Technical Paper

# Regional Climate Outlook: Southeast Asian Applications

Extreme Climate Events Program

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# REGIONAL CLIMATE OUTLOOK: SOUTHEAST ASIAN APPLICATIONS

By

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Presented at the
Global Review Meeting of Regional Climate Outlook Forums
Organized by World Meteorological Organization, World Bank,
U.S. National Oceanic and Atmospheric Administration,
International Research Institute for Climate Prediction,
and the South African Weather Bureau
16-20 October 2000, Pretoria, South Africa

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## Abbreviations and Acronyms

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| ASMC | ASEAN Specialized Meteorological Centre |
| BMG | Bureau of Meteorology and Geophysics (Indonesia) |
| BPPT | Agency for the Assessment and Application of Technology (Indonesia) |
| BOM | Bureau of Meteorology (Australia) |
| ECE | extreme climate event |
| ENSO | El Niño Southern Oscillation |
| HMS | Hydro Meteorological Services (Vietnam) |
| IRI | International Research Institute for Climate Prediction (USA) |
| ITCZ | Inter-Tropical Convergence Zone |
| LAPAN | National Aeronautical and Space Agency (Indonesia) |
| NPC | National Power Corporation (Philippines) |
| NOAA | National Oceanic and Atmospheric Administration (USA) |
| NWRB | National Water Resources Board (Philippines) |
| PAGASA | Philippine Atmospheric, Geophysical and Astronomical Services Administration |
| SOI | Southern Oscillation Index |
| UK | United Kingdom |

## About the Report

This paper was a contribution to an international workshop which reviewed the Regional Climate Outlook Forums. The workshop was organized by WMO, IRI, the NOAA Office of Global Programs, the World Bank and the South African Weather Bureau in Pretoria in October 2000. The paper draws significantly on the experiences gained from ADPC's Extreme Climate Events (ECE) Program.

Launched in 1998, the ECE Program is designed to improve understanding of the impacts of extreme climate events such as El Niño and La Niña on society and the environment in selected Asian countries, and to reduce the disaster impacts of such events through effective application of climate information. In its first phase (1998-2001), the ECE Program was implemented in Indonesia, the Philippines and Vietnam, and in its planned next phase, will be extended to Bangladesh and Thailand. The program is funded by the United States Office of Foreign Disaster Assistance (OFDA) and supported by NOAA's Office of Global Programs.

## Introduction

Climate variability on seasonal and inter-annual scales has significant socio-economic implications for Southeast Asia. This has been underlined by the wide-ranging impacts of El Niño 1997-98 and La Niña 1998-99. These two events brought into focus the need to make best use of state-of-the-art knowledge in climate science for development planning. In this context, efforts in recent years to set up sustainable mechanisms for regularly generating regional climate outlooks in Southeast Asia assume significant importance.

This paper draws upon the experiences of Indonesia, the Philippines and Vietnam and discusses some key issues related to the application of climate forecasts for decision-making. The paper first describes the range of impacts associated with climate variability, particularly the regional ENSO cycle. The second part deals with how institutions responded to regional climate forecasts during the 1997-98 El Niño event, describing the usability of climate forecast products in the Southeast Asian context. The third part deals with current practices of climate forecast application in the three countries. In the fourth part, observations are made regarding the future of climate forecasting applications.

## Climate Variability and Its Impacts

Climate variability associated with the ENSO cycle has a range of implications for different socio-economic sectors in Southeast Asia.

In Indonesia, 28 drought years have been recorded since 1877. Of these, 20 were associated with strong El Niño events; of the remaining eight, six accompanied weak El Niño events. Thus 93% of drought years over a period of 123 years were linked to El Niño events. There is a strong link between El Niño and drought and fire in Indonesia. Over the last two decades, all instances of widespread fire activity were associated with strong ENSO events. Analysis of official figures of forest areas burnt indicate a relationship between SOI and the area of forest burnt. In seasons when the SOI remains above -10, the area is relatively small; when the SOI falls below -10, the area burnt appears to increase dramatically.

In the Philippines, records indicate that since 1982-83, El Niño years have coincided with significant shortfalls in rice production and hydro-electricity generation, and drinking water shortages in urban areas. During La Niña years, high typhoon incidences inflict greater damage to life and property.

During El Niño years in Vietnam, the number of typhoons is less than during La Niña and normal years. The shortfall in rice production during La Niña and normal years is more than El Niño years. This is attributed to more incidences of typhoons and flooding. Analysis of the period 1979-98 indicates that during normal years, the average area under paddy cultivation affected annually by natural hazards is 1.1 million ha; during El Niño years this is on average 0.073 million ha.

These glimpses of climate variability effects associated with ENSO indicate that there is a potential to reap significant benefits from the application of climate forecasts in Southeast Asian countries. However, it needs to be emphasized that there are large variations in impact across different regions within each country, different seasons, different kinds of ENSO events (based on onset, intensity and duration) and different sectors. It is imperative to understand these variations to the fullest extent in order to move towards effective application of climate forecasts for development planning.

## Application of Regional Climate Outlook Forum Products

In Southeast Asia, a Regional Climate Outlook Forum was held in February 1998 in Bangkok in conjunction with the Asian Regional Meeting on El Niño Related Crises. This was followed by a forum organized by the ASEAN Specialized Meteorological Centre (ASMC) in Singapore in February 1998. Since then, ASMC has been producing Regional Climate Outlooks using electronic communication with international agencies as well as national meteorological agencies in the region.

These Regional Climate Outlooks are used by the member countries to generate their own seasonal forecasts. In general, the national meteorological agencies use the regional forecasts in conjunction with past statistical information on local climate conditions and inputs from other meteorological agencies (e.g., BOM, IRI, NOAA, UK Weather Service) to generate national seasonal forecasts. The regional forecasts issued by ASMC indicate rainfall probabilities in five categories (below normal, slightly below normal, normal, slightly above normal and above normal). However, the national forecast products indicate rainfall probabilities in the traditional three categories. This may be attributed to the low level of confidence in using the five closely-spaced rainfall categories. It may also be attributed to the fact that at the national level, accountability to users with regards to the accuracy of the forecasts is much higher than at the regional level. However, it is expected that as more experience is gained and confidence levels are raised in the application of forecasts, the national forecasts will become more detailed.

The national seasonal forecasts use boundary conditions given in regional forecasts and identify existing rainfall stations in each probability zone. Based on historical mean seasonal rainfall at each rainfall station, values are determined for normal, above normal and below normal rainfall, probabilities applied to these values as indicated in the regional forecasts. However, in this process, some judgment is also applied with respect to past performance of regional forecasts for different localities in the countries.

In the current socio-economic context of Southeast Asia, where agricultural activities no longer only follow the traditional dry and wet season cropping pattern, the continuous production of Regional Climate Outlooks every two months has significant value. However, it would require that the system of producing national seasonal forecasts takes adequate advantage of this continuous process.

The lead-time provided by these regional forecasts is also adequate to anticipate impacts and mobilize institutions to take necessary action to minimize the negative

impacts and maximize potential benefits. However, here again, the result would depend greatly on how effectively the national meteorological agencies use these forecasts and localize them.

Regional forecasts provide rainfall probabilities for the forecast months. This is certainly a relevant parameter for Southeast Asia, which is a humid tropical region where much socio-economic activity depends on rainfall. However, effective application would require that this information is produced in greater detail at the national level and also include other rainfall attributes such as onset, distribution and termination.

With decreasing dependency on agriculture in the coming decades, the forecasting of other parameters such as temperature and humidity would become more useful. For example, monitoring and control of urban pollution and disease outbreak would be greatly helped by seasonal temperature and humidity probabilities.

## Current Practices in Climate Forecast Application

### Indonesia

Before 1997, the Bureau of Meteorology and Geophysics (BMG) issued weather forecasts with meteorological parameters in view. Since 1997, BMG has taken the initiative to establish a broad-based National Seasonal Forecasting Working Group drawing upon expertise from various sectors. The Working Group comprises BMG, the Bureau of Assessment and Application of Technology (BPPT), the National Space Center (LAPAN), the Agriculture Research Institute and the Water Resources Management Research Institute.

The Working Group draws upon forecast information from ASMC, IRI, BOM Australia and the UK Metro Office to prepare seasonal forecast guidance for 102 meteorological regions across the entire country, including:

- Seasonal monsoon onset forecast indicating the dates of monsoon onset at ten-day intervals;
- Monthly rainfall forecast; and
- Seasonal cumulative rainfall status for the entire season.

Respective national climate-sensitive organizations, on receipt of the climate forecast information from BMG, process the outlook with reference to past impacts and disseminate processed information to provincial sectoral organizations. At present, these forecasts are used as a general alert. Information is received by national-level user agencies from the field agencies only when disaster events occur. The processed forecast information received at the national level is useful for taking general precautionary measures but cannot be used for comprehensive development planning.

**Philippines**

In the Philippines, the Departments of Agriculture, Water Resources and Public Health have well-defined mechanisms as end-users for receiving forecasts from the Philippine Astronomical, Geophysical and Atmospheric Service Administration (PAGASA) at the national level and processing and disseminating it to regional and sub-regional levels.

The Department of Agriculture, on receipt of advisories from PAGASA, analyses potential impacts on agriculture production. Based on this information, the department prepares a vulnerability map for each of the country's 12 regions. These maps are then reviewed with agriculture research institutions and other agencies such as water resources and irrigation departments and food security agencies. After receiving inputs from these organizations, modifications are made to the maps as necessary. The final processed information is passed on to regional agricultural departments.

The National Water Resources Board (NWRB) and the National Power Corporation (NPC) assess the potential impacts through reservoir operation simulations after receipt of forecasts from PAGASA. These simulations determine the projected available water in reservoirs and serve as the basis for water releases or allocation to various users.

The Department of Health recently established a mechanism to use the forecast information from PAGASA in planning for contingency measures to deal with water-borne diseases.

Although establishment of a comprehensive climate forecasting applications system is well under way in the Philippines, there is still a need to develop capabilities to process forecast information into more actionable formats at the local level. The information provided by the national agencies falls short of meeting the specific needs of users at the local level.

**Vietnam**

Until recently in Vietnam, ENSO global forecast information was not incorporated into national seasonal forecasts. The Hydro Meteorological Services (HMS) uses antecedent parameters such as Eurasian snow cover and ITCZ to make seasonal forecasts. After the initiation of the Extreme Climate Events (ECE) Program, HMS began to incorporate long-range forecast information into seasonal forecasts. The forecasts are received from a range of agencies including ASMC and NOAA. In view of these developments, the importance of regional climate outlooks for Vietnam has increased.

The seasonal forecast information provided by HMS is used by climate-sensitive sector agencies like agriculture and water resources, and the Disaster Management Center, only as a general alert. These departments have a well-established mechanism to monitor situations created by natural hazards. However, much progress is needed to make full use of climate forecast information for development planning.

## The Future of Climate Forecasting Applications

It is clear that the countries of Southeast Asia are gradually working towards setting up systems for effective application of climate forecast information. However, there is a long way to go before the benefits can be realized. On the applications side, three key issues need to be addressed:

- Building historical databases of sectoral impacts to continually improve the understanding of impacts of climate variability on different sectors;
- Capacity-building of user organizations to translate climate forecast information into usable information for decision-making purposes; and
- Setting up systems to continually evaluate the usability of forecasts and improve methodologies to translate forecasts into actionable information.

### Nationally-focused Application

While this paper recognizes the importance of setting up mechanisms for generating regional climate outlooks, the application of forecasting should have a national focus. This is because the impacts can be highly specific to location, season and sector. The institutional systems and local capacities available to take advantage of good forecasts are also highly variable, not only across countries but also within each country.

On the applications side, at the regional level, it would be useful if a mechanism could be set up to exchange best practices or well-tested methodologies for climate forecasting applications.

### Capacity-building of Intermediary Organizations

Over the last few years, climate forecasting agencies have received a lot of attention at all levels, and efforts have been made to improve their capacities to produce timely and relevant climate forecasts. At the same time, enhanced awareness has led to increased expectations of user communities for better forecast information for decision-making. However, this gap cannot be bridged unless intermediary organizations (such as agro-meteorology departments, forestry research institutions and water resources research organizations) are developed to act as brokers between climate forecast producing agencies and user departments.