantz

Final Report submitted to APN

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Executive Summary: March 2006 Workshop

Most environmental hazards are seasonal and coping strategies have been sought and in many cases developed to respond appropriately within the limits of forecast uncertainties about the timing, magnitude, and location of occurrence of specific hazards. As climate changes with global warming of the Earth's atmosphere, societies will gradually, and in some cases precipitously, be forced to respond to and cope with events and process that will surprise them. These may include prolonged droughts in new locations, shifts in tropical storm tracks in the Atlantic and Pacific Oceans, changes in intensity of the various characteristics of severe storms such as winds and rainfall, appearance of new infectious diseases in unsuspecting places, and so on.

Rather than focus on just the causes for such shifts in hazard behavior or dwell only on the specific impacts on society, it is imperative to identify more specifically the chain of events from cause to ultimate impacts on humans, including responses to those impacts. We propose to highlight "seasonality." Early warnings of changes in seasonality, whether qualitatively or quantitatively based, can elevate to prominence the key influence that subtle changes in the characteristic flow of the seasons can have on the behavior of living things on land and in the sea.

Our initial seasonality focus is on countries in a greater Southeast Asia. This region was chosen in part because of the wide range of the kinds of climate-related hazards that the governments and their citizens are affected by and, in part because the countries in Southeast Asia consider themselves (and are, in fact, considered by others) to be an integral part of the region for geographical as well as functional reasons (political, cultural, and shared natural resources, such as rivers as well as natural hazards). The notion of a "Greater Southeast Asia" has been introduced because regional politics, cultural, ethnic, and climate similarities do not stop at political or administrative borders.

Four countries were originally chosen for the prototype workshop: Vietnam, the Philippines, Malaysia, and Thailand. Each of these countries has been actively involved in climate variability and climate change issues, and the organizers have had interactions with various researchers within each of them. There has been preliminary interest expressed by the University of Malaya (Kuala Lumpur) in climate affairs as a program. Participants were also selected from Ho Chi Minh City and Hanoi, Vietnam. Some universities in Bangkok also participated in the workshop. It is hoped that the universities and training centers that participated will continue the educational activities related to seasonality and climate change and variability, including health issues. In addition, participants from universities in India, China, and Sri Lanka actively participated.

Educational materials on the topics of seasonality, climate variability, climate change, sustainable development, and the influence of changes in the flow of the seasons on human activities have been identified for use at the university undergraduate or graduate level. A second phase of this activity will be to develop the concept for other universities and other countries in the region. The participants were encouraged to interact electronically and will assist in the development of course materials for use by others in the region.

Acknowledgments

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Participants by Country:

The Philippines

- ***Elizabeth M. Remedio***, Department of Economics, University of San Carlos
- ***Marilou Gallos***, Dean, Department of Education, University of San Carlos
- ***Ramon S. del Fierro***, Dean, Department of Arts and Sciences, University of San Carlos
- ***Ritchie Anne Guzman,*** Philippine Association of Tertiary Level Educational Institutions

Malaysia (University of Malaya)

- ***A.Hamid A.Hadi***, Deputy Vice Chancellor
- ***Khairulmaini BOS***, Department of Geography
- ***Azmi Sharom***, Dean, Faculty of Law

Vietnam (Water Resources University)

- ***Hoang Thanh Tung***, Faculty of Hydrology and Environment, Hanoi
- ***Nguyen Quang Kim***, Vice Director, sub-campus at Ho Chi Minh City

China (various institutions)

- ***Qian Ye***, CCB & Chinese Academy of Meteorological Sciences
- ***Yuan Ren***, Center for Urban and Regional Studies, Fudan University
- ***Qiang Liu***, Ministry of Education

India

- ***Sanjay Chaturvedi***, Center for the Study of Geopolitics, Panjab University

Sri Lanka

- ***Sarath B.S. Abayakoon***, Dean, Faculty of Engineering, University of Peradeniya

Thailand

- ***Anond Snidvongs***, Southeast Asia Regional Committee for START
- ***S.H.M. Fakhruddin***, ADPC/Indian Ocean Tsunami Warning System Project (from Bangladesh)
- ***Suwanna Panturat***, Srinakharinwirot University
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- ***Selvaraju Ramasamy***, Climate Research, ADPC
- ***Suppakorn Chinvanno***, Southeast Asia Regional Committee for START

Other

- ***Michael H. Glantz***, organizer, CCB/National Center for Atmospheric Research, USA
- ***Zafar Adeel***, co-organizer, UNU's International Network on Water, Environment & Health, Canada
- ***Greg Guibert***, Natural Hazards Center, University of Colorado, USA
- ***Sarah Stapleton***, Natural Hazards Center, University of Colorado, USA
- ***LeeNah Hsu***, Climate and Health Consultant, Ottawa, Canada
- ***D. Jan Stewart***, administrator, CCB/National Center for Atmospheric Research, USA

Introduction

Robert Chambers' book on Seasonality and Poverty (Chambers et al., 1981) was the inspiration for my attraction to and concern about seasonality. We know a lot about seasonal problems intra- and inter-seasonal problems and prospects (and, in many cases, solutions). We know about drought-prone, flood-, disease- and fire-prone regions. We also know about decadal-scale fluctuations (e.g., Colorado streamflow variations and trends across decades). But, what we do not know with any degree of confidence is the effect that global warming will have on the actual and expected natural flow of the seasons and on the characteristics of seasonality. It is not just each of the seasons that is important to societies and human activities, but also the actual as well as expected flow of the seasons. --MHG

Workshop Goals

1. **What is the notion of Climate Affairs?**
2. **Why care about climate-society-environment interactions?**
3. **Previous work on Climate Affairs in Southeast Asia**
4. **Explore climate change, seasonality, hazards nexus in Climate Affairs context**

Why Care about Climate Affairs?

Climate affects just about everything: societies, ecosystems and those of special concern, such as ecosystems on which societies depend for their well-being. The Climate Affairs notion can help to foster development of new climate and climate affairs-related activities in universities and training centers in Greater Southeast Asia (e.g., Pakistan to the Philippines).

Climate Affairs is designed to educate educators and train trainers about how climate can and does influence human activities and ecosystems. However, it is very difficult to tell educators that you want to educate them about something, even if it is about a topic they have an interest in but do not yet know well. This is because they feel that they are wise enough to read and learn about climate-related issues on their own, though they often may not get to do it because of time constraints and other pressing obligations of teaching, research, and community service. They can, however, be encouraged to learn about Climate Affairs in ways that do not impinge greatly on their time. It will likely enhance their climate knowledge of use in their chosen fields.

In 1995, the Environmental and Societal Impacts Group (ESIG) at NCAR convened a "Usable Science" workshop in Ho Chi Minh City, Vietnam, on "El Niño/Southern Oscillation (ENSO) and Extremes in Southeast Asia." In 2002, ESIG and the United Nations University (Tokyo) convened a "Climate Affairs" workshop in Kuala Lumpur, Malaysia at the University of Malaya. In 2003, the University of Malaya created its Center for Climate Affairs. From 2002–2004, Glantz was consultant to Columbia University's Earth Institute to develop a prototype Climate Affairs one-year Master's level program. The first year for that program, called "Climate and Society," began in September 2004.

The workshop organizers believe that the concept of seasonality merits much more attention from the IPCC (Intergovernmental Panel on Climate Change) and other climate change science and impacts research programs than it apparently receives at present. At least 2 billion people, living basically hand to mouth and season to season, are very dependent on their expectations about the natural flow of the seasons. Any disruption of that expected flow causes hardships, such as impaired nutritional intake and associated potential increases in morbidity and mortality as a result of food insecurity.

While food insecurity is normal in many countries, an adverse climate anomaly makes a bad situation worse. Even the industrialized countries, which until recently were seen as immune from the impacts of harsh climates, are in constant competition with the climate system, often in ways they do not realize.

Most environmental hazards are seasonal and coping strategies have been sought and in many cases developed to respond appropriately within the limits of forecast uncertainties about the timing, magnitude, and location of occurrence of specific hazards. As climate changes with global warming of the Earth's atmosphere, societies will gradually, and in some cases precipitously, be forced to respond to and cope with events and processes that will surprise them. These may include prolonged droughts in new locations, shifts in tropical storm

tracks in the Atlantic and Pacific Oceans, changes in intensity of the various characteristics of severe storms such as winds and rainfall, appearance of new infectious diseases in unsuspecting places, and so on.

Rather than focus only on the causes of such shifts in national hazard behavior or dwell only on the specific impacts on society, it is imperative to identify more specifically the chain of events from cause to ultimate impacts on humans, including responses to those impacts. We propose to highlight "seasonality." Early warnings of changes in seasonality, whether qualitative or quantitative, can elevate to prominence the key influences that even subtle changes in the flow of the seasons can have on the behavior of living things on land and in the sea.

Introduction to Workshop and Key Concepts: Why We Are Here

Three major overriding objectives of this workshop are as follows: (1) To introduce participants to key concepts related to the notion of Climate Affairs and to climate and climate-related impacts assessments; (2) to elevate the importance of research on the impacts of climate variability, climate change and extreme events on seasonality; and (3) to discuss the importance of global "climate" in the 21st century.

Our seasonality focus is on several countries in a Greater Southeast Asia. This region was chosen in part because of the wide range of the kinds of climate-related hazards that the governments and their citizens are affected by and, in part because the countries in Southeast Asia consider themselves (and are, in fact, considered by others) to be an integral part of the region for geographical as well as functional reasons (political, cultural, and shared natural resources, such as rivers as well as natural hazards). The notion of a "Greater Southeast Asia" has also been introduced because regional politics, cultural, ethnic, and climate similarities do not stop at political or administrative borders.

A participant from India joined the workshop in order to develop pathways to bring the Climate Affairs notion to the Asian sub-continent. A regional workshop was convened on Climate and Society Affairs in Islamabad, Pakistan, in November 2005. It was sponsored by the Pakistan Department of Meteorology (COMSATS Institute of Information Technology) and by NCAR/CCB. Southern China can be considered a part of Southeast Asia and, therefore, for our purposes falls under a Greater Southeast Asia label.

Each participant identified the potential usability of Climate Affairs for his/her own research and institutional needs.

Many concepts were mentioned throughout the workshop. Some of the key ones included climate affairs, deep climate change, seasonality, forecasting by analogy, creeping environmental problems, "step beyond" adaptation, superstorms, seasons of superstorms, adaptation, capacity building, early warning, earliest warning, the "climate century," greater Southeast Asia, usable science, "backing the public into science literacy," "climate, water, and weather affairs," educating educators, viewbooks, lessons identified vs. lessons learned, the issue-attention cycle, the "future already exists," Nature's Bank analogy, the "hawks, doves and owls" analogy, decision-making under uncertainty (DMUU), and Spare Time University.

* * *

A targeted search on the Internet shows that historians as well as social pundits have considered each century for the past 500 years or so as having been dominated by one or another country or empire. This is not to say that historians agreed. It is to say that a dominant Western view (better yet, perception) has emerged. Great Britain, for example, is said to have been a dominant force in the 19th century, in large measure because of its seapower and resultant Colonial expansion. France appears to have influenced world affairs in the 18th century. Some have argued that America has been a dominant influence in the 20th century. Already, various observers are proposing that China's influence on global affairs (from politics to economics and commerce) will dominate the 21st century.

I contend that the 21st century will not be dominated by a country, but by climate. Despite intermittent wars, and epidemics and ideological conflicts that are sure to occur throughout this century, climate in its various forms (variability, fluctuations, change, extremes and seasonality) will prominently influence life on Earth, having impacts both positive and negative on the well-being of people, societies, cultures and governments. --MHG

* * *

We must remind ourselves that climate is not just a hazard or a constraint to economic development for some countries or regions of the globe. It is, and will continue to be, a resource. In other words, there is

a “sunny side” to climate: most people in most places have managed most of the time to subsist within the limits of the climate, water, and weather regimes under which they have learned to live.

This seasonality workshop is what we call a “usable Science” workshop. “Usable Science” workshops represent an approach to identify, discuss, and apply scientific research findings to national needs worldwide. It was developed and has been pursued by NCAR’s ESIG staff since 1993. Our first multidisciplinary, multinational “Usable Science” workshop was held in Budapest (Hungary), where we applied El Niño information, including forecasts, as an early warning of potential food insecurity in various locations in sub-Saharan Africa (Glantz, 1997). As a newly created Center for Capacity Building at NCAR, one of our key goals continues to be making scientific information usable by decision-makers at various levels of government in a wide range of climate-, water- and weather-sensitive socioeconomic sectors, including policymakers.

Climate Affairs purpose:

- **To foster the development of Climate Affairs Programs at colleges, universities, and other educational and training institutes around the globe.**
- **To develop an awareness among educators and trainers in a variety of disciplines that climate affects all aspects of life in rich and poor countries alike, and that decision makers can improve the way they are affected by enhancing their understanding of climate affairs.**
- **To build the capacity of institutions and individuals to deal with climate-related issues.**

A Climate Affairs Program enables students, trainers and educators alike to concentrate part of their educational experience in an area of research, impacts, application, and policy centering on the climate system and on climate-related issues.

The purpose of Climate Affairs is to build human and institutional capacity about climate’s direct and indirect influences on societies as well as about societies’ influence on climate. It serves as a way to spark an interest in climate knowledge and to develop climate and climate-related literacy among those whose careers are not necessarily in scientific fields. In fact, we have a minimalist attitude toward generating Climate Affairs activities on campuses and in training programs: that means that our capacity-building efforts would be deemed successful if they lead to the creation of lectures, courses, seminars, workshops, as well as a university-level certificate or degree program centered on climate-related issues. At the very least, generating awareness about the importance of climate and climate-related knowledge will produce a citizenry that has to elect governmental representatives who make climate-sensitive decisions for society.

Climate Affairs provides what could be called a “soft path” to science literacy and education for the public. In essence, it introduces science to people by “backing the public into science literacy” through a focus on climate, water, and weather impacts on societies and on ecosystems. In addition, by focusing primarily, but not exclusively, on training educators of undergraduates and trainers of people already in the workforce, they become potential consultants, if not advisors, to policymakers on climate-related issues from their disciplinary perspectives. In turn, these educators are then in a position to educate and train undergraduates, graduates, and people in the workforce. Within a few years, their students are most likely to have taken an increasingly influential role in the policy and other decision-making processes in government agencies, educational institutions and corporate structures. Thus, targeted audiences for capacity building in Climate Affairs can be categorized as direct (educators, trainers) and indirect (students, civil society, people young and old) targets in the climate-sensitive workforce.

Organizers’ Objectives

Three objectives:

1. **Enhance interest in Climate Affairs (or, more broadly, climate, water, weather affairs) in Southeast Asia regionally and nationally.**
2. **Explore interactions among climate, seasonality, and environmental hazards.**
3. **Encourage consideration of developing university Climate Affairs activities and developing a regional Climate Affairs network.**

The three specific objectives of the workshop cited above were chosen in order to foster “usable science” in civil society in Greater Southeast Asia through climate, water, and weather affairs activities. Please note that Climate Affairs has become shorthand for climate, water, and weather

issues. These three areas are so intertwined that each by itself is difficult to discuss without bringing into the discussion the other two areas. For example, one cannot talk about water issues effectively without taking into account where the water comes from and where it goes, as well as its uses and its properties. Likewise, it is not possible to talk about climate (precipitation, temperature, vapor, clouds, evaporation, oceans, etc.) without taking weather or water into account. Weather too is a key integral aspect of climate and water issues.

"Usable Science" workshops are based in large measure on applying existing and cutting-edge climate-, water-, and weather-related scientific research findings to existing social and economic activities, while taking into consideration existing scientific, environmental and societal uncertainties that remain. So, for example, while El Niño forecasts are still not yet very accurate in terms of the timing of El Niño's onset, once an El Niño has been determined to have begun for sure, it tends to lock into a cycle of growth and decay over about a 12-month or so period of time. Once an episode has "locked in," so to speak, it is generally associated with a set of relatively reliable teleconnections (a teleconnection is defined as the impacts of El Niño on weather or climate conditions at some distance from the field of action for the El Niño phenomenon (the central or eastern tropical Pacific Ocean). Many of these teleconnections (droughts, floods, fires, frosts, disease outbreaks) are seasonal. Hence, this is an example of usable science related to seasonality issues.

A fourth, unanticipated, result of the workshop has been an example of what can be called "capacity building by proxy." This refers to the fact that many of the participants, who were being exposed for the first time to Climate Affairs as a potential educational activity on a campus, began to ask questions about the problems and prospects of setting up climate affairs activities. They presented their questions to the director of the recently established University of Malaya Center for Climate Affairs (Khairulmaini bin Osman Salleh). Participants were interested in learning directly from him how he had been able to gain the interest and capture support of the university's administrators and faculty in setting up the Center on his university's campus. They directed their concerns to him, because he had gone through the process of developing Climate Affairs on his campus a few years earlier, with the assistance of NCAR and the United Nations University (UNU). This was a great example of "capacity building by proxy": A university in the South was serving as a prototype to countries in the developing world instead of using a university in the industrialized North.

Capacity Building Defined

Efforts under the label of capacity building are aimed to develop human skills and societal knowledge within a community or organization in order to increase societal resilience and to reduce vulnerability to climate, water, and weather anomalies and hazards. Capacity building also includes the development or mobilization of institutional, financial, political, moral, and other resources, such as technology at different levels and in different sectors of society.

There are several formal and informal, even personal, definitions of capacity building. Therefore, there is a good chance that it will mean different things to different people. However, capacity building is much more than just creating an enabling environment where decisions can be made. It must include making something happen as well as to provide tools, making it possible for something to happen. There are also competing perceptions about what capacity building is supposed to accomplish. This makes it difficult, if not impossible, to identify a universally accepted set of indicators with which to measure either its progress or its success.

Capacity Building: Developing Country (UNDP) Definition

A capacity building process is defined as involving:

- **The creation of an enabling environment**
  Institutional development and community participation
- **Human resource (or potential) development**
  - **Other terms are also used to describe this process:**
    - Capacity development
    - Capacity enhancement

UNDP recognizes that capacity building is a long-term, continuing process, in which all stakeholders participate.

[www.gdrc.org/uem/capacity-define.html]

The UNDP notes that "capacity building is a long-term continuing process in which all stakeholders

participate." With regard to this UNDP statement, stakeholders will also have their own definitions of capacity building, and this reality must be taken into account in the process of improving capacity in issues related to climate, water, and weather. There should be operational goals and milestones along the way to measure somehow the progress being made toward a threshold level at which capacity can be said to have been "built" and self-sustaining.

Capacity Building: Education & Training Activities

- **What *we* see as Capacity Building: institutional and individual**
- **Foster interest in possible Climate Affairs programs and activities**
- **Identify level of potential interest for each university or training center**
- **Discuss Viewbooks**

Discussion in this session especially, but throughout the workshop as well, exposed the interest of the participants in developing some type of a climate affairs activity on their campuses. The level of interest was high for each country, although each one had a different climate affairs activity in mind: a seminar, a diploma, a Masters degree, lecture series, etc.

For example, the participants from the Philippines (educators from San Carlos University, Cebu City, and from a national government agency in Manila whose mission is environmental education) identified a range of possible climate-related educational activities in their country, such as teaching high school teachers in a summer program as early as mid-2006 and developing a college course or program. The participant from Sri Lanka (a Civil Engineering professor) also proposed developing a summer course in Climate Affairs at his university. The participants from Water Resources University in Vietnam expect to develop a program with the support of the CCB staff. The participant from Malaysia proposed to develop a Masters program in Climate Affairs, etc.

Outreach for the Climate Affairs concept is designed to "expose" the importance of using climate and climate-related knowledge in climate-sensitive socioeconomic sectors and decision-making processes. There are many useful examples (e.g., case studies) of the interactions among climate, society and the environment as well as examples of the use of information in decision-making.

Such case studies, when carefully assessed, can provide useful insights into how societies might improve their interactions with the climate settings under which they have to operate. Case studies also provide insights into strengths and weaknesses of societal coping mechanisms in the face of changing global and regional climates.

"Seasonality" Viewbooks were prepared for the participants. These contained the agenda, questions for discussion, and background information about various topics to be addressed. The participants' Viewbook can be downloaded from the Internet at www.ccb.ucar.edu/apn/bkkViewbook-final.ppt.

Climate Affairs Template Components

- **Climate science**
- **Climate impacts**
  - on societies
  - on ecosystems
- **Climate policy & law**
- **Climate politics**
- **Climate economics**
- **Climate ethics & equity**

The Climate Affairs template is a generic template that provides a checklist of aspects of climate (from climate-related science to ethics & equity) that needs to be taken into consideration when evaluating the level of influence of climate and atmospheric processes on human activities and on the environment. It is necessary to repeatedly remind policymakers, as well as physical and biological scientists, that the climate system is no longer made up only of geophysical and biological components. It is easy to show societal influences on climate, from the local-to-global spatial and temporal scales. Societal influences on global climate, e.g., on temperature, vegetative cover, or the hydrological cycle, are to a large extent now identifiable and measurable, as are the long-known influences on climate of such factors as sea ice, forests, glaciers, deserts, clouds, topography, etc.

Thus, the template encourages physical and social scientists, as well as people in the humanities, to learn about the climate system, a system that now – in the 21st century – clearly includes society as an

integral and active component. Regardless of disciplinary background, each university educator of undergraduates or trainers of people in the workforce are at liberty to modify the Climate Affairs template in order to fit their personal and organizational research needs and teaching interests. It can also be adjusted to mesh within the constraints that might be imposed by a university's finances or by its academic guidelines.

Open Discussion

- **Can climate / weather / water affairs activities be incorporated into university settings?**
- **Can interest in climate-related issues be generated and sustained in different disciplines and university centers?**

The following comments were made during discussions about the possibility of developing Climate Affairs activities on a campus. The points that follow were suggested in a brief presentation by Khairulmaini bin Osman Salleh. As noted earlier, two years ago, Khairul developed a Climate Affairs center on the University of Malaya–KL campus, the first center of its kind in Southeast Asia. He shared his experiences, comments, and made suggestions about what he felt was needed to establish a center on his campus in Kuala Lumpur.

- Created a Climate Affairs awareness course for undergraduates;
- Suggested educating undergrads at first as part of their discipline's degree program;
- Suggested that there must be a champion for Climate Affairs on campus;
- Noted the need to identify potential employment possibilities for the student body interested in Climate Affairs (in Malaysia, for example, tourism, agriculture, energy, forestry). In other words, students want to know if there are jobs in Climate Affairs;
- Noted in his case that he needed the support of the Vice Chancellor (and got it) and high-level administrators to sustain the Climate Affairs program;
- Underscored the need to attract educators from a range of physical and social science disciplines into the Climate Affairs activity in order to make it truly multidisciplinary;
- Need to encourage deans to support the effort;
- Climate Affairs, as an academic activity, could be expanded beyond the undergraduate level, once the program takes hold on campus;
- Need colleagues. You cannot build such a program alone;
- Need secretarial support;
- Need seed money (about $30K US was received from the University of Malaya);
- The University of Malaya is preparing a proposal to be submitted to the AUN (ASEAN University Network) to develop the University of Malaya–KL as a regional Southeast Asian Climate Affairs center. This would help to direct some regional resources to focus on climate, water, and weather-related problems *affecting the region*, such as haze and fever outbreaks.

Additional Comments

Khairul reiterated his belief that it is imperative to get a "buy in" from faculty members in different disciplines. He also reminded the group that a prime concern of students, when they are selecting courses, is whether that course (or program) would in some way help them to find employment. Adeel (INWEH) noted that one must show the marketability of a Climate Affairs course, certification, or degree. He also suggested that it is necessary to first identify local capacity availability and their needs in order to develop an ongoing Climate Affairs activity.

Yuan Ren explained briefly about Fudan University's interactions with Oslo University (Norway). He reminded participants that, if expertise does not exist on one's own campus, it is possible to link to other campuses where that needed expertise does exist. He also suggested that the development of a Climate Affairs activity on a campus could be pursued by either a top-down approach (being developed by the university administration and set in place for students) or a bottom-up approach (developed slowly and out of the emerging interest of faculty and students in Climate Affairs issues). In most cases it will likely be a mix of these approaches, depending on the structure, function, and needs of a specific university or training center.

Seasonality

There are several definitions of seasonality:

- The changing availability of resources according to the different seasons of the year;

- Periodic fluctuations in the climate related to seasons of the year (e.g., wetter winters, drier summers);
- Many time series display seasonality. By seasonality, we mean periodic fluctuations;
- Cylicality in a business or the economy from one season to the next;
- Of, or dependent on, a particular season;
- Changes in business, employment, or buying patterns which occur predictably at given times of the year;
- Seasons are defined differently in different environments and by different societies.

Seasonality is a cross-cutting issue, in the sense that it cuts across disciplines, resources, and issues. It was suggested that seasonality variations and changes (natural and human induced) are mainly threatening most immediately to those at the local level. Therefore, there is a need to build human and institutional capacity at that level in terms of awareness and coping tactics and strategies. Seasonality also cuts across all elements of Climate Affairs.

Seasonality and the natural flow of the seasons vary from one location on the globe to another. In some regions, seasonality of temperature is most important, while in other areas seasonality of precipitation is a key concern.

Alterations in the characteristics or behavior of seasonal climate are not the only threat to local people. For example, the recent deadly mudslides in the Philippines were initially blamed on seasonal rains that were prolonged (5 days). However, in the higher elevations mountain slopes had been deforested. As a direct result of excessive and prolonged rainfall and deforestation, the soils became supersaturated with moisture and the soil began to move. It was the combination of underlying (deforesting mountain slopes) and precipitant (prolonged rainfall) factors that produced the deadly mudslide.

Participants expressed their beliefs that the seasons were not as predictable as they used to be in terms of temperature, precipitation, timing of the season's onset and ending, and so forth. They also suggested that we (societies) have become more dependent on the seasons, not less, despite technological attempts to buffer society from the vagaries of climate. This interesting suggestion merits considerable discussion and research.

To gain a glimpse of seasonality and perceptions about it and its impacts on society at the local level, we should rely on available science and rely as well on what we can learn from folk wisdom and local stories of the past provided by the elderly. Researchers need a broader understanding of perceptions about seasonality.

Researchers now acknowledge that there are different kinds of droughts: agricultural drought, meteorological drought, hydrologic drought, paper drought, green drought, etc. Agricultural drought occurs when there is insufficient moisture for plants to produce their expected yields or meet desired production levels. Meteorological drought is said to occur when there has been a reduction of precipitation in a given period of time, e.g., 25% less rainfall in the rainy season. This, however, may not result in an agricultural drought, if the rain that does fall does so at the time when the crop's growing cycle can use it.

Hydrologic drought refers to do with a predetermined reduced level of streamflow that is some percentage of a long-term average annual flow. A "paper drought" is said to occur when an agent from a bureaucratic unit tells the farmers that there will be no water available for their use on their fields as a result of water laws and water-rationing allocations. "Green drought" is when the vegetative cover on the surface of the land appears to be green, but no grain is produced by the crops, due to moisture stress, for example.

Different government ministries and agencies divide up nature in ways that nature itself is not naturally divided. Therefore, what is viewed as "drought" by one ministry may not be viewed and labeled as such by another. For example, a national meteorological service may identify a drought based primarily on rainfall conditions, while the Ministry of Agriculture rejects their designation, because the crops in the field appear to be doing well in the midst of their growth and development cycle. Thus, an understanding of what has been referred to as the *institutional landscape* is very important to effective coping with seasonality issues involving both problems and prospects.

Seasonality: The PowerPoint

- Science of seasonality and changes in seasonality
  - Under condition of contemporary climate
  - Under condition of global warming
    - *Transition to new climate regime*
    - *"End-state" of new climate regime*
  - Definitions and perspectives
  - Impacts on society and ecosystems
    - What's already known: drought, flood, fire, frost, etc
    - Unknowns: climate and climate-related surprises
  - Policy and law
  - Politics
  - Economics
  - Ethics & equity

Glantz gave a PowerPoint presentation on seasonality, using a template similar to that used for Climate Affairs. A brief summary is presented here. (The complete PowerPoint can be found in the Appendix.) Glantz began the presentation with two quotations about seasonality taken from Chambers et al. (1981):

> "It is difficult to find any aspect of rural life in the tropical third world that is not touched by seasonality."

> "Does seasonality make some people poor and keep them poor?"

Climate-related hazards are, for the most part, seasonal. Droughts, floods, fires, frosts, streamflow and tropical storms are variable according to the rhythm of the seasons. There are other kinds of climate-related seasons to consider as well: for example, the hunger season, the growing season, fishing season, clothing seasons. He suggested that the activities of most people are attuned to their expectations about the natural changing of the seasons, and that any disruption of that expected flow will result in changed human activities and often will result in hardship for them. They have to wait a year or so for the fruits of the next harvest and, in the meantime, they must go into debt to buy or borrow food in order to survive until harvest.

Glantz proposed that most people, whether living in an industrialized society or in a developing one, were more dependent on the natural flow of the seasons (more correctly, their perceptions of the natural flow) than their governments realize.

Some of the aspects about seasonality of concern include, but are not limited to precipitation, temperature, solar radiation, cloudiness, relative humidity, wind speed and direction, and the lengthening or shortening of the seasons. The impacts of disruptions of seasonality on ecosystems and societies vary in general by latitude, altitude, and by human activities that are directly and indirectly influenced by climate.

Societies have pursued different ways to override the influences of the characteristics as well as the flow of the seasons on societal well-being, with varying degrees of success. Some of the ways societies have come up with to "beat the seasons"; that is, to overcome the influence of the seasons include the development of elaborate irrigation schemes, refrigeration and heating technologies, air conditioning, greenhouses, livestock feeding pens, and even trade policies which allow for comparative advantage (exporting produce that cannot be grown in some climate zones in exchange for products that are produced in those other zones).

That there are adverse and advantageous impacts of climate on human health has been well known for centuries, if not millennia. The literature is bountiful on this topic of perennial concern to societies and governments, rich and poor. What has been of relatively recent and of growing interest has been the "foreseeable" impacts on human health of global warming. Vector-borne diseases are clearly linked to climatic conditions and many of those are linked to seasonality.

Many new articles, books, seminars, conferences, and research projects have appeared since, say, the mid-1980s with the UN World Health Organization as a major actor in this area of climate-related research application. National governments are also targeting for research global warming's effect on existing and new diseases ("old" infectious diseases moving into new areas) for policy purposes. This has become a prominent and exciting area of climate-related research.

Seasons and Human Health

- **Identify and discuss known links between seasons and human health**
- **From Ebi et al., "Integration of public health with adaptation to climate change"**
    - Heat-related illnesses and deaths
    - Extreme weather events-related health effects
    - Air pollution-related health effects
    - Water and food-borne diseases
    - Vector- and rodent-borne diseases

Dr. LeeNah Hsu gave a PowerPoint overview of "Climate change, seasonality, health and development." She underscored the point that ecosystem health and human health are integrally linked, noting that an "ecological characterization" of a region can provide insights into potential health and health-related hazards. She described some of the specific linkages in the following box.

Some ecological influences on health

Floods & drought	Cholera	Bangladesh
Forest fire	Nipah virus	Malaysia
Humidity	Lyme disease	
Temperature, rainfall	Dengue, Malaria, Hantavirus, Cyrptosporidiosis, HIV	Coastal
Migratory bird	Avian flu	Pandemic

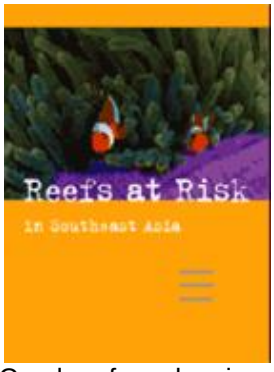
Some examples were shown of how certain vector-borne diseases are temperature dependent, such as mosquitoes and malaria. She noted that in the face of a warming global climate and changes in regional climates that pathogens tend to keep up with (that is, adjust to) such changes, perhaps more efficiently than do human populations. She then noted that early warning systems are important for detecting changes in risk levels to certain weather and climate sensitive disease vectors but that, as an integral part of those systems, response mechanisms are essential for successful outcomes in public health care.

Hsu provided a graphic highlighting an "Early warning rapid response system linking climate change, seasonality, people, development and health. It noted the importance of including surveillance at certain crucial points: spatially, temporally, seasonally (and for seasonality), and dormancy, threshold and movement phases of the vectors of concern. Glantz then showed a "hotspots pyramid" that had been prepared for the UN FAO as a graphic way to discuss early warning needs for food production/environmental degradation as well as other environmental changes of concern to societies (Gommes et al., 2004).

Hsu ended her presentation with a call to shift away from multisectoral research to transdisciplinary research and from disciplinary training to transdisciplinary curricula, teaching, and institutional development. It was again noted in the discussion that followed that people and their bureaucracies divide themselves into units convenient to their interests. Nature does not operate in the same way. For example, we have groups that study water, others the soils, still others the climate; and then we create ministries to support their activities. Nature is holistic, and if it were a person it would respect neither international borders nor bureaucratic jurisdictions.

Dengue mosquito

Ecosystems are at risk too!



Coral reefs under siege

This publication was shown on a slide and in the Viewbook as a reminder that ecosystems are also at risk to changes in seasonality as well as changes in the variability and extremes that occur on seasonal-to-interannual time scales. In general, some of those risks are human-induced (e.g., encroachment of human settlements on pristine areas, fragile ecosystems, or marginal lands). Other risks are seasonal, and they are worsened by prolonged or permanent changes in the expected flow of the seasons. Ecosystems are also at risk to the seasonal and the perennial pressures associated with human activities.

Decisions about land and water use can influence atmospheric processes on seasonal time scales. For example, the drying out of the Aral Sea in Central Asia that resulted from inappropriate irrigation and technology practices has had an adverse impact on the regional climate and characteristics of the various seasons. Scientists have noted that the summers have become hotter and the winters colder. In other words, the regional climate around the sea has become "continental." Wind direction and speed have also been altered by the drying out of the sea; dust storms, for example, originating on the desiccated sea bed have a seasonal bias.

(The Russian stamp at left depicts the drying out of the Aral Sea with a rusted fishing boat trapped in a sea of sand.)

Irrigation is said to increase relative humidity in and around the irrigated area. In addition, irrigation can be used to bypass or supplement seasonal precipitation patterns and their unpredictable constraints on agricultural production. It can be used to assure that a steady supply of water would be delivered to potentially fertile but very dry soils at different times of the year, not when nature dictates but when decision makers decide the crops need water.

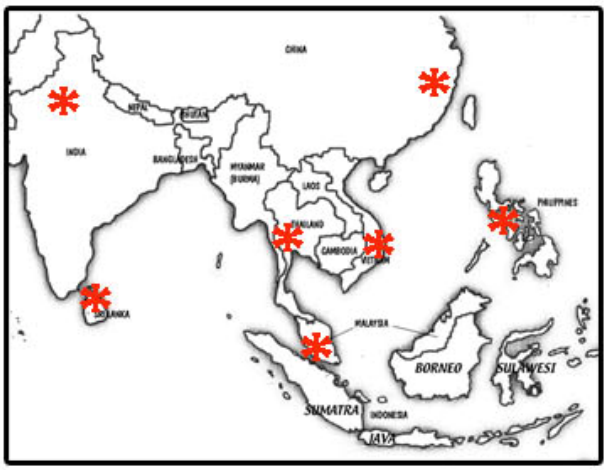
As another example of human influence on seasonality, tropical deforestation in Brazil has had an impact on regional rainfall. Researchers have identified that about half of the rain that falls in the Amazon Basin comes from evapotranspiration from the vegetation in that basin. Deforesting the rainforest can reduce precipitation by a significant amount.

Researchers and the public now know very well that the urban heat island effect has altered the urban temperatures by at least a few degrees Fahrenheit. This results from the large surface area covered by concrete, asphalt and the use of air conditioners, heaters, and cars.

And then there is the slow warming of the Earth's atmosphere that is attributed by the IPCC scientific community to the human use of fossil fuels and other heat-trapping greenhouse gases, tropical deforestation, and certain types of land use. Global warming, regardless of cause, will have a major impact on the various characteristics of each of the seasons as well as on the existing natural flow between seasons. Eventually, talk about global warming will also influence perceptions and expectations about that seasonal flow to which societies have already become accustomed.

Country and Organization Brief Overviews

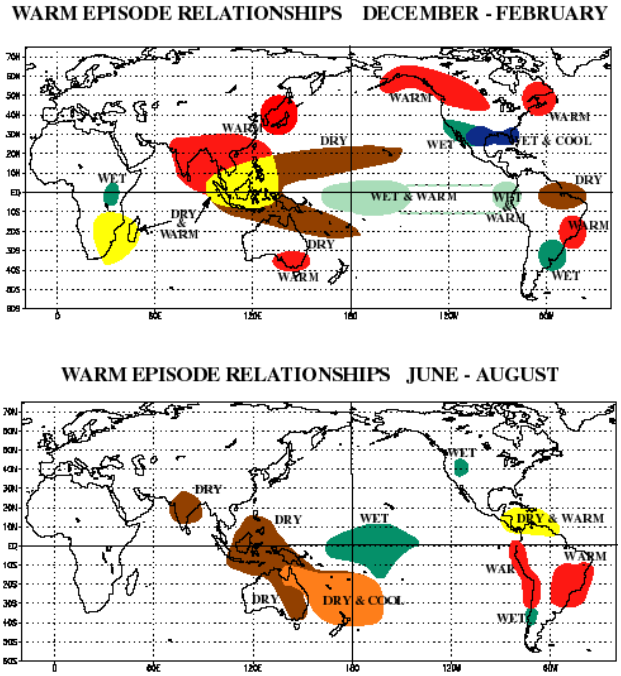
Participants from each country presented a brief overview of their country's climate, water and weather related hazards that governments and their citizens are likely to face in any given year. Training and educational organizations also provided overviews to the workshop about their missions and activities. Participants then identified similarities with respect to the types and timings of hazards to which their countries are known to be at risk. Collectively, the participants represented a wide range of disciplinary backgrounds and therefore, perspectives on climate-society-environment interactions: political science, chemistry, hydrology, geography, atmospheric science, statistics, education, civil engineering, university administration, and science management.



Location of participants' countries are indicated by an asterisk.

Glantz provided an overview of the El Niño-Southern Oscillation cycle (ENSO). Arguing that the ENSO extremes are "spawners" of natural hazards and potential disasters, he underscored the fact that these extremes (El Niño, or warm events, and La Niña, or cold events) generate the occurrence of certain climate- and weather-related anomalies. In distant parts of the globe and not just in Pacific Rim countries, El Niño has been linked geophysically to anomalous weather and climate. Some of those physical or statistical linkages over large distances are called "teleconnections." The relationship between El Niño's occurrence and the strong possibility of drought in northeast Africa, for example, is based on statistical correlations.

As another example, In Southeast Asia during an El Niño event, there is a high probability of drought in the Philippines and Indonesia as well as an increase in forest fires and haze throughout the region. Infectious disease outbreaks, such as dengue fever in Vietnam, have been linked to El Niño. Also, likely impacts of an El Niño include frost episodes in the highlands of Papua New Guinea, which can have a devastating impact on food security in the highlands. Glantz concluded by noting that forecasts of El Niño (and La Niña) can provide the earliest warning possible to some governments in this region about foreseeable adverse climate anomalies and climate-related impacts they may have to deal with.



Participants then collectively identified the various obvious and no-so-obvious climate-, water-, and weather-related hazards in the greater Southeast Asian region. This list, meant to be illustrative as opposed to exhaustive, follows:

Regional Hazards in General

(influenced by seasonality in Southeast Asia)

Tropical storms	Saltwater intrusion
ENSO cycle	Sandstorms
Monsoon cycle	Flash floods
Droughts, floods	Hail storms
Fires, haze	Frost
Mudslides, landslides	Fog, smog
Disease outbreaks	Hypoxia/eutrophication
Coral bleaching	Invasive species
Pest attacks	Tidal surges
Red tides (harmful algal blooms)	Heat waves

Cyclones, typhoons and other tropical storms/ El Niño

(usually occur in summer and autumn)
(they originate between 5 deg N and 20 deg S of equator)

- **During a typical El Nino year (year of onset +1), tropical cyclone activity is:**
  - Reduced in the Atlantic Basin
  - Caribbean, southern USA, Central America
  - Reduced in the western part of the NW Pacific
  - Reduced off NE Australia; slightly reduced off western and northern Australia
  - Increased in eastern part of NW Pacific
  - Increased in south and central Pacific
  - Slight increase in eastern north Pacific

Cyclones and tropical storms/ La Niña

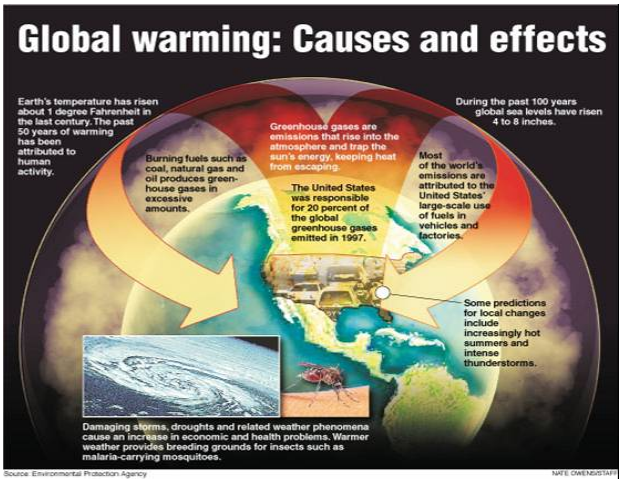
- **During a typical La Nina (year of onset +1), tropical cyclone activity is:**
  - Increase in the Atlantic Basin
  - Increased in the western part of the NW Pacific
  - Increased off NE Australia and slightly reduced off W and N Australia
  - Reduced in the E part of the NW Pacific
  - Reduced in the S and central Pacific

Cuba is a country that has a good record for responding when it comes to taking action to early warnings of regional hazards, such as hurricanes. The situation is as follows: Cuba has an authoritarian government, which in the face of impending climate-related risks, can move thousands of people without having to convince its citizens of a potentially imminent danger; it calls on them to evacuate areas at risk to, say, a hurricane, related winds, and storm surges. Cubans would comply with a government declaration to flee the coast or move to higher ground. This raises an interesting question about the degree of personal decision-making independence that citizens in other countries would be willing to relinquish to their governments in exchange for an increase in personal safety, which would require having to obey safety measures that are mandatory as opposed to voluntary.

The trade-off appears in this instance to be between personal control over one's activities as opposed to embracing a near-perfect disaster avoidance system that can only be carried out with strong top-down management, at least where potential disasters are concerned. It is difficult, however, to reduce impacts to zero, even with the best warning systems. To date, there is no truly fool-proof (perfect) climate-related system of alerting 100% of the people to impending harm.

A comment from Kristie Ebi (Ebi et al., 2005) on public health sums up the dilemma quite well: "In general, the need to protect society is a higher imperative in public health than are the rights of an individual. Public health practitioners believe that as long as the community perspective and the pursuit of common good remain in force, actions can occasionally be taken that limit individual autonomy or infringe on justice" (p. 4).

* * *



Global Warming: A Brief Overview

The global warming problem from science to ethics & equity was briefly presented by Glantz. He offered an overview of the global warming issue by addressing what is the global warming problem, who is responsible for it, who and what will be affected by it, when did concern about it capture attention, when might its impacts be clearly identifiable, how might it be addressed by governments and by citizens, and whose responsibility might it be to take the proverbial first steps to reduce their greenhouse gas emissions in the near future.

Glantz then in the context of equity issues discussed the "Nature's Bank analogy." He described the idea briefly as follows:

Everyone from the poorest farmer or herder to the richest person knows that if one borrows money from a bank at some point that loan must be repaid. If one looks at Nature as an environmental bank, then some countries that in the process of developing their economies polluted the

atmosphere with a range of gases and other pollutants. They also "borrowed" land and water from Nature – not only these physical resources, but also its quality by degrading air, soil, vegetation, and water. Having now achieved their desired threshold levels of development, one could use the Nature's Bank analogy to argue that it is an appropriate time to ask developed countries to pay back to the environmental bank the loans they borrowed since the 1700s (especially air and water quality) by taking the first steps to clean up the global environment.

Doing so, i.e., restoring environmental quality by reducing greenhouse gas emissions or reforesting areas they had caused to become denuded in other countries, would allow developing countries to develop without the same high level of constraints imposed on their interactions with the environment. In other words, in a period of transition to a cleaner environment and to more sustainable economic development process, developing countries could phase down their contributions more slowly than their industrialized counterparts, at least for a specified period of time.

In sum, in the context of the global warming issue, one could effectively argue that industrialized countries have a responsibility to pay back Nature's Bank, enabling some of the developing countries to continue to emit greenhouse gases with no net global gain of GHGs to the atmosphere. The industrialized countries by reducing their emissions first, enabling developing countries to continue to emit GHGs for some period of time in their attempts to surpass a threshold level of sustainable economic development.

Focus on Global Warming

- **Suggestions about impacts of climate change on Southeast Asia**
- **Suggestions about options (in theory and reality) for adaptation and mitigation in Southeast Asia**

Participants then focused on identifying possible changes in regional climate conditions that might be expected to accompany global warming. The traditional (obvious) set of adverse societal and environmental impacts were noted: more droughts of greater intensity, an increase in the frequency, intensity and location of tropical storms (including cyclones and typhoons), more floods, an increase in the frequency and spatial extent of Southeast Asian forest fires and resulting increase in episodes of haze, an increase in vector-borne diseases (as well as their appearance in areas not previously affected), and longer and more intense heat waves, as happened in April and May 2006 in parts of India, for example. Also an increase in sea level would be accompanied by an increase in saltwater intrusion into groundwater, and increasingly further upstream in rivers near the coast as a result of hydrological droughts inland.

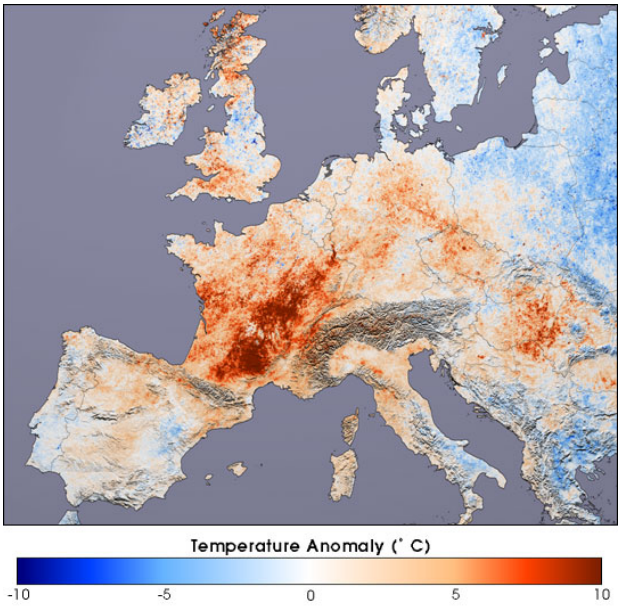
Many people believe that more information about the future, such as in forecasts, will automatically assure better decision making. That is an unrealistic expectation. In theory, one can identify many ways to use a forecast to take action to protect society from adverse impacts. In theory, everything is possible. The reality is that societies (and their institutional structures) have many obstacles that need to be identified as well as overcome. Even perfect forecasts, days or weeks in advance, will expose societal problem, when it comes to preparing for potentially foreseeable adverse impacts. Many societies do not so choose to recognize or deal with known constraints on the improved use of climate-related forecasts; that is, until after a disaster strikes. The recent Hurricane Katrina (August 29, 2005) in the Gulf of Mexico is a perfect example of a poor U.S. government response to a near-perfect forecast 60 hours in advance of impact on America's Gulf Coast.

A Step Beyond Adaptation

- **Mitigating the impacts of adaptation to climate change**
- **Enhancing adaptive capacity**
  - Reducing vulnerability
  - Enhancing resilience
  - Strengthening coping capabilities

Glantz raised a new topic, often overlooked, which he refers to as "mitigating the impacts of adaptation to climate change." The purpose of addressing this topic was to identify "soft landings" for those most vulnerable to the consequences of changes in climate and their environment and for those who are likely to be displaced from their normal activities and forced to adapt to their new conditions where they live or elsewhere. For example, it is plausible that people will flee from cities permanently, as heat wave frequencies and intensities increase. Plans can be developed that would prepare for that influx into new areas, so that displaced persons do not have to start their new lives unprepared, in poverty, or subjected to other forms of deprivation and discrimination. The impacts of Hurricane Katrina and government responses to it provide a "teaching moment" about the importance of thinking seriously

about mitigating the impacts of adaptation to climate change, such as lost medical records of refugees due to flooding.



Europe heat wave, summer 2003. More than 30,000 deaths were attributed to it. Modis (Moderate Resolution Imaging Spectroradiometer) satellite picture comparing July 2001 to July 2003. Image acquired 31 July 2003 by R. Stockli and R. Simmon, NASA's Earth Observatory Team. (http://earthobservatory.nasa.gov)

In this context, consideration of the Precautionary Principle can help avoid undesired, unintended impacts and can help to avoid or at least prepare for second- and third-order (i.e., downstream) effects that are likely to cause disruptions to human activities and settlements.

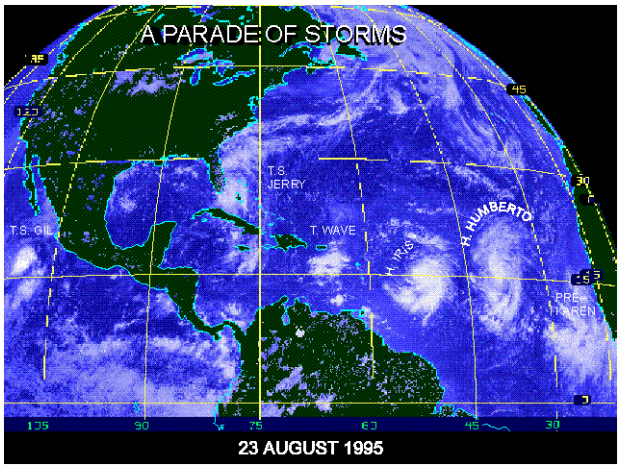
Introduction of Notions

- **Superstorms & "Seasons of Superstorms"**
  - **High-impact weather and climate**
  - **Presentation of Hurricane Katrina's impacts and responses**
- **Forecasting by analogy**
- **Creeping environmental change**
- **Early warning systems**

Each of the notions was described as they relate to seasonality and to the impacts of climate, water and weather.

- ***Superstorms & "Seasons of Superstorms":*** Since the early 1990s, there has been a sharp increase in the labeling of extreme climate- and weather-related events and anomalies as "super." "Super" is, as yet, undefined but has been used to refer to the strength of the specific weather and climate indicators as well as to the level of their deadly or costly impacts. Even if a climate- or weather-related anomaly was not an extraordinary one in any way, shape, or fashion, it could still be viewed as a super event, depending on regional history; that is, an event not witnessed before. Today, there is concern as well as expectations that extreme climate and weather-related events are increasing in intensity if not in frequency, and maybe even shifting location of impact In fact, the 2004 and 2005 tropical storm seasons were record-setting in terms of the number of events (in the Atlantic in 2005) and in the number making landfall (in Japan and the US in 2004).

- ***High-impact weather and climate events:*** High-impact weather and climate events capture the attention of the public and of decision makers at all levels of society, from local to national. These events may not be record-setting but can be dangerous to humans and destructive of property. A gentle but prolonged rainfall over several days, as was the case with the recent mudslides in the Philippines can destroy an entire village. Hurricane Katrina's impacts and responses were discussed, viewing it, like many other extremes, as providing a teaching moment for students as well as educators. While its strength as a hurricane was a Category 3 when it moved inland, the damage it caused made it the country's most costly "natural" disaster in American history. Such events can be assessed and discussed using the Climate Affairs template, from the science of high-impact events to their impacts on equity in a given society.

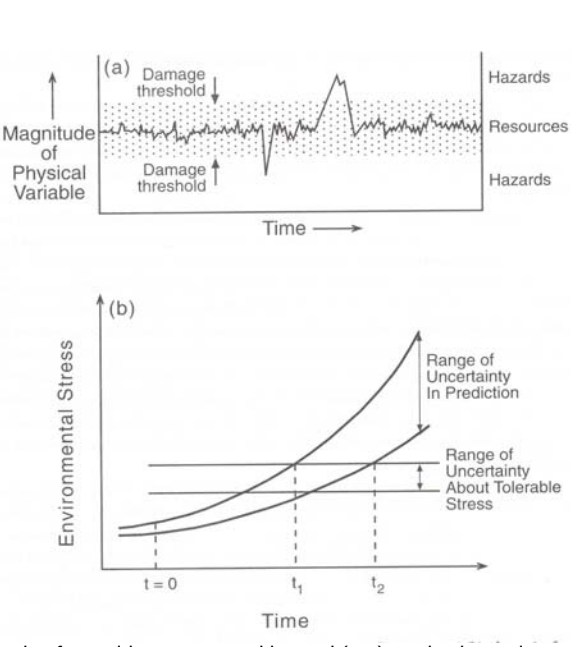


A parade of storms heading toward the United States in August 1995 may foreshadow increasing frequency and intensity of storms and seasons of superstorms in the future.

- ***Forecasting by analogy*** is an approach in climate-related impacts studies that uses case studies of environmental changes from the recent past taken from the same or even other locations or other times that appear to be similar in some way to the environmental changes taking place in the region under investigation. This is used to identify ways to improve positive responses to climate-related hazards, while identifying and removing constraints on society's ability to cope effectively with those impacts.

- ***"Creeping environmental change"*** is a notion where environmental change is of the slow-onset, low-grade but cumulative kind. Changes from day to day or week to week are imperceptible to the human eye. However, after an extended period of time has passed, an environmental crisis has emerged because those incremental changes had been accumulating. As with changes in air pollution, tropical deforestation, or soil erosion, or even with greenhouse gas emissions, these environmental changes (let alone their impacts) are not readily discernible in the short term. Most environmental changes in which human are implicated are of the "creeping" kind. No government, regardless of the type of its political or economic system, has managed to work out how to cope effectively and in a timely way with creeping problems in their early stages (Glantz, 1988).

- ***Early warning systems*****,** as noted earlier, involve not just a warning about an emerging problem but also include dissemination of the warning and responses to the warnings and impacts as well. It appears that governments do not realize how important climate-related early warning systems are to their stability and to the well-being of their citizens.



Schematic of a rapid-onset natural hazard (top), and schematic of show-onset (creeping) environmental problems (bottom).

Participants Prepare a SWOC

(Assessment of **S**trengths, **W**eaknesses, **O**pportunities, and **C**onstraints) In order to undertake a SWOC assessment, participants separated into small groups to discuss the different aspects of a SWOC (strengths, weaknesses, opportunities, constraints) as they applied to the possibility to undertake Climate Affairs-like programs and to undertake such activities from the perspective of their specific university or training courses. This SWOC chart follows on the next page.

The results of the small group discussions that follow are illustrative.

SWOC Chart:
Developing a Climate Affairs activity at universities or training centers (for purposes of illustration)

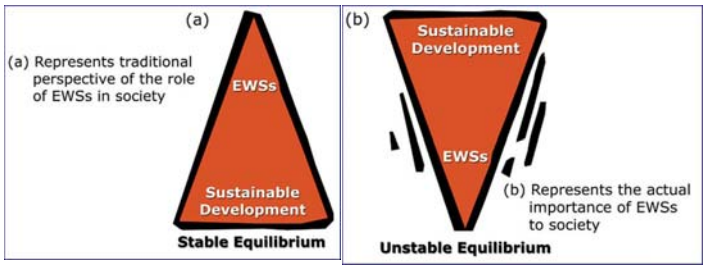
Strengths	Weaknesses	Opportunities	Constraints
Universities have: --Existing human resources and discipline-focused departments --Several disciplines/faculties to draw on --High potential for affecting social change --Documented traditional knowledge research useful for Climate Affairs --Have knowledge of the subject --Have international involvement --Potential leaders with vision --Links to international network --Could create Masters degree program --Linkages to government agencies and NGOs --Some who are already networked with governments --Desire and ability to collaborate --Infrastructure exists and is available --This would be a new activity that piggybacks existing program --Indian Ocean Research Group will support the efforts --Can be a catalyst to involvement of other disciplines --International support for diploma in Climate Affairs --Climate Affairs goal is to educate educators	--Limited linkages among relevant disciplines --Few university incentives for integrating disciplines --No merit for teaching multidisciplinary courses --Perceived limited job opportunities for Climate Affairs students --Lacking a passionate prime mover(s) among faculty to foster Climate Affairs on campus --Lack of initial support of higher university management --Lack of multidisciplinary expertise related to climate --Lack of financial resources --Lack of incentives for faculty to develop expertise focused on multidisciplinary climate issues --Lack of faculty-based critical mass for Climate Affairs --Lack of a track record for such a new activity in attracting faculty or students to do Climate Affairs activities at the outset	--Use context-based case studies relying on actual region-specific climate events and their impacts to integrate into cross-cutting activities --Can use diverse teaching methods --Multimedia possibilities --Can engage marketing strategies to develop a national strategy for the communication of climate issues --Piggyback public festivals (e.g., Climate Affairs Month) --Can involve university administrators to develop a strategic plan --Piggyback existing structures and programs --Take advantage of growing awareness of climate affairs --International links and collaborations --National to local levels of interest in natural hazards --Can create an electronic journal for interdisciplinary studies --Can create international board of willing participants --Convert to collaborators from competitors (foster cooperation among disciplines as opposed to conflict) --Use existing forums (e.g., International Polar Year 2007; Shanghai Expo 2010) --Use multimedia centers --Establish a national and, if desired, an international e-visory group --Develop Spare Time University concept	--Funding availability --Low awareness of faculty in general about climate issues research and application --Limited climate, water, weather-related expertise available on campus --Heavy existing workloads --Apparent lack of interest in climate --Politics within and outside the campus environment --No textbook in local languages on climate (especially at the primary & secondary levels) --Difficult to publish in peer-reviewed journals --Incompatibility of data across disciplines --Need local cooperation for local needs --We have competitors --“Working culture” often difficult to change (e.g., disciplinary bias)

Capacity Building for Early Warning

- What does it mean to "build capacity?"
  - *Institutional*
  - *Individual*
  - *Societal*
- Creating a "culture of prevention"
- What are the ethical aspects of capacity building?
  - **"Capacity building by proxy"**
  - **Is the call for "capacity building" sincere or just a palliative?**

To many observers, an early warning of an impending hazard is seen as representing an early warning *system*. In fact, the preparation and issuance of an early warning is only one subsystem or component of a much more comprehensive early warning system. That also encompasses the responses to the warning by governments, their agencies, and by those likely to be affected by the hazard itself.

Once again, Hurricane Katrina (New Orleans, 29 August 2005) provides an example of the consequences of early warning activities in which the responses to what was, in essence, a sixty-hour advance (near-perfect) warning were not considered as important by various government agencies as the actual warning itself. The acceptance of an all-encompassing early warning system goes a long way toward developing a "culture of prevention" in a society. Clearly, institutional as well as individual capabilities must be enhanced, so that an effective system can be developed and properly supported in a sustained way from "observation and forecast" to "dissemination and use" and to "preparation and response."



"Capacity building by proxy" is a new phrase to describe an old process of educating educators and training trainers who teach others, so that their students can, in turn, become knowledgeable and can then serve to educate and train succeeding generations. In our case, if we can convince university administrators to foster educational activities related to climate, water, and weather affairs in their own countries, dependencies on costly foreign experts can be reduced, if not eliminated, and self-sufficiency enhanced. This would make regional responses to climate, water, and weather problems more in tune with regional culture and needs. Capacity building by proxy can also help to correct regional inequities that exist between industrialized and developing countries.

CCB/NCAR has been involved in one such activity, by supporting Uzbeks from the southern Uzbekistan Termez State University to train Afghan educators 70 kilometers across the Uzbek-Afghan border at Balkh University in monitoring water and air quality.

Climate Affairs & Capacity Building on Campus

- **Open discussion among participants**
- **Introduce notion of "Spare Time University"**

Climate and climate-related impact studies require from researchers as well as decision makers more than just a recording of facts surrounding a climate-related societal or environmental impact. They require insight, intuition, and objectivity. They require a careful use of historical information and an objective interpretation of that information. This is especially important because no government or agency likes to admit it has made a mistake, especially a mistake that results in human tragedy. In this regard, the impacts researcher is a detective, as historical Robin Winks once wrote. To improve the way societies can prepare for hazards (i.e., prevent, mitigate, adapt), objectivity and a willingness are essential elements to address obstacles and constraints to develop effective evasive preparations in the face of future hazards.

The following quotation captures the spirit of what is needed from physical and social science researchers and their governments, politicians and bureaucrats alike.

"I said that I wasn't clever.
I was just noticing how things were, and that wasn't clever. That was just being observant.
Being clever was when you looked at how things are and used the evidence to work out something new."

(Haddon, 2002)

The concept of "Spare Time University" was introduced to the workshop. This is one way to get people involved in knowing about today's problems and proposed solutions in various aspects of life, especially those related to climate, water, and weather.

Many people are too busy or do not have the opportunity to take courses in school, whether it is at the high school level or at a university. They are too busy trying to put food on the table or they do not have the funds to attend establishments of learning, for they are in isolated areas, usually at great distances from learning centers. Spare Time University is a way to bring these establishments to people at little or no cost. Radios, cellphones, and newspapers can be used to get information to people.

Everyone knows that weather and climate influence much of our lives: a good harvest at the end of a growing season, or a poor harvest. They can affect the amount of moisture in the soil, water needs at different times in the life cycle of a crop (from sowing seed to harvest). Climate affects the abundance of pests that can eat crops (such as locusts), the abundance of mosquitoes, and so forth. Prolonged droughts or heavy rains can be disruptive and destructive of human activities and settlements. And now there is a lot of talk about the likelihood of a change in the climate that people know, have gotten used to, and cope with.

Usable information is a top priority for a Spare Time University; new agricultural methods, new fishing techniques, different ways to till the soil, or to terrace the hilly landscape, and methods used elsewhere to harvest water in dry areas, and so forth. Even global warming can be explained easily through Spare Time University. This kind of information can be brought to villagers who want to listen, read, or learn.

The information for each spare time course can be relatively short, concise, and to the point. It can be user friendly; that is, without scientific jargon. A lot of time can be taken to read or listen to the courses, however they are delivered to the villages and remote areas, as well as poorer neighborhoods in major cities, or to students in high schools and universities.

Spare Time University is not an idea conceived in an industrialized country and developed for developing countries. It was an idea fostered by the Chinese government a few decades ago. It was designed to close the gap between those going to universities to earn advanced degrees and those people who were laborers in fields and factories who had neither the time nor the level of education to attend a formal university setting. It was China's attempt to level the playing field in society with respect to opportunities by enabling workers on farms or in factories to participate in university courses as well as to feel a part of the country's development process.

In many countries, there is considerable interest in what we call a "free university" and in informal educational programs that are designed for "K-to-Grey" (kindergarten to old age), or what in Thailand is called a "midnight university." Learning is a lifelong process.

Review of interlinkages of seasonality-environment-society:

- Food production
- Water resources
- Natural hazards
- Public health
- Air pollution and fires
- Infectious diseases

Aspects of nature and society are such that any changes, accidental or purposeful, will surely have impacts elsewhere in the natural world: wanton tree cutting on mountain slopes for timber, for example, will likely lead to soil erosion, sediment buildup in rivers, and silting up of reservoirs. Cutting down mangrove forests along the coast for development purposes can destroy coastal fisheries and leave the land along the coast exposed to wave action, tidal surges and erosion.

Even seemingly neutral forecasts of El Niño, which are increasingly used by societies to prepare for El Niño's teleconnected impacts around the globe, have been used as an excuse by unscrupulous officials to set illegal rainforest fires for personal gain (Glover and Jessup, 1997). As beneficial as a forecast might be, there are ways it could be used in negative ways for personal gain.

A systems approach (comprehensive) is essential in impact assessments for climate, water, and

weather concerns. Downstream (or ripple) effects must also be identified in order to better cope with seasonal hazards (and changes in those hazards) that might result from global warming. A systems approach reinforces the idea that governments and research communities must look beyond adaptation to climate change and look to the impacts of proposed adaptive responses.

Southeast Asia in 2015

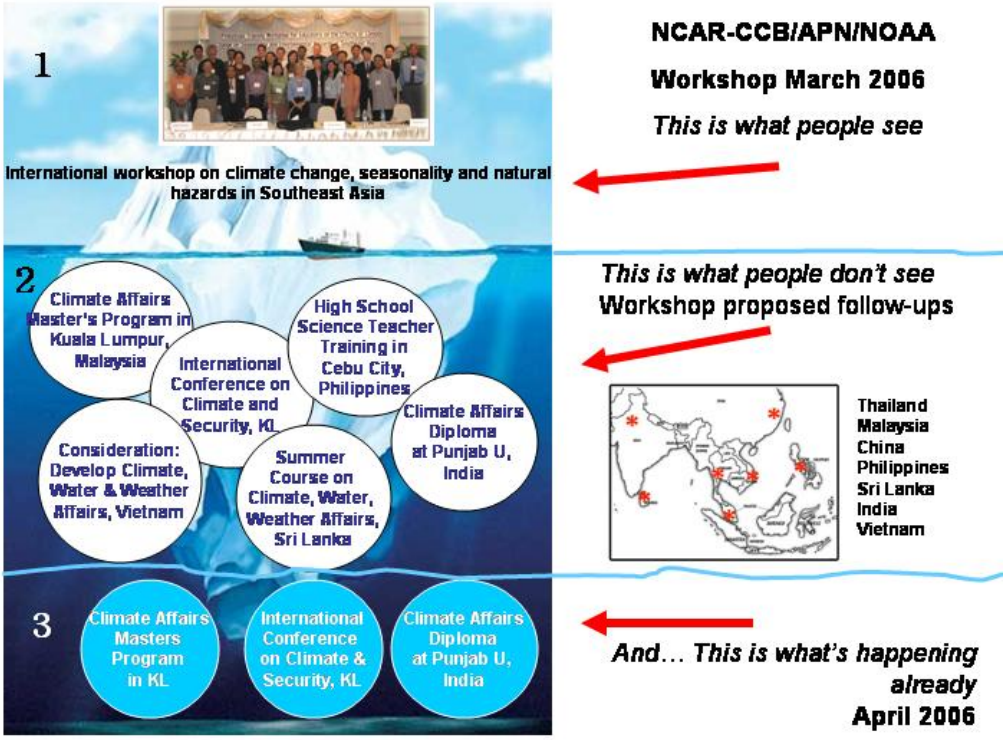
- **ASIA 2015 -** Promoting Growth, Ending Poverty (www.asia2015conference.org)
- Over the past two decades, more people have been lifted out of poverty in Asia than in any other region at any other time in history. In the next decade, there is the chance to fulfill the potential of this success story - the world is presented with an historic opportunity to end poverty in Asia.
- To achieve this ambitious goal, many challenges lie ahead. Despite Asia's success, two thirds of the world's poor still live in the region, held back by poor nutrition and health, limited educational opportunities and lack of access to water and sanitation. Tackling these issues will require sustained economic growth, good governance and visionary leadership.
- The Asia 2015 conference, held in London on 6-7 March 2006 brought together key decision-makers from Asia and across the world to learn from Asia's success, to identify future challenges and solutions, and to build new alliances to fight poverty.

Discussion about the states of the world, of the environment and of South and Southeast Asia in 2015

This session focused on what Asia and the rest of the world might be like ten years from today, 2015. The purpose of this exercise was primarily to encourage out-of-the-box thinking about Greater Southeast Asia and about emerging new hazards that regional inhabitants might have to face in coming years. Interestingly, when the workshop convener typed the phrase *Asia 2015* into "Google search," a website appeared for a conference to discuss Asia 2015, a conference meeting in London about the same time as this workshop!

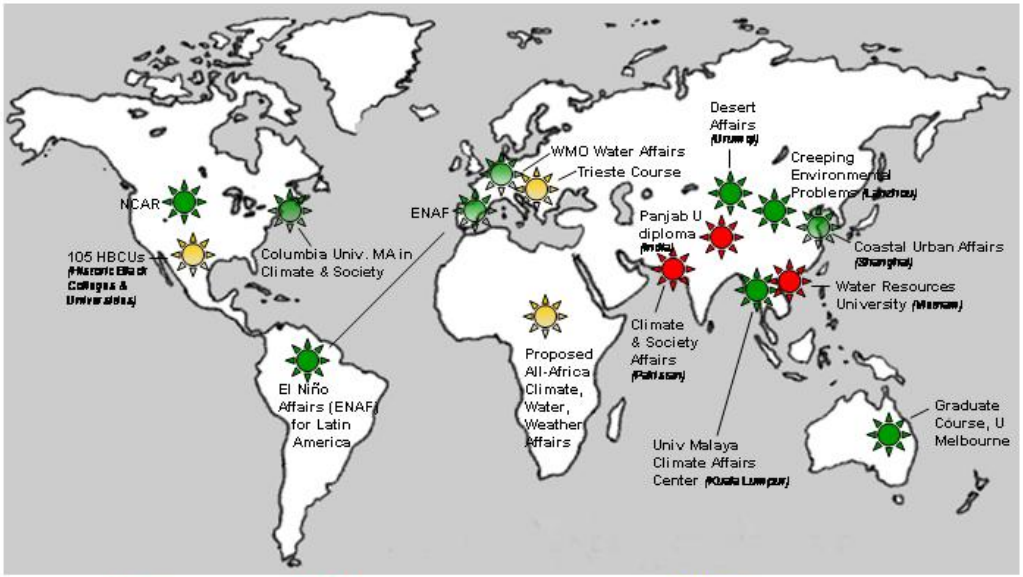
Revisiting the Workshop's Goals: back to basics

- **Enhance interest in Climate Affairs**
- **Explore interactions among climate, seasonality, and environmental hazards**
- **Consider a regional Climate Affairs network**
- **Where can we go from here?**



To date, several initiatives have been started based on the "Affairs" template. The Affairs template of science, impacts, policy & law, politics, economics, and ethics & equity provides a checklist for students as well as educators and trainers to assure that the program is one of multidisciplinary education and training. Interest in climate affairs has expanded to include activities such as water affairs, desert affairs, and coastal urban affairs.

CCB Climate Affairs activities as of 5/1/2006



Key: Green = started; Red = likely, under discussion; Yellow = potential: next step

Activities based on the Affairs template

- **Coastal Urban Affairs (Shanghai, China; int'l cities)**
- **Water Affairs (WMO Hydrology)**
- **El Nino Affairs (under development)**
- **Weather Affairs (PowerPoint developed, USA)**
- **Desert Affairs (Xinjiang University, China)**
- **Climate Affairs (University of Malaya; U. of Melbourne, Australia)**
- **Climate and Society Affairs (Islamabad, Pakistan)**
- **Climate and Society (Columbia Univ, USA)**
- **Mountain Affairs (Chengdu, China)**
- **Island Affairs (NCAR, USA)**
- **Center for Capacity Building (NCAR, USA)**
- **Proposed: "All-Africa Center for climate, water and weather Affairs"**

In the following section is a Climate Affairs prototype "cell" for Southeast and South Asia. The participants modified the cell that Glantz had provided for discussion. It contains a rationale for the need to develop Climate Affairs activities and programs in the region. The Affairs template contains suggested issues that could be addressed within the components.

Prototype Climate Affairs Cell for Southeast and South Asia

South and Southeast Asia Cell Prototype

Climate Affairs should be applied to Asia for the following reasons

- Growing interest in various climate issues throughout all parts of Asia and in other countries and donor, development and humanitarian organizations – concerns about climate changes (rainfall shifts, ENSO, sea level rise)
- But insufficient, inconsistent attention by government – some departments are more engaged (industry, trade, etc.)
- Awareness about climate issues is low
- Fear that climate-related hazards are becoming more frequent, more deadly and more costly throughout the region (droughts, floods, diseases)
- Lack of technology, resources, and institutions for dealing with climate change
- Greater involvement of all stakeholders is needed – education and awareness for communities
- The region needs to focus on climate affairs – with greater emphasis on economy, extreme climate events
- Environmental justice issues are increasingly being raised, following extreme events, and with regard to the dissemination of forecasts
- Sustainable development and climate variability and change concerns
- Public health (vector-borne infectious diseases and climate concerns)
- Improvements in the science and monitoring of global climate system
- Growing awareness of the need to consider climate information in risk-related decision making
- The realization that costly climate-related impacts on a national economy can in many instances be mitigated by human activities

Climate Science – Asia

- Regional climate influences of the global climate system
  - Monsoon, ENSO, Eurasian snow cover, deforestation, GHG emissions, forest fires, volcanic eruptions, sea-level rise, mudslides
- Regional climates
  - Can any be called “problem” climates? Drought-prone, flood-prone, fire-prone, frost-prone
  - Inter-regional relationships are not well understood
- Climate-social science linkages are weak
- Better information sharing for monsoons
- Limited data availability and sharing
- Multi-decadal and long-term oscillations are not well understood
- Tropical storms - Cyclones, typhoons, heavy rainfall
- Extreme events (floods, droughts, mudslides, tsunamis)
- Climate-environment-society interactions
- Forecasting
  - “Translation mechanism” for general public
  - Variability (seasonal, inter-annual, multi-year); Fluctuations (decade scale); Change (new climate average); Extremes (weather, climate, climate-related)

Cllimate Impacts (on ecosystems) – Asia
humans are part of ecosystems

- Biodiversity
- Land use and suitability
- Desertification - Arid and semi-arid areas
- Rainforests
- Mangrove ecosystems
- Agriculture
- Aquaculture – low harvest
- Coral reef
- Species movement patterns
- Rivers drying up – linked also to low hydropower generation
- Indirect human impacts, including through population displacement
- Highlands
- Coastal erosion
- Wetlands
- Frost, fire, drought, flood
- Rivers and estuaries
- Inland seas

Climate Impacts (on societies) – Asia

- Poverty – chronic poverty, socioeconomic impacts
- Politics, government stability and economy
- Ecosystem management needs to be done better – using raised awareness (e.g., water demand management and recycling)
- Livelihood security
- Property and infrastructure destruction
- Change in livelihood strategy and lifestyles (e.g., exploitation, prostitution)
- Population movement – planned/forced – rural-urban or marginal-degraded
- Human trafficking
- Peace and border security
- Food production
  - Domestic food security
  - Export crops
- Water resources management (national, transboundary)
- Energy production and consumption
- Health impacts
- Public safety

Climate Policy and Law – Asia

- Domestic or National
  - Overall policy for dealing with climates is not available (both national and regional)
  - Gap in enforcement of existing laws – linked to lack of awareness and resources
  - Domestic empowerment is needed for better representation internationally
  - CDM's to be developed
  - Water allocation – demand management – policies
  - Countering deforestation: Re-forestation and governmental ambiguities towards it
  - Greenhouse Gases: Sources and sinks
  - Fisheries (inland and coastal) – dense fish farming policies
  - Air pollution, haze – policy push to increase air quality
- International

- Regional cooperation (e.g., ASEAN, Mekong River Com., SAARC, Indus, Ganges)
- Foreign debt
- Kyoto Protocol-based policies and COP negotiations (also IPCC)
- Wetland laws (e.g., Ramsar Convention)
- Polar issues and marine affairs (e.g., UNCLOS)

Climate Politics – Asia

- International
  - Climate-induced migration (national and international) – environmental refugees
  - Transboundary smuggling – humans, goods, drugs
  - Transboundary issues
  - Shared resources
  - National vs. regional politics
  - Industrial vs. agricultural societies
- Domestic or National
  - Climate-induced migration (voluntary and forced) – urban-rural movement linked to harvesting seasons
  - Stability of governments due to climate events
  - Include civil society
  - Gender and climate issues
  - Core-periphery
  - Rich vs. poor
  - Upstream vs. downstream
  - Urban vs. rural

Climate Economics – Asia

- Should include indirect factors impacting climate (e.g., energy consumption) – "Pro-climate" technologies and economics
- Optimization of economic policies through decision analysis (green economy) – improvements in understanding the valuation of ecosystem services
- Capturing short-term seasonal impacts on local economics
- Role of markets and corporate sector
- North-South relationships
- Implementation and enforcement of "emission quotas"
- Climate and development
- 'Pay now or pay later'
- Discount rates
- Trade-offs
- Risk analyses (risk takers, risk avoiders, risk makers, risk manager)
- Who benefits from climate variability, extremes, seasonality, forecasts?
  - Who loses?
- Greenhouse Gas reduction

Climate Ethics & Equity – Asia

- Who is affected by climate variability, change, extremes, seasonality?
  - Poorest of the poor?
- Impacts of free-trade zones on environment – difficulties in enforcing national environmental laws
- Sharing of information is restricted and less equitable
- Notions of "eco-justice" for those affected – upstream-downstream
- Inclusion of and attention to indigenous knowledge

- Who gets protection?
- Responses within the region: indigenous, local, national, regional
- Disaster relief and Development aid: conflicting or complementary bureaucratic objectives?
- Core vs. periphery
  - Domestic: transparency, corruption, equity
  - International: transparency, donor-recipient 'partnership', etc.

Climate Impact Methods – Asia

- Context-based analysis needs to be emphasized
- Minimize undue bias towards quantitative analysis – linked to inaction
- Qualitative
  - Participatory methodologies
  - Historical
  - Analogies
  - Case studies
  - Foreseeability assessments
- Quantitative
  - Scenario analysis
  - Simulation models (prototype kits for modeling)
  - Statistical
  - Risk assessment
  - Surveys
  - GIS

Possible Research Topics for Climate Affairs in Asia

- Social science research – focusing on social equity
- New opportunities through climate change lens
- Vulnerability assessment for society
- Coastal urban development and climate affairs
- Institutional alliance – on early-warning systems
- Regional approaches towards climate change and influence on existing environmental problems
- Impact and adaptation options and coping strategies
- Health and climate issues
- Collection of endemic/indigenous knowledge about climate
- Data sharing on regional basis – particularly hydrological information
- History of climate in various parts of Asia – Specific country, region or socioeconomic sector
- Assessments of climate and climate-related forecasts in Asia – Comparative value to countries or sectors in Asia of climate and climate-related forecasts
- Eco-justice issues
- Natural disasters and local and national coping mechanisms
- Ethics and politics of treaties, agreements and conventions at national, regional and international level
- Climate change and national sovereignty for transboundary issues – military/civil
- Corporate-driven globalization and climate – market forces
- Climate-related law and policy

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Workshop Agenda, 6–9 March 2006

Monday, March 6

9:00 to 9:30 – Introduction to workshop

9:30 to 10:00 – Participants Roundtable Introduction

10:00 to 10:45 – ISDR Conference Overview

10:45 to 11:15 – Break

11:15 to 12:00 – Capacity Building: Education & Training

12:00 to 1:30 – Lunch

3:30 to 4:15 – Southeast Asia Hazards

4:15 to 4:45 – Seasons and Human Health

4:45 to 5:15 – Human Activities and Seasonality

Tuesday, March 7

8:30 to 9:45 – Country Presentations

9:45 to 10:30 – Seasonal Concerns for Southeast Asia

10:30 to 11:00 – Break

11:00 to 11:45 – Coping with Seasonal Hazards

11:45 to 12:15 – Global Warming: A Brief Overview

12:15 to 1:30 – Lunch

1:30 to 2:30 – Focus on Global Warming

2:30 to 3:15 – A Step Beyond Adaptation

3:15 to 3:45 – Break

3:45 to 5:00 – Starting Climate Affairs at a University: Open Discussion

Wednesday, March 8

9:00 to 10:30 – Introduction of Notions: Superstorms, Forecasting by Analogy, Creeping Environmental Changes

10:30 to 11:00 – Break

11:00 to 12:30 – SWOC Assessment for Climate Affairs

12:30 to 2:00 – Lunch

2:00 to 3:00 – Climate Affairs and Capacity Building on Campus

4:30 top 5:00 – Open Discussion

Thursday, March 9

8:30 to 9:45 – Review of Interlinkages

9:45 to 10:15 – Break

10:15 to 11:00 – South and Southeast Asia in 2015

11:00 to 12:00 – Back to Basics: Revisiting Workshop Goals

12:00 to 1:30 – Lunch and Adjourn

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6–9 March 2006

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