CAPACITY BUILDING TO ADDRESS IMPACT OF CLIMATE CHANGE IN INDONESIA[1]

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Abstract

Historical data show that the Indonesian climate has already changed. The direction of change in the future may vary between regions. In Java and Bali, the pattern of change is similar to changes that occurred in the past. It is very likely that the length of rainy season in these two islands will shorten and the depth of rainfall in this season tends to become higher than that of the current climate, while the depth of the dry season rainfall tends to decrease. Extreme weather and climate events cause serious floods, drought and wild fires in Indonesia. Many reports showed that these events have caused serious impact on Indonesian economy and human lives. The database of the OFDA/CRED International Disaster Center shows that wild fires in the El-Nino year 1997 caused an economic loss of about 17 billion USD. They damaged people's livelihoods thus increasing poverty rates by one-third or more. Flood hazards have become common in many parts of Indonesia. In the period 2001-04, about 530 floods were reported, occurring in almost all provinces. The scale of damage is also increasing. Preparing for this sort of events seems to be crucial and urgent.

Summary and Conclusion

Indonesia is the largest archipelagic country in the world. Indonesia's size and island structure make its water resources and irrigation sector uniquely complex and challenging. The occurrences of extreme climate events have already caused serious impacts in many sectors. Current capacity to anticipate to such events is still low. In the future the intensity and the frequency of these extreme climate events may increase. If this capacity to adapt to such changes is not developed right away, Indonesia may not be able to achieve sustainable development. Plans for adaptation to climate change need to be developed. Planned adaptation to future climate will be based on current individual, community and institutional behavior that, in part, have been developed as a response to current climate. Water management, which has to deal with the majority of climate impacts, has been decentralized to a large extend in Indonesia. At all levels the need for adequate capacity to deal with present and future water problems is huge. Target groups that need capacity development to prepare for climate change can be categorized into three large groups: a) government institutions at different levels, b) universities, knowledge institutions, and Non-Government Organizations (NGO), and c) general public.

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Introduction

Climate is already changing

Historical data show that the Indonesian climate has already changed. The direction of change in the future may vary between regions. In Java and Bali, the pattern of change is similar to changes that occurred in the past. It is very likely that the length of rainy season in these two islands will shorten and the depth of rainfall in this season tends to become higher than that of the current climate, while the depth of the dry season rainfall tends to decrease. In addition, the frequency of extreme climate events associated with the ENSO may also increase under global warming.

Impact of Climate Change and Variability in Indonesia

Extreme weather and climate events cause serious floods, drought and wild fires in Indonesia. Many reports showed that these events have caused serious impact on Indonesian economy and human lives. Since the last 10 years (1993 -2003) a total number of 2.453 million hectares of rice fields had been affected by drought, among them 0.462 million hectares is total loss. El-Nino phenomena is the main caused of drought in the year of 1994, 1997 and 2003 which caused a total number of 1.5 million hectares of rice fields are affected. Average annual loss of rice production due to drought is estimated to be about 300,000 ton or equal to Rp 550 billion or equivalent to US $ 61 million. Furthermore, annually these droughts has caused about 250,000 family of farmer that depend on the rice production suffer from a decrease in rice farming income. A flood in early February 2007 lasted for about 22 days, killed 57 people and forced 422,300 people to leave their homes, of which 1,500 were destroyed. The total damage was estimated to be about 695 million USD. Flood hazards have become common in many parts of Indonesia. In the period 2001-04, about 530 floods were reported, their impact among others were inundation of about 879,235 hectares rice fields, occurring in almost all provinces. The scale of damage is also increasing. Preparing for this sort of events seems to be crucial and urgent.

Adaptive capacity in water management in Indonesia

Indonesia is the largest archipelagic country in the world. Indonesia's size and island structure make its water resources and irrigation sector uniquely complex and challenging. In addition to that other key water challenges that impose threats on water sustainability are:

- Increasingly adverse impacts of watershed degradation, including increased flood peaks and the occurrence of flash floods and land slides causing significant loss of live, severe economic damages, decreased dry season flow, and sedimentation damages to water infrastructure. In this regards climate change that increase the intensity and the frequency of these extreme climate events actually exacerbated the impacts of environmental degradation.
- Water pollution and other adverse impacts of untreated municipal wastewater discharge, including industrial and mining effluent disposal.
- Degradation on groundwater environment at five groundwater basins in Java and Bali due to the over-abstraction of industry causing the occurrence of land subsidence and salinization on the groundwater along the coast.

The occurrences of extreme climate events have already caused serious impacts in many sectors and actually exacerbated the impacts of environmental degradation. Current capacity to anticipate to such events is still low. In the future the intensity and the frequency of these extreme climate events may increase. If this capacity to adapt to such

changes is not developed right away, Indonesia may not be able to achieve sustainable development. Plans for adaptation to climate change need to be developed. Planned adaptation to future climate will be based on current individual, community and institutional behavior that, in part, have been developed as a response to current climate. Water management, which has to deal with the majority of climate impacts, has been decentralized to a large extend in Indonesia. At all levels the need for adequate capacity to deal with present and future water problems is huge.

Review on the existing programs in the water sector

At present, the programs for water sector at the Ministry of Public Works are planned to response to the increasing pressure on water resources due to population growth, industrialization, urbanization, groundwater overuse and inadequate supply in some regions. The impact of climate change has not been properly considered yet. But this is important if one wants to realize "***climate smart***" development planning. The idea of climate smart is to combine structural intervention to reduce the risks to a quantified level, accepted by society or economy, with a new generation of measures towards risk management (non-structural). Non-structural aspects include measures such as operational early warning and response systems, anticipatory spatial planning, risk transfer mechanisms for the poor and marginal populations including insurance, participatory planning and capacity enhancement.

Identification of needs for capacity building

In the "climate smart" development planning, the main challenges are (i) to understand how the rehabilitation of the basins will affect sustainability of water supply under current and future climate, in particularly during extreme drought years, and (ii) to develop how water manager can improve their capacity to optimize water allocation under extreme drought year to ensure the equitable distribution of water through the use of climate information. In this case what is needed is to develop the capacity of water managers to interpret climate change projections, probabilistic climate forecasts and implement IWRM principles with a context of climate variability (e.g. capacity to use climate forecast information to improve current planning operations), to capacitate the institution to incorporate climate information in master planning for the river basin and to develop decision support tools that incorporate climate forecast and climate change projection scenarios for the water manager agencies.

Target groups for capacity development

Target groups that need capacity development to prepare for climate change can be categorized into three large groups: a) government institutions at different levels, b) universities, knowledge institutions, and Non-Government Organizations (NGO), and c) general public.

Government institutions

This group includes *policy makers* at national, regional and local levels for various water usages; *water managers* at regional, river basin and local levels; *water operators* at river basin and site levels.

Need for capacity development to address climate change:

Policy makers at national, regional and local level:

1) Expanding and strengthening an informed, multi-stakeholders process at basin, national and regional levels that build the political will to increase the resilience of water management against climate variability and climate change through a demand-stimulation approach and by mainstreaming adaptation into water sector planning.
2) Facilitating the enhancement of capacity and knowledge of water managers by supporting and encouraging sharing of information regarding the vulnerability of the water sector to climate variability and change, including the promotion of assessment methodologies, adaptation mechanisms, and precautionary approaches, by promoting communication between the water, climate and hydrology sectors.
3) Raising awareness of the issues relating to water and climate among stakeholders and decision makers in the water and climate sectors at the global down to the local level through publications, presentations at national, regional and global conferences and advocacy through the media.
4) Investment management; to meet the long term national development goals, including the Millennium Development Goal targets, capacity to deal with substantial investments in structural measures (such as storage, control and conveyance systems) and non-structural measures (such as demand side management, flood plain management) is required. Such investments are long term and hence should be designed in ways that reflect the risks associated with climate variability and change. Using historical or statistical data alone will not suffice when preparing for a future under climate change. Design standards and management strategies should take account of likely future changes in the hydrological cycles and climate. Policy makers have to be able to think in these long term processes.
5) Disaster management planning requirement; capacity to develop a suitable and effective combination of structural and non-structural measures to deal with risks. Structural defense or resistance type measures that include dams, dikes and reservoirs and non-structural measures such as early warning, spatial planning, "living with water principle", insurance and others need to be combined to form "a safety chain-concept".

Water managers at regional, river basin and local levels:

1) Capacity building in hydrology with special focus on climate variability and change, including Training of trainers (ToT) for Indonesian staff at different levels on how to handle extreme events in hydrological analysis;
2) Strengthening the hydrological data collection, data management capacities and capacities to use model tools in pilot river basins, including rehabilitation of hydrological networks in pilot river basins (including staff training in Indonesia for operation and maintenance)
3) Review of a few pilot river basins' water balance considering future changing climatic condition, changing land use and demand pressures from society, including:
    - Review of current and future water availability considering the current meteorological trends
    - Review of future water demands projections based on various scenarios of population, economic growth and land use

- Development of "up-dated" water balance and possibly revision of water allocation for various purposes in the pilot river basins considering climate change

This review may be used as training material for a larger group of water managers.

4) Increase water use efficiency for all water usages

Water operators at river basin and site levels:

1) Improve capacity for good management and operation & maintenance (O&M) of drainage and irrigation systems with respect to climate variability and change
2) Improve capacity to make an operational cropping pattern and cropping intensity with respect to characteristic of river basin and climate variability and change.
3) Improve capacity to increase water use efficiency for all sectors of water usages.

Capacity building already carried out

Current capacity development carried out by water resources stakeholders mainly focuses on water resources development and management as well as environmental degradation. For most of the policy makers, administrators, water managers and water operators, climate change has just come under their attention after Indonesia hosted the UN-COP 13 in Bali in December 2007. Except for the seminars, workshops and dialogues to address climate change that were and still are carried out in conjunction with the UN-COP 13 in Bali, almost no activity is devoted to increase the capacity to address climate change. The Government of Indonesia, by Presidential Decree in July of 2008, established the National Council on Climate Change chaired directly by the President himself with member of 18 line ministries. Until now there are no extra activities visible under this Council with respect to capacity development.

Planned capacity building to prepare for climate change

- Governments at all levels advocate strengthening the capacity of involved institutions to use appropriate tools and strategies such as:
- participatory identification of current vulnerabilities and risk reduction measures; implementation of prioritized community-based disaster risk reduction activities (e.g. national and sub-national early warning systems);
- improve the competence and proficiency of human resources in instrumentations handling, data collecting, processing and analysis
- improve hydrological network infrastructures (hardware (equipments and instrumentations) and software)
- improve hydrological institutions and services
- optimize available resources of different institutions, including experts networking in utilizing hydrologic data at the different institutions
- strengthening the capacity of communities to manage their resources (e.g. savings, credit schemes, agricultural inputs, agricultural production, land use, etc.);
- enhancing the use of technological options to manage climate variability associated risks (e.g. disaster information management system);
- raising awareness of community and building capacities of local institutions in support of national disaster management policy;
- advocacy by policy makers on natural disasters risk management and climate change;

- create support within society for climate policy by keeping the general public informed about climate change;
- beginning the process of educating and training a new generation of climate-water risk management specialist;
- strengthening education in the field of climate and spatial planning.

Scientific community, knowledge institution, and NGO

Need for capacity development to address climate change

Knowledge and Capacity for Development

- Water management is facing increasing challenges like water scarcity, climate change, urbanization and decentralization. These challenges require more capabilities of people and institutions. Such capacities need to be strengthened at all levels.
- Capacity Development and Social Learning are cornerstones for sustainable development, hence directly related to the real chances to achieve water security and the MDGs and reduce extreme poverty.
- There is growing awareness that a paradigm shift is needed in the way water-related problems are addressed and solved. As a consequence, a more holistic approach to strengthen the capacity of both individuals and organizations is required.
- Investing in the development of capacities, especially at local level, is essential to the sustainability of the water sector. Investing in capacity now will create long-term benefits to both donor and recipient. For development, investment in the "softer" legal, management, institutional and social components is as vital as the investment in the "hard" technical ones.

Knowledge Sharing

- Actions in the water sector need to be scaled up. There are successful experiences that should be systematically replicated. For instance, networking and partnerships have proven to be two effective vehicles for sharing information and knowledge while making use of the expertise, skills and experiences available. They also enable the creation of a mass of experts for research on water development and management, which is a critical fault in developing countries.
- A shift to more locally owned and implemented actions is needed. Actions must be less directed in a top-down manner and more in a participative way. It implies that international and national efforts should be particularly focused on empowerment while mobilizing leadership around locally owned capacity development actions. It also means enhancing the knowledge exchange mechanisms with pairs simultaneously.
- Capacities to reduce the exposure to risks in the future must be built now, involving both specialists and the public. Water professionals are not adequately prepared to cope with extreme situations. With climate change, extreme events such as floods, droughts and storms seem to be increasing in frequency and intensity. Changes in the hydrological cycle imply an increase in human, economic and environmental risks. Now it is time to build the capacities of

sector professionals and the general public to protect socio-economic, ecological and environmental interests through enhancing protection and resilience against the increasing risks.

Knowledge Generation and Research

- Development of relevant methodologies for integrated risk assessment and management drawing the attention to traditional and local knowledge;
- Research and training with a strong orientation to application;
- Policy dialogue between researchers, politicians, policy makers and other stakeholders for context-specific appropriate interventions;
- Development of regional cooperation and partnership in and between North and South in order to bridge the mismatch in the knowledge base between these regions;
- Networking, cooperation and coordination of efforts among relevant institutions of excellence worldwide;
- Pursuit of free research of complex nature-society systems is decisive for human security.

Capacity building already carried out

- Researchers at universities and knowledge institutions responsible for addressing climate change, with the cooperation and support of related international knowledge and donors institutions (UNESCO-IHE, GTZ, ADB, World Bank, and others), seem to continue their work in a more intense fashion. Involving NGOs is still seldom seen.
- International workshop on water and climate in partnership with national (Ministry of Public Works and Indonesia Water Partnership) and international partners (The Dutch Government) was organized to address the climate change issues in May 2007. The outcome of this workshop lead to the development of the Country Report which serves as one of references showing to the local and global stakeholders how climate variability and climate change has impacted Indonesia and what would be the implication if no serious efforts are taken from now on to adapt to climate change. Subsequently, follow up plans to work out programs and activities were done, as an example to bring all parties together on the adaptation agenda and preparation of a national action plan in November 2007.

Planned capacity building to prepare for climate change

The followings are the planned capacity building for scientist, knowledge institution and NGO:

Knowledge and Capacity for Development

- A program is set up for people and institutions in water management to face increasing challenges like water scarcity, climate change, urbanization and decentralization.
- Capacity Development and Social Learning to achieve water security and the MDGs and reduce extreme poverty for enhancement of sustainable development
- Both individuals and organizations will be trained in a more holistic approach in the way water-related problems are addressed and solved.

- Individuals and organizations especially at local level will be trained in the "softer" legal, management, institutional and social components; this is essential to the sustainability of the water sector.

Knowledge Sharing

- Networking and partnerships have proven to be effective vehicles for sharing information and knowledge in climate change. They also enable the creation of a mass of experts for research on water development and management, which is a critical fault in developing countries.
- Actions should be shifted to more locally owned and implemented actions and must be less directed in a top-down manner but in a more participative way and should be particularly focused on empowerment.
- Capacity development to reduce the exposure to risks of extreme events such as floods, droughts and storms; this involves both specialists (sector professional) and the public to protect socio-economic and environmental interests.
- Knowledge building for scientists about the latest developments in policy and practice in relation to climate change and spatial planning.

Knowledge Generation and Research

- Vulnerability assessment and adaptation planning as tools for scientists and experts;
- Methodologies for integrated risk assessment and management with attention for traditional and local knowledge;
- Research and training with a strong orientation to application for measures in climate change adaptation;
- Policy dialogue between researchers, politicians, policy makers and other stakeholders to anticipate climate change impacts with appropriate interventions in mitigation and adaptation;
- Development of regional cooperation and partnership in and between North and South in order to bridge the gap in the knowledge base between these regions on climate change mitigation and adaptation;
- Networking, cooperation and coordination of efforts in mitigation and adaptation of climate change among relevant institutions of excellence worldwide;
- Pursuit of free research of complex nature-society systems such as climate change facilitated by international knowledge centers;
- Partnership between regional and national research, extension systems and farmers/fishermen.

General public

Need for capacity development to address climate change

- Capacity building and awareness raising to understand and undertake adaptation;
- Preparing material for the media and for other awareness-raising initiatives;
- Assessing the effectiveness of consultation, awareness raising, education, and related programs undertaken at community level;
- Information dissemination and public awareness promotion on need of long-term planning and investment;

- Promoting effective community participation and consultation e.g. in resources management, disaster preparedness and pro-poor initiatives.

Capacity building already carried out (some examples)

There are two activities of capacity development that might be considered as relevant:

1) System of Rice Intensification (SRI): the basic idea of SRI is to apply a combination of (a) transplanting of young seedlings with wider spacing and (b) intermittent irrigation during vegetative growth period. The results of "Trial Stage" and "Extension Stage" over a total area of 9429 hectares over period of five years (2002-2006) shows that i) the average yield increase was 78% (3.3 ton/ha) with reductions of 40% in water use, 50% in fertilizer application, and 20% in the costs of production. The economic attractiveness of SRI methods is large, giving farmers strong incentives to accept water-saving as the new norm for irrigated rice production.

   Lessons learned of SRI practices are: i) good management and operation & maintenance (O&M) of irrigation systems is essential to get farmer participation; ii) motivated farmers are important, which also means a high level of agricultural skills and awareness of possibilities for innovation and increase of yields, otherwise, agricultural conservatism will prevail, and present practices will continue. This example increased the resilience of the farmers to a large extent.
2) Climate-Field-School: the aims of the Climate Field School are (a) to increase farmer's knowledge on climate and their capability to anticipate extreme climate events, (b) to help farmer in observing climate parameters and utilize them in supporting on farm activities, and (c) to help farmer to interpret weather forecasts for developing an appropriate strategy of farming culture. Challenges in extending this school are (a) lack of knowledge of field facilitator, and (b) lack of support funding from local and central governments.

Planned capacity building to prepare for climate change

- Sustainable use of forests and dry lands, agricultural areas and river basins for economic development and pro-poor initiative in a participatory and consultative manner, using demonstration plots or pilot areas.
- Disaster management and disaster preparedness focused on (a) mitigation action planning which involve local communities developing and implementing their own mitigation plans, (b) disaster preparedness action planning based on participatory analysis of vulnerability and capability, and (c) dissemination of weather forecast for early warning (flood and drought) and adjustment plan and actions for agricultural activities.

The way forward

- Extend the content of existing capacity development programs in water resources management for operational water managers at various level of river basin to also include training material to increase capacity to cope with the impacts of climate change.
- Community based multi-stakeholder process, both in horizontal and vertical level, is absolutely has to be developed and become the main principle for

institutional development in the future including institution for dessimination of measures to cope with climate change.

- Create a new program to translate science documents to policy briefs, workshops, and dialogue for members of National Council for Climate Change and other policy makers at related ministries and various sectors of water users
- Extend the content of existing/on-going mass capacity development of pro-environment activities for farmers and other water users such as "System of Rice Intensification", "Climate-Field-School", "National Movement for Safeguarding Water Resources", "Toward Green Indonesia", and "Kampong Climate" with practical materials/demonstration plots to increase capacity to cope with impacts of climate change.
- Disseminate the finding of research works on impacts of climate change which is done at some universities in Indonesia in cooperation with international knowledge resources to water resources stakeholders including farmer group/associations and local governments.
- Make use of available web-based educational tools such as the on-line course provided by UNESCO-IHE, to disseminate operational knowledge, tools and methodologies, and research findings from Indonesia to climate change stakeholders including students and practitioners.

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