Asian Disaster Preparedness Center

# Managing Climate Risks through Climate Information Applications: The Indonesian Experience[i]


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In the past two decades, significant advances have been achieved in tropical climate forecasting. A key development has been the ability demonstrated in the mid-1980s to forecast El Niño Southern Oscillation (ENSO) - the anomalous warming of the equatorial Pacific Ocean - with lead times of as much as six months to one year. The value of this breakthrough cannot be under-estimated: if forecasted with sufficient lead-time, El Niño-related forecasts can theoretically provide societies with opportunities to undertake steps that would enable them to address potential impacts, which in many Southeast Asian countries include drought, forest fires, and outbreak of infectious diseases. Different countries and different sectors are in varying stages of harnessing the present capability of climate science to reduce risks in sectors which are susceptible to climate fluctuations, most notably agriculture and water resources. Arguably, a major task facing countries continues to be to develop an end-to-end climate information generation and application system that is aimed at climate risk reduction. Such system encompasses a continuous cycle of forecast generation, dissemination, application, and evaluation of results.

The purpose of this article is to discuss the efforts made by the Asian Disaster Preparedness Center (ADPC) in the past eight years to facilitate the development of an end-to-end climate information generation and application system in Indonesia, particularly to mitigate climate risks in agriculture. Under the aegis of the USAID's Office of Foreign Disaster Assistance (OFDA)-supported Climate Forecast Applications (CFA) Program (2003-2008) and its predecessor the Extreme Climate Events (ECE) Program (1998-2003), efforts have been made to strengthen the capacity of national and local institutions in Indonesia and the

Philippines to build such system with the goal of improving the performance of climate-sensitive

sectors. This article will focus solely on the Indonesian component of the program to allow a more in-depth discussion of the impacts made by the program so far. The first part of the article will discuss the lessons learned from the El Niño event in 1997-1998 and the second part will discuss how ADPC initiated efforts to act upon these lessons. The article will end by discussing the impacts made by these initiatives.

## I. Lessons learned from the 1997-1998 El Niño

The mere availability of climate forecast will not necessarily translate into measures that would enable societies to adapt to the potential impacts of the forecasted climate event. This is one of the key lessons learned from the massive 1997-98 El Niño.

El Niño forecast was made available as early as six months before the onset of the event. Indonesia's national meteorological service - the Meteorological and Geophysical Agency (BMG) - incorporated such information into its dry season forecast, which was released in March 1997. But despite the availability of such information, the 1997-98 El Niño spawned widespread social and economic damages in Indonesia because adequate mitigation measures were not put in place. Large-scale forest fires generated a regional smoke and haze emergency and El Niño-induced drought resulted in a production shortfall of three million metric tons of paddy. As a consequence, rice imports reached five million metric tons.

This experience drives home the point that several conditions have to be present for climate information to translate effectively into precautionary actions. First, information would be of little use without well-functioning information delivery systems. While the information was released by BMG six months before the onset of the El Niño event, there was no institutional mechanism to translate global El Niño index into local impacts. Second, the 1997-98 El Niño demonstrates that climate information - be it a seasonal climate forecast or an analysis of past rainfall pattern – is not sufficient for issuing early warning until it is translated in terms of impacts on the variables that are of interest to decision makers. For example, reservoir managers need to know how an El Niño event would affect stream flow and evaporation. On the other hand, farmers need to know how El Niño could potentially impact on the spatial and temporal distribution of rainfall. Because not all El Niño events are accompanied by the same climate fluctuations, translating a forecast into sectoral impacts is such a tremendous challenge that requires well-trained and technically competent human resources.

For the past 5 years, ADPC made efforts towards assisting Indonesia in building the conditions that would enable it to reduce climate risks through the development of an end-end climate generation and application framework. ADPC's involvement in Indonesia started with the ECE program, which documented the impacts of and the institutional responses to past extreme climate events in Indonesia, with focus on the 1997-98 El Niño and the La Niña (cooling of the eastern tropical Pacific) that followed. ECE was undertaken in collaboration with national and local partners. Based on ECE documentation, ADPC identified further research and capacity building needs for mitigating the societal and economic impacts of climate events. Hence, implementing the CFA program was initiated. Application of climate information constitutes incorporating such information (e.g. past climate, seasonal climate forecast) to change or influence a decision regarding future actions. For example, armed with a forecast of rainfall deficit, farmers switch to crops that require less water. The ultimate goal of the CFA program is to improve the performance of climate-sensitive sectors.

## II. ADPC-initiated efforts to institutionalize climate forecast applications

As mentioned at the outset, ADPC's goal is to assist Indonesia and Philippines in developing a robust and sustainable end-to-end climate information generation and application system. The program's approach is two-fold: first, it carries out targeted demonstration sites to explore and refine tools and risk management strategies. Armed with the lessons learned from demonstration sites, the program will move towards strengthening national capacities to scale up the application of methods elsewhere in the region. The CFA project is initially working in four sites (two in each country) to demonstrate how climate forecast applications may be utilized in managing climate-related risks.

The two sites in Indonesia represent different agro-ecological zones and are embedded within different institutional systems - Kupang, Nusa Tenggara Timur is a dry land agricultural system while Indramayu, West Java is located at the tail-end of an irrigation system. Both sites are extremely vulnerable not only to extreme climate events but even to the annual seasonal cycle. In Indramayu, more than 80 percent of annual crop losses are accounted by droughts and floods. In Kupang, false rains are a serious problem. As farmers usually broadcast seeds on false rains only to lose them, false rains are responsible for routinely pushing farmers to the brink of food insecurity. In both sites, the ability to anticipate how climate will change from one year to the next will reduce damages and lead to better management of agriculture, water supply, fisheries, and other resources.

The steps undertaken by ADPC in implementing the CFA program include (i) understanding climate variability and impacts at local level; (ii) understanding stakeholders' demands for forecast products; (iii) creating an enabling environment for climate forecast uptake, such as making sure that support institutions make credit and agricultural inputs available to farmers; (iv) capacity-building for institutions for translating and communicating forecast products; (v) ensuring partnership development between producers and users of forecast; (vi) processing and delivery of localized forecast information; (vii) demonstration of climate information's potential value; (viii) policy advocacy at all levels; and (ix) replication. A key feature that distinguishes the CFA program from other climate forecast applications initiatives is the effort to ensure that the climate science research component of the program, which will ultimately lead to the development of forecast products for the demonstration sites, is driven by the demands identified by the stakeholders.

**III. Results**

In a huge district like Indramayu with a very heterogeneous rainfall pattern, BMG responded to stakeholder needs by downscaling seasonal forecast in spatial terms, i.e. dividing the district into different rainfall regions and producing forecast for each of the region. Information regarding the varying dates of the onset and termination of rain in different parts of the district is instrumental in setting up a cropping strategy (e.g. dry seeding vs. wet seeding) as well as in determining the timing of planting activities. In Kupang, the CFA program has institutionalized a sustained dialogue between forecast providers and users. Progress in developing forecast products proved to be a lot slower in Kupang because of the scarcity of rainfall data.

On the application side, the CFA program's efforts to stimulate local capacities to implement climate risk management strategies resulted in innovative approaches that are initiated by program stakeholders themselves. One of such initiatives is the Climate Field School (CFS), which the district of Indramayu has piloted in 2003 with support from NOAA, OFDA, Bogor Agricultural Institute (IPB), and BMG.

Photo 1: Farmer participants in the Indramayu CFS studying the process of rainfall formation.

The CFS employs practical and field-based learning for agricultural extension workers and farmers to enhance their expertise in using climate forecast to make appropriate farming-related decisions. While dialogues between farmers and extension workers formally extend over two seasons only, the CFS has become a permanent institutional mechanism that connects producers of climate information, intermediaries (agricultural extension workers), and end users (small-scale farmers). BMG has been utilizing this mechanism to distribute seasonal forecasts and post-mortem forecast evaluation, as well as in evaluating user responses to forecasts.

Farmers who participated in the CFS gained a systematic appreciation of climate variability as well as a better understanding of the probabilistic nature of climate forecasts. For example, in a normal wet season (October-March), rains arrive by mid-October. Based on their long farming experience, rains may be delayed but only until the end of November at the latest. The District Agriculture Office, with the help of BMG, reinforced this perception by presenting graphs showing climatological data for the past 30 years. The farmers' perception, reinforced by scientific data, led them to revise their cropping practices. To adapt to this variability in wet season onset, with confidence that rains would come, some farmers revised their cropping calendar and changed their planting strategy from water-intensive transplanting back to direct seeding (gogo rancah). Gogo rancah is a mitigation measure against both flood and drought by making the planting of rice viable even if rainfall is low so long as it is frequent. And because it allows early planting (mid to late October), paddies are already high enough to survive flooding, whose probability of striking Indramayu is more than 50 percent in January to February. CFS also made impacts in terms of how farmers set up their cropping calendar. Farmers in the sub-district of Losarang revised their cropping calendar, i.e. the sequence of planting rice, fallow, and planting other crops, in 2004-2005 and obtained higher yields compared to previous years.

Because of these positive impacts, local and national investments have been mobilized to replicate the CFS in other locations. The Indramayu district government decided to sustain CFS beyond the pilot phase and has allocated 100 million rupiah to replicate CFS in 4 to 5 sub-districts every year. As of December 2005, 1,000 farmers have participated in CFS. In addition, the Directorate of Plant Protection (DITLIN) within the Ministry of Agriculture (MOA) has adopted the CFS as part of its nation-wide agricultural development program.

Photo 2: A farmer leader in Kandanghaur sub-district shows a rainfall graph, which he created from his own rainfall observations using improvised rain gauges. He has been monitoring daily rainfall levels since he attended CFS in 2003.

The institutional and policy changes at the national level as well as the level of investments mobilized for producing spatially downscaled climate forecasts together indicate that the CFA activities will be sustained beyond the pilot phase.

Realizing the utility of producing downscaled forecasts, BMG has been producing localized forecast for 30 more districts as of 2006 and more districts are in the pipeline. This project started in 2004 when BMG developed localized forecasts for 10 districts. For this undertaking, BMG, with support from the Parliament, invested 3 to 4 billion rupiah in 2006 - representing a 300 percent increase from 2005 budget level. Institutional mechanisms at the district level involving BMG and district officials have also been established to interpret and make use of climate information to manage climate risks in water resources and agriculture sectors.

Policy changes have also occurred signaling a paradigm shift from crisis management to risk management. From 2001 to November 2005, addressing climate problems was within the purview of the Pest Analysis and Disasters Division within DITLIN. But with the realization that climate problem is such a huge problem and should be given more attention, a new division named the Climate Analysis and Mitigation Division was formed in November 2005. Operationally, this institutional development means that the bureaucratic unit responsible for climate risk management has been elevated in the bureaucracy and as such, it has been vested with more budget and authority.

## IV. Conclusions

Although climate information is not the only information needed to improve the performance of climate-sensitive sectors, it is a potent tool that enables decision makers to manage risks in different sectors. Just three years into implementing the CFA program, the basic pre-requisites for sustaining an end-to-end climate information generation and application system have already emerged. These pre-requisites include the changing perceptions and practices for managing climate-related risks through the Climate Field Schools, mobilization of investments for risk management, and institutional development.

The program stakeholders in Indonesia went ahead of schedule and replicated the CFA program in several locations and in sectors not initially targeted by the program's pilot phase. The challenge now is to understand and respond to the new capacity building demands brought about by the expansion of climate forecast applications.

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[i] This article is based on the numerous field visits and program monitoring missions conducted by the authors.

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