

## **Action Report toward Flood Disasters Reduction Indonesian Case**

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### **Abstract**

Geographical position of Indonesia causes most of Indonesia area experiencing high rainfall annually. In addition to that, Indonesia is also close to earth quake zone and become location of numerous active volcanoes. Having those characteristics, Indonesia is very susceptible to various natural disasters such as floods, droughts, landslides, volcanoes eruptions, earth quake, tsunami, and forest fire, etc. The losses due to such natural disasters are varies, that is from a reduction of life comfort ability to loss of life of hundred thousands of people and swept out of some cities in the east and west coast of Aceh due to tsunami recently. Among the above mentioned natural disasters, flood is the one that most frequently occurred every year. The frequency of the occurrence and the magnitude of devastating impact are getting bigger and bigger. More than 250 peoples are reported loss their life annually and more than 500-1,000 billion rupiah annual loss is the average damages of economic and social infrastructures including personal property in monetary term.

This report will summarize impacts (lost of life, number of person missing, injured, and displaced, and damages of public and private property) of floods and other water related natural disasters such as landslides that occurred during the last 4 years for the whole river basin in Indonesia and tsunami disasters at Aceh and surrounding areas in December 2004. Qualitative descriptions on the impacts to socio-economic conditions and likelihood of urban and rural populations as well as for industrial and commercial areas will also be briefly described.

Furthermore, causes of increasingly intensive floods, challenges and constraints in overcoming floods disaster will also be analysed. The recent Government of Indonesia's comprehensive policies in flood management which try to address mitigation of floods in comprehensive way, i.e., synergizing spatial planning, integrated water resources management, providing better management of drainage system and garbage disposal and controlling of development of new settlements and improving preparedness of community in tackling floods to seek an effective and efficient approach to mitigate floods will also be reported.

## **Action Report towards Flood Disaster Reduction Indonesian Case**

- 1. Problem Statement**
  - 1.1 Review of Current Condition**
  - 1.2 Assessment of legislation and available data**
- 2. Government Policies**
  - 2.1 Review of current policies**
  - 2.2 Review of institutional setting**
  - 2.3 Lessons learned, evaluation of policies**
- 3. Implementation**
  - 3.1 Integrated Flood Management Policies**
  - 3.2 Legislation and Organizational Setting**
  - 3.3 Structural and Non-Structural Measures**
  - 3.4 Measures in normal time**
  - 3.5 Measures in emergency**
  - 3.6 Early Warning and Damage Control**
  - 3.7 Lesson learned and evaluation**
- 4. Report on Special Cases**
  - 4.1 Bahorok-North Sumatera Flashflood**
  - 4.2 Tsunami Aceh and Nias**
- 5. Actions Proposed for International Cooperation**

## 1. Problem Statement

### 1.1 Review of Current Condition

Indonesia has a land area of approximately 2 million km<sup>2</sup> and 220 million inhabitants. Recurrence of major floods is increasing, with heavy losses to the economy. This is partly since increased population induced urbanization as well as coastal and watershed degradation, reducing natural retention for storm water run-off and encroaching natural flood protection and diversion capacity. Moreover, higher population density and economic development increased numbers of casualties and value of losses.

Most of floods in Indonesia are due to overflowing of a huge mass of water overtopping of river banks and inundating low land areas in adjacent of river banks. Velocity of water overflowing over low land areas depend on the terrain of the lands and the height of accumulated water on the river. Anything on low land areas, they can be urban centres, commercial districts or agricultural areas can be inundated for a couple hours and even a couple days (2-5 days).

Three determinant conditions are heavily influence floods events those are: 1) the intensity and duration of rainfalls, 2) the condition of river channels, and 3) the existence of low land areas. Those three determinant conditions are influenced by a combination of two causal factors of natural factors and human/social factors as described bellow:

A. Natural factors, it can be combination of all or some of the following factors:

- 1) High intensity and long duration of rainfall. For example, flood occurred in Jakarta in 2002 partly was due to a total of 550 mm rain that fall within 6 consecutive days in the areas surrounding Jakarta.
- 2) The existence of some low lying areas in which their ground elevation are below a mean of high tide sea level. For example, about 40% of Metro-Jakarta area is below a mean of high tide sea level.
- 3) During a high tide sea level, a back water effect occurs on river mouth. This back water effect causes overflowing of river flow over river bank and inundating low lying areas surrounding river.
- 4) Existence of a meandering river and some natural contraction river channels cause a bottle neck for river flow.
- 5) Abrupt change of land terrain from hilly area to flat areas also causes overflowing of river flow over river bank.

B. Human/social factors

As a result of growing population pressure and intensity of economic development that has significant contribution in poverty eradication program by providing job opportunity throughout Indonesia, land-related issues of efficiency, sustainability and equity have become increasingly important. On the other hand, poverty makes the situation worse through deforestation and overexploitation of the natural resources. On major islands of Indonesia, i.e., Java, Sumatra, Kalimantan and Sulawesi the conversion of upland forests and coastal wetlands to agricultural use has led to soil erosion, watershed degradation and the loss of valuable marine resources. Because of high rainfall intensities and watershed erosion, most river carry large quantities of sediment which result in river regime problems as well as river mouth clogging. Due to the flat slopes and inadequate carrying capacity in lower reaches, many rivers experience flooding in the lower reaches. The rapid—but often uncoordinated—expansion of urban areas results in less-than-optimal land use densities and efficiency in the provision of infrastructures. Population growths create the high demands of human

settlements. Therefore, the flood retention basin and the topographically depressed and even river channel or flood way have been encroached by the housing development projects and other urban support facilities such shopping centre, sport centre, etc., that are impacted by economic development, wetlands that use to be a flood retention basin for surrounding area became less and less also because of the development activities. Many of the aquifers in Java's rapidly growing urban centres– particularly in the densely populated urban areas have already suffered from over-extraction, resulting in salt-water intrusion and ground subsidence in many coastal urban areas. Land subsidence has increased numbers of flood prone areas.

Floods normally occur during rainy season. However, the start and end of rainy season are different from island to island. For provinces in the island of western part of Indonesia it starts earlier, i.e., September. While provinces in the island of central and eastern part of Indonesia it starts latter, i.e., in the month of October and November respectively. Over the last four rainy seasons an increasing number of people have died or missing, rising from 200 in 2002, 320 in 2003, 482 in 2004, and 274 in 2005 (up to May 2005 and not include human casualties due to tsunami in Aceh and Nias). In total on these 4 years about more than 930,000 persons were evacuated, the accumulated recorded impacts on infrastructures more than 280,000 ha business and industrial areas, 805,000 units houses, 1,199,400 ha rice fields and 2,830 km roads are inundated or damages. The complete information on destructive impacts of floods and landslide hazards for these 4 years for the whole of Indonesia are given in the Attachment 1.

The most severe losses were caused by the record strong earthquake and subsequent devastating tsunami that struck Aceh and North Sumatra in December 2004. More than 200,000 people were killed or missing and 500,000 had to be evacuated. Damages are going up to estimates of US\$ 4.5 billion, which is more than 2% of GDP. Such magnitude of one single event was unprecedented, and although tsunamis and earthquakes are occurring frequently with much lower number of victims and damages, it still remains unclear what is the risk of recurrence for a similar catastrophe of this magnitude.

Earlier flood management plans mainly focused on improvement of infrastructure, to address inadequacies for flood prevention. As has been identified Indonesia has about 5,860 unit of rivers, among them 600 rivers have the worst impact on social and economic conditions. To mitigate the flood hazard impact structurally on those 600 rivers about 30,000 km river training and 15,000 km dike are required. However, the capacity of government in term of budget availability to develop river training and dike is about 300 km and 150 km respectively, therefore it needs about 100 years to mitigate flood hazard structurally. In addition to that, these plans either address only part of the problem, which makes the result ineffective, or they are too ambitious, and socio-economic feasibility is usually not sufficient. Moreover, if plans are implemented they frequently do not deliver the results expected, because of insufficient analysis of what causes the problems, or because institutional capacity to support the measures is insufficient.

In response to this problem, Government of Indonesia seeks and promotes a more promising approach that would be to concentrate on flood management, realizing that floods cannot be prevented totally. This implies “living with the floods”, with focus first on non-physical plans to limit the damages, and secondly, direct physical investments to feasible locations. Preventive measures comprise risk assessment, and subsequent preparation or updating spatial plans and raising public awareness about flood risks for new development and required preventions. Cost effective investments to reduce damages could make use of natural retention capacity, directing floods from potential high damages, usually industries and settlements, towards flooding of agricultural land or natural wetlands, which can withstand limited flooding without harm.

Feasible investments to reduce floods should start with soil conservation in the upper watershed and removing natural or man-made bottlenecks in flood ways.

In this approach the resilience of community to live in harmony with flood such as *community service and empowerment of society* is the most important component. It consist of provision of early flood warning system and flood hazard mapping and risks guides, flood resistant building code, raising awareness, campaign, capacity building, education and training, etc. The resilience of community to flood program is intended to abate the impact of flood for urban and sub-urban areas and rural areas as well. The targeted areas among others are JABODETABEK (Jakarta, Bogor, Depok, Tangerang dan Bekasi), Bandung, Semarang, Surabaya, Makassar, Denpasar, Padang, Medan, and Lampung and other cities that have flood prone areas.

## **1.2 Assessment of legislation and available data**

### **Legislation**

Indonesia recently adapted its legislation concerning water resources. The former Water Resources Law 11/1974, mainly regulated investments. Thirty years later the main issue is how to manage the available infrastructure, and the new law aims to regulate the various needs of conflicting interest groups. Moreover, in line with the reform movement of 1998, the law aims to change the role of the government from the “centralized management” to the more “decentralized management” of activities by lower levels of government and the community. The new Water Resources Law No. 7/2004 deals with authority, duties and responsibilities of the different levels of government and the community, and covers planning, utilization and emergency aspects of water resources, as well as information management, participation of private sector and corporation etc. It also stipulates that basin water resources management approach should be based on the whole river basin, based on hydraulic boundaries.

### **Available data**

A series of data is available from earlier flood events concerning water levels, discharges, weather, topography, inundation patterns, damages, land use etc on rivers currently manage by PJT I and PJT II and about 50 Balai Pengelolaan Sumber Daya Air (BPSDA)/Water Resources River Basin Management Units in some river basins in Java, Sumatera, and Sulawesi. However, access to these data is not yet standardized and use for flood prediction and risk assessment still requires a lot of work for collection and processing. Most hydrological data are stored in the Public Works National Water Resources Data Centre, PJT I and PJT II and 50 BPSDAs with the standard systems of HYMOS and TiDeDa, established nation wide.

## **2. Government Policies**

### **2.1 Review of current policies**

#### **2.1.1 Government General Policy in Disaster Mitigation Management**

- a. In any disaster mitigation measures and risks management there must be the same perception among all parties concerned from government institution as well as from community. All efforts and measures have to be based on general guideline, manual and permanent procedure that issued by related institutions in accordance to their competence.
- b. Disaster mitigation efforts and risks management are implemented in integrated and coordinated manner involving all government and community potentials. The efforts and measures previously mentioned are implemented before, during and after disaster which are materialized in preventive, repressive and rehabilitative/recovery manners.
- c. Disaster mitigation measures and risks management is one of the government duties, therefore it must be implemented by government together with all private sectors concerned and community at larges by empowering facilities and infrastructures that are

available and to put the government as a facilitator and pose the main responsible institution.

### **2.1.2 Government Operational Policy to Mitigate Flood Hazard**

The Government of Indonesia has adopted a comprehensive operational policy to mitigate flood hazard comprising five principles:

- a. *Land use (spatial) planning*: inventory of land use changes that cause floods, review of existing land use (spatial) planning; support of land use planning that minimize run-off; and control land use development to minimize run-off.
- b. *Integrated Water Resources Management*: flood control measures have to implemented base on one logical ecosystem or hydrological unit, from spring down to river mouth based on *one river one integrated plan and one coordinated management*. Flood Control measures shall consist of structural and non-structural measures with special concern to preparedness and self-reliance of the community as a whole and to protect residential, industrial and agricultural areas from flood hazard.
- c. *Provision of adequate urban infrastructure*: for drainages of settlements and other urban areas as well as solid waste disposal.
- d. *Provision lows priced housing to resettle poor people obstructing discharge of flood waters or are living at vulnerable locations for floods and land slides*.
- e. *Community service and empowerment of society* comprising early flood warning systems and hazard mapping and risks assessment as well as raising awareness.

### **2.1.3 General Measures to Mitigate Societal and Economic Impacts**

The following measures are taken to mitigate the societal and economic impacts of flooding:

- a. In the prevention stage, efforts are mainly focused on prevention measures such that damages and victims are kept at minimum level during disaster.
- b. In the emergency stage, efforts are focused on search and rescue measures and evacuation as well as emergency supports such as temporary shelters, food supplies and medical service for disaster victims.
- c. In the rehabilitation stage, efforts are directed to rehabilitate any damages on physical and non-physical matters caused by floods as well as community empowerment and to recover the strength of victims.
- d. In reconstruction stage, efforts are directed to reconstruct public infrastructures and facilities such the community live are recovered.

### **2.1.4 Role Sharing Between Governments and Community**

#### **a. Roles and Responsibilities of Local Government**

Emergency response is widely regarded as the initial responsibility of the local authority. Only when the capacity to deal with the emergency at hands is exceeded, it will be necessary to request assistance from more high levels of government. Overland floods from a river can usually involve the whole or part of river basin and its sub-basins, and consequently can involve an affected land surface area far greater in area extent than one local municipality. It therefore makes sense, in the case of flooding, for a local government to establish organizational linkages to either more high levels of government and/or to neighbouring municipalities further upstream and downstream. In this manner, an effective flood emergency program can be established at the local level but designed to operate at perhaps a river catchments management.

#### **b. Roles and Responsibilities of National Government**

At country level, risk assessment is the starting point for risk management, which determines the nature and extent of risks by analysing potential hazards and evaluating

existing vulnerability and capability. A fundamentally important role for national governments is the function of “preparedness and recovery”. The superior financial resources of national governments are usually necessary to assist the local government level in the recovery tasks following an emergency. It is further presumed that, through legislation, the national government has organized the resources in its mandate; has planned the necessary coordination between its various agencies and departments; and is generally prepared to assist the local levels during the response period.

**c. Roles and Responsibilities of Community**

There are three aspects in which community as an individual and as a whole can play an important role in flood management, these are:

1) Causal aspect, in which if several influential rules are implemented or obeyed by the community they will significantly reduce magnitude of flood disaster, those are: i) not to dump garbage/solid waste to rivers, canals and drainage system, ii) not to built bridge and other structures that will obstruct river/canal flows, iii) not to live in river channel/river flood way, iv) not to reclaim low areas (for flood retaining areas) for other purposes, v) to stop deforestation on catchment areas, vi) to stop agricultural practices and other land use practices that against soil and water conservation rules, and vii) to control rate of urbanisation and population growth.

2) Participatory aspect, in which participation or contribution of community will mitigate impacts of flood disaster to community themselves, those are: i) to involve and active in flood mitigation drill such as, disaster awareness campaign, preparedness and evacuation drills, flood forecasting and warning etc, ii) to participate and actively join in a flood-proofing houses program, iii) to participate in education of flood disaster prevention, and iv) to participate in all step of public consultation meeting related to flood control measures development and flood mitigation measures.

### **2.3 Review of institutional setting**

Government of Indonesia is formulating a National Flood Management Policy. In July 2002 the Coordination Committee was established, chaired by BAPPENAS, comprising resource persons from relevant ministries. Activities are funded through ADB, results rely on performance of three working groups for (i) Spatial Planning, (ii) Technical Solutions and Financing and (iii) Emergency Management. Recently they submitted an academic paper with background information and a draft National Flood Control Policy Plan, to be discussed in a wider audience.

Interagency disaster task forces have been organized to coordinate emergency management at the provincial (SATKORLAK), district (SATLAK) and sub-district level (SATGAS/POSKO). A national body (BAKORNAS) provides central coordination, with support from technical ministries, including support concerning flood management from the Directorate General for Water Resources (DGWR) of the Ministry of Public Works (PU).

The National Forestry Department still takes most responsibility for upper watershed conservation. They manage the National Parks and similar protected areas. This is done through the public corporation for forestry (Perhutani/Inhutani), which also involves in wood production. Watershed Management Units (*Balai PDAS*) were set up at regional level (six for Java), to coordinate planning for all types of watershed conservation, but no follow up in the districts is done. The districts are responsible for implementation of the activities aiming at conservation of water resources and reducing erosion. They should prepare proper plans, using the knowledge available at the Balai PDAS, for an appropriate integrated approach of conservation.

### **2.4 Lessons learned, evaluation of policies**

An attempt to manage river basin in comprehensive and participatory manner involving sectors /relevant government agencies and surrounding communities have been started sometime ago. Several initiatives have been taken in the past which coincidentally in line with the current need of new policy. First, River Basin territories have been established, comprising several river basins in logical and manageable units. Since 1982 Indonesia has been divided in 90 River Basin territories or Satuan Wilayah Sungai (SWS) and in several strategic river basins, a basin water resources management committee or Panitia Pelaksana Tata Pengaturan Air (PPTPA) consisting of involved provincial and district agencies in water have been established, for coordination of policy and management. Since 1996 these committees are supported by Basin Water Resources Management Units (BPSDAs), established as structural technical unit of the provincial water resources agency.

Secondly, cooperation between upstream and downstream communities has been promoted, with promising results in various places. In Lombok a surcharge on drinking water is used for extra contribution to upstream farmers to support better stewardship of forests, and enhance water supply in the dry season. In Banten the private Krakatau industrial estate supports the community living around lake Cidanau to maintain the wetland conditions essential for sustainable water supply for Krakatau estate. In Yogyakarta the local community around Sermo Dam obtained more secure rights for intercropping in the forest and use of the fruits, under the condition that they would guard sustainable growth of the forest.

Thirdly, cooperation with the poor community living in the flood plain has been established to look for win-win solutions, promoting better discharge capacity during floods, and still taking care for the income generation capacity of the people living there. A decision of the Minister for Public Works in 1991 created the necessary framework for such cooperation, and promising results have been achieved in Brantas Basin (East Java), in Yogyakarta (replacing obstruction through fish cultivation with other types of fish cultivation and brick industry) and in Jakarta (Bidara Cina), where local communities started to better prepare themselves for the floods and organized different methods for solid waste removal.

Despite attempts to manage basin in comprehensive and participatory manner have been made, however the situation is rapidly deteriorating because of increased population pressure, especially in Java. Confusion, uncertainty, and institutional capacity constraints, frequently related to policy shifts such as decentralization and regulating access to protected forest areas, resulted in poor maintenance, accelerated deforestation and degradation of upper watersheds. Population growth, industrialization and urbanization are expected to proceed, especially along the north coast of Java and around metropole as Bandung, Medan, Makasar, Surabaya and Semarang. As a result, damages from floods are expected to increase, and the accelerating pace of watershed degradation is expected to continue, causing increased frequency of floods and decreasing warning times; comparisons with historical data no longer apply.

Spatial Plans have been established for broad areas, but do not include provisions based on possible flood risks. As such, flood risks are not incorporated in planning for development. Even if there are mechanisms to restrict land use and control development in flood retention basins and wetlands, enforcement is usually weak. Flood retention basins have been encroached by housing development and wetland areas have been reduced. Current regulations are unable to ensure that sensitive areas are not developed unless adequate precautions are taken to ensure that developers provide proper conservation or flood protection works. Urgent action is required.

In response to severe degradation of watersheds and devastating impacts water related disasters during the 5 years, recently GoI has launched remedial measures. Firstly, a National Movement for Rehabilitation of Forest and Soil Conservation has been launched, as a coordinated action



program implemented under the leadership of the Ministry of Forestry, but supported by all relevant national departments and local governments. The program comprises a multi million dollar investment budget aiming to restore 3 Million ha of critical watershed in five years started in 2003. However, this will not be enough, since watersheds are degenerating at a rate of 2.6 Million ha per year. Of the total area of 200 Million ha in Indonesia, some 120 Million ha is forest, and of this already 43 Million ha is in critical condition.

Secondly, in April 2005 President of Republic of Indonesia in conjunction of the World Water Day 2005 has launched a National Partnership Movement for Safeguarding Water Resources. This movement attempting to embrace all component of water resources multistakeholders to work in partnership to reverse current trend of degrading water resources and severe environmental disasters in the six aspects, i) spatial planning, physical development, land use and population growth aspects, ii) rehabilitation of forest & land and conservation of water resources, iii) management of water related disasters, iv) water quality management and water pollution control, v) increase of water use efficiency and management of water demands, and vi) equitable, efficient and sustainable water resource utilization.

### **3. Implementation**

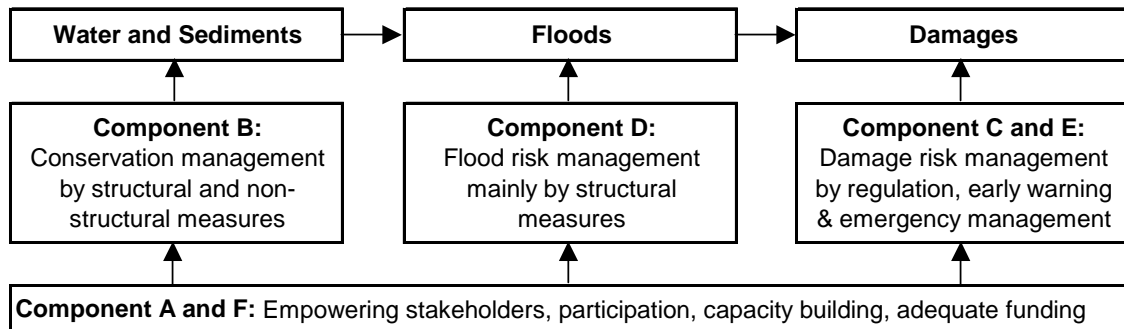
#### **3.1 Integrated Flood Management Policies**

Appropriate policies to address those problems currently being studied and planned are the Integrated Flood Management Plan (IFM Plan) that comprise of an inter-related set of measures. The measures should encompass the whole basin, from source to sea, based on one comprehensive plan, or effective integration of related plans, such as spatial plans, basin plans and other sectoral plans. Coordination and integration of planning is pivotal in the design, with objectives, priorities and preferences agreed by all stakeholders. The IFM Plan policy proposes measures that focus on mainly social and institutional measures to:

- i) Create conducive social and institutional environment through enhancing effective basin cooperation and governance. This is achieved through i) empowering local communities in decision-making, with special attention on cooperation between upstream and downstream stakeholders, ii) capacity building of government agencies, at all levels, to ensure adequate management, including support, monitoring and evaluation; and iii) providing adequate funding for total river basin water resources management, where cost recovery from beneficiaries can supplement Government funding (Component A and F).
- ii) Reduce inflow of water and sediment into the river to reduce flood occurrence. Specific measures needed for watershed conservation, rehabilitation and sustainable development (Comp B). Promising initiatives have been started for watershed conservation in Lombok, Yogyakarta and Brantas, where downstream users pay for environmental services of upstream farmers.
- iii) Enhance learning to “live with the floods” in the flood plain through prevention of damages by adequate risk assessment, and based on that informing the people and introducing regulation of developments and land use planning in flood plains (Comp. C).
- iv) Enhance learning to “live with the floods” through effective assistance and repair during emergencies and early warning systems before floods. In general this emergency management is well established, but more could be done to mobilize capacity within the community (Comp E).
- v) Ensure the proper function and quality of existing infrastructure to protect areas and to divert the floodwaters and / or to reduce the peak floods through proper O&M (Comp D).

- vi) Only where possible and feasible this is accompanied by investments in physical measures to increase capacity to convey floods. The aim is to increase the capacity to convey water to protect critical places, and direct water from locations where it would cause high damages towards locations where harm would be tolerable (Comp D).

These abovementioned policy components are inter-related, as illustrated in the figure below.



### 3.2 Legislation and organizational setting

Indonesia has recognized the need for reform, and, over the past four years, the country's 30-year old water resources law has been amended to:

- ◆ enhance integrated water resources management (IWRM) to achieve sustainable resource use
- ◆ manage water in all aspects -- social, ecological and economic
- ◆ achieve a balance between conservation and water use
- ◆ decentralize the water resources management
- ◆ assure the basic right of water for all people
- ◆ make future policy in a democratic way.

Features of the new law presented in overview of several important aspects are as follows:

- **Management focus:** The new act is no longer primarily focused on the construction (development) of water infrastructure and irrigation networks, but on the provision of conditions for sensible, sustainable water resources management and irrigation networks.
- **Integration/river basin approach:** The act aims to integrate all aspects of water management - surface water and groundwater -- with regard to quantity and quality, with the river basin the focus of the approach.
- **Participation:** The new act encourages openness and stakeholder participation. Social organizations and citizens can participate in all aspects of water development and management – policy preparation, design, construction, operation, maintenance, and monitoring of water quality.
- **Good governance:** The act seeks to incorporate principles such as effectiveness, efficiency and transparency.
- **Water as a social and economic good:** The act acknowledges water has both social and economic functions and values. A new emphasis on economics recognizes surface and groundwater is a scarce commodity, needing investment that (at least in principle) must be repaid. Although government remains responsible for the allocation of water among sectors, the new act opens the door to possible new roles for the private sector.

While new features of the new law related to water induced disaster aspect are as follows:

**Flood Control:** The act now includes a flood control regulation, focusing on creating conditions to manage floods. It also describes the roles of central and local government in mitigating flood disasters.

**Information Systems:** One chapter of the new act is dedicated to the regulation of water resources information systems. All levels of government (national, provincial, district and municipal) are required to foster information systems as part of their water management obligations. Information systems will include data on: hydrology, hydro-meteorology, hydro-geology, water resources policy, water resources infrastructure, water resources technology, environmental issues, socio-economic and cultural aspects of community water needs. Hitherto, the provision of information was given a low budget priority. The new emphasis on providing wide public access to accurate and reliable information is a key step in improved management of water resources.

Law 7/2004 stipulates that river basins should be managed by river basin. The principle “one river, one plan, one coordinated management” may imply “many managers”, but these should coordinate the activities. Current institutional setting in most basins differs considerably from this concept, with many different managers pursuing their own interests, while a coordinating body to balance and negotiate between these interests is lacking. Only in Brantas and Citarum basin, the River Basin Organizations or *PJTs* mentioned above are trying to coordinate all aspects of the basin as manager in cooperation with the other relevant stakeholders.

In future the Water Resources Councils (*Dewan SDA*) are envisaged to take over that role. They provide a suitable platform for negotiation between the different interests, but the Councils will need adequate support from skilled managers to realize satisfactory results. Initial versions of such councils are the National Coordination Team for Water Resources, and Water Management Committees at provincial (*PTPA*) and basin level (*PPTPA*). They usually have only representatives from government agencies, meet only once or twice per year, and only few representatives from the community are involved. Following Law 7/2004, these committees will be replaced by the Water Resources Councils (*Dewan SDA*) at province and district levels, and possibly also at basin level, and will comprise direct stakeholders and government agencies. Exact composition will be arranged through an upcoming presidential regulation (PP) on water management in 2005.

The law also envisages river territories (*Wilayah Sungai, WS*), areas with hydrologic boundaries, comprising a distinct combination of watersheds of several rivers. If this area is located in one district, the district is responsible, and if located in more than one district, the province is responsible. The Directorate General for Water Resources Agency (DGWR in Public Works department in Jakarta) is responsible if the WS is located in more than one province, or the WS has a strategic-national interest, such as Jratunseluna serving the metropolitan city of Semarang and Citarum serving the JABODETABEK areas.

General arrangements are formulated in the law, for more specific aspects the government will issue new government regulations (*PP*). The minister indicated the following PP-s: (i) Water Resources Management, comprising all aspects of surface water resources on Planning, Utilization, Conservation and Flood Management, (ii) River and Lakes, (iii) Irrigation, (iv) Water Quality, (v) Ground Water, (vi) Water Supply, (vii) Corporations (River Basin Authority to exploit Multipurpose Dams), (viii) Dams and Reservoirs and (ix) Swamps. Also some Presidential Decrees are required, one of them especially on Flood Management at National level.

### **Organizational Setting**

The Ministry for Public Works (*PU*) coordinates development and management of assets in the build up area through its four Director Generals for Spatial Planning, Roads, Urban and Rural Development, and last but not least Water Resources. It also coordinates research, development and training through two institutes, one for technical research and development and another one for human resources development and guidance of construction and investment. The Directorate General for Water Resources (DGWR) has five functions: (1) formulation of policy for water resources management covering rivers, lakes, reservoirs, swamps, coast, irrigation, water resources conservation and mitigation of natural disasters, (2) formulation of basin water resources plans related to the spatial planning for that area, (3) implementation of policies concerning water resources and basin management, (4) stimulating cooperation in public and private sector investment for water resources management, and (5) provision of technical guidance and evaluation in implementation of policies for basin and water resources management.

Decentralization to local governments since 1999, increased the need for institutional strengthening for river basin and flood management at provincial and district level. All 30 provincial governments have the authority for overall management of rivers crossing district boundaries (most rivers), but they are required to deal with some 500 district governments responsible for utilization of natural resources. To fulfil this mandate, master plans for basin management in some 100 basins need to be prepared.

The five provincial governments in Java set up some 20 Water Resources Management Centres or *Balai PSDA* under the Provincial Water Resources Services or (*Sub*) *Dinas PSDA*, responsible for river basin management, including flood management. Most of these Balais are still weak in terms of budgetary provision and staff capacity to prepare proper operation and maintenance (O&M) plans. Cost recovery mechanisms need further development to make flood management and other aspects of basin management more sustainable. Outside Java another 20 Balais have been established, but they are still operated and funded on the basis of projects. The rest of the river basin territories are still operated by the provincial agency for public works with sub-agency for water resources.

Where an administrative boundary separates the upper watershed from the flood-prone area, it is difficult to convince the upper district to invest in watershed conservation, if this is only for the benefit of the lower district through reduced flood hazard there. Mechanisms to provide upper districts with incentives to maintain the watershed are needed. Creation of income generation activities for people living in the watershed could be such a mechanism. Land title issues in the watershed area also require urgent attention.

### **3.3 Structural and Non-Structural Measures**

Vulnerability to flood damage is largely the consequence of human actions and choices, resulting from endless cycles of development, flood damage and protection. The cycle starts with investments in a flood-prone area, suffering from damages when a flood occurs, and triggering flood protection; in turn this is followed by more investments, resulting in more flood damage, and triggering more protection, etc. Responses so far have been to design flood control strategies heavily depending on infrastructure development, without addressing other possible solutions.

Over-emphasis on investments in structural measures is typical of past flood control projects. Some seriously affected countries (e.g. Bangladesh and China) have started to reduce over-reliance on levees and other large-scale infrastructures, because of doubtful economic viability, adverse effects and negative environmental impacts. Recently, projects which is based on IFM

Plan have started to give more attention to restricting development in floodplains, watershed rehabilitation, preserving ecosystems and controlled flooding of retention areas. Such approaches are also less costly. The Project, therefore, will have investments in infrastructure in the most critical areas only.

Structural flood control measures have often addressed the symptoms and not treated the cures of flooding. Upper watershed conservation and adequate Operation and Maintenance (O&M) are important prevention measures, which may be less spectacular to include in project design, but which in the long run may yield sustainable results. The issue of insufficient O&M is well known, with available budgets of only 10-50% of actual requirements. The low budgets for O&M do not reflect the economic costs of flood damages and of new flood protection infrastructures. The IFM Plan policy addresses the issue of O&M under component D and F.

Non-structural measures have received relatively little attention in the past, although their potential to contribute to flood control and reduce damages related to floods can be considerable, for example: i) awareness raising, increasing local people's preparedness; ii) flood hazard mapping, monitoring and forecasting floods in time; iii) improved land use planning, particularly in flood prone areas; iv) early warning systems, that are designed to actually reach local communities in high risk areas; v) emergency measures, such as provision of food and drinking water; vi) improved operation and regulation of storage reservoirs, etc. Therefore, the IFM Plan puts much emphasis on these institutional issues (component A, C, E and F).

Policy support and good governance are increasingly considered as important issues that must be part of flood management projects. The recent policy and institutional reforms in Indonesia are calling for decentralisation, integrated water resources management ("one river, one basin"), basin coordination institutions, empowerment of local communities (water users associations) in decision-making, capacity building of government organisations, and equal distribution of costs and benefits between the various stakeholders. The IFM Plan is design to fully aware of these recent reforms and developments, on which it has based the total IFM Plan design, with specific attention through components A and F.

### **3.4 Flood Management Measures in Normal Time**

Task and role of inter-agencies disaster taskforce namely SATKORLAK (provincial level) and SATLAK (district and or river basin level) during normal time (in Indonesia during dry season), will be categorized in two measures, a) preventive measures which are done yearly in repetitive way before floods occurred, and b) recovery measures of socio-economic condition of community after floods occurred.

#### **a) Measures before flood**

- Establishment of a new or activate an existing Inter-agency Working Group (chaired by Provincial/District Water Resources Service) as part of SATKORLAK and SATLAK to make observation, inspection, and "walking through" on available structural (flood control structures) and non-structural measures and define of role sharing among members.
- Recommend any required improvement to maintain function of flood control structures.
- Monitor and evaluate rainfall and floods data, report on inundated areas and other information required to forecast floods and identification of affected areas and flood prone areas.
- Preparation of flood prone area map with plotted evacuation routes, location of temporary shelters, location of POSKOs, and location of flood discharge measurement/observation stations.

- Checking and testing of available flood warning system and take necessary measures to maintain them or establish them if there is not exist.
- Logistical planning and provision required funds, equipments and materials for emergency funds, relief materials (food and water), equipments (excavator, bulldozers, dump truck, movable pump, etc), and materials for flood fighting (sand bags, etc) and others equipment for emergency measures (boat, life jacket, etc).
- Planning and preparation of a Standard Operation Procedure (SOP) for emergency measures and flood fighting actions involving all member SATKORLAK, SATLAK and POSKO such as identification of affected/potentially flooded areas, identification of evacuation routes, evacuation equipments (transportation measures such as trucks, boat, etc), identification and preparation of temporary shelter for displaced peoples, identification of needs and provision of relief materials such as food, water, mobile sanitation and medicine on each temporary shelter.
- Implementation of Flood System Information, by direct disseminations to communities and issuance of press release and transmission of flood information in cooperation with printed media and electronic media such as TV and radio stations.
- Practicing evacuation drill to check preparedness of communities, Emergency Task Force, and evacuation equipments, readiness of temporary shelters with their emergency equipments.
- Coordination meetings in BAKORNAS, SATKORLAK, SATLAK, Inter-Agency Working Group and Emergency Task Force to determine various Levels of Flood Risk with associated consequences and role sharing among involved agencies, familiarization for all members SATKORLAK, SATLAK, and POSKO on SOP during emergency and to agree on information flows and reporting procedure and formats.
- Establishment of networks among involved government agencies and NGO working on flood mitigation and printed media as well as electronic media for public education, awareness campaign and transmission of flood information.
- Conduct public education on flood hazard mapping and its associated risks and the use of device for flood-proofing houses.

**b) Measures after floods**

- Verification and assessment on impacts of floods.
- Returning back displaced peoples accompanied by physiological medication/counseling.
- Inventory of number of flood victims such as dead, missing and injured and displaced people.
- Inventory on damages of public and socio-economic infrastructures and loss of private properties.
- Cleaning up of vital public and socio-economic infrastructures from mud, garbage and debris.
- Recovery of function of vital public and socio-economic infrastructures by temporary measures.
- Reporting and proposing rehabilitation of damages public infrastructures with permanent measures to relevant authorities.
- Rehabilitating damages public infrastructures with permanent measures.
- Evaluation of previous floods fighting and emergency measures to find deficiencies of actions for the purpose of recommendation for improvement.
- Improvement of floods fighting and emergency measures based on evaluation and recommendation on previous actions.

### **3.5 Flood Management Measures in Emergency**

Tasks and roles of inter-agencies disaster task force namely SATKORLAK (provincial level), SATLAK (district and or river basin level), and POSKO (Sub-district level) during emergency period (period in which floods and other water induced disasters occurred), are categorized as mitigation measures, those are:

- Observation and patrolling on condition of flood control measures and other critical areas such as dike, river junction, pumping stations, flood retention areas, etc
- Monitoring of flood water levels every three hours and increase to every one hour if flood water level increase sharply passing a pre-determined emergency level of flood with high risks for certain areas.
- Transmission of flood warning every three hours and increase to every one hour if flood water level reach an emergency state to enable evacuation measures effectively use available short time lag before flood water reach flood prone areas.
- Implementation of flood fighting actions such as an attempt to lower flood water level by several measures such as to distribute flood discharges to available flood ways, rivers and retention areas; to increase dike height with sand bags at critical point along flood prone river banks; to pump water out of low land areas, etc.
- Implementation of mitigation measures such as search and rescue of missing peoples; evacuation of peoples from inundated areas to temporary shelters which equipped with foods and drinking water, mobile sanitations, sleeping bags, emergency medicines; hospitalized injured persons, etc.
- Distribution of foods, drinking water and emergency medicines to displaced peoples and other parts of communities affected by floods.
- Conduct a patrol on left over settlements/housing areas while their owners are displaced peoples staying in temporary shelters.
- Conduct special actions/measures to observe and monitor impact of floods on strategic areas such as airport, vital distribution road networks, main toll roads, centre of government areas, centre of business areas, centre of industrial areas, main hospitals, etc and take necessary actions to protect or at least to minimize impact flood hazard on those areas.
- Preparation of report on number of people died, missing, injured displaced, inundated areas, damage on public and socio-economic infrastructures, private properties, etc.

### **3.6 Early Warning and Damage Control**

All developed basins in Java (about 11 river basins), 3 basins in Sumatra and 2 basins in Sulawesi have emergency plans and early warning systems, concerning operation of gates and alertness for extra protection with sand bags or evacuation in case of critical heights recorded at strategic locations. Generally optimal use is made of the limited possibilities: although it is inadequate to prevent floods, generally speaking fatal casualties are minimal. Fancy early warning systems based on telemetry nearly all have failed, because proper maintenance is difficult with limited budgets and inadequate staff. But reading staff gauges diligently during heavy rains, and communicating their progresses of increase of water level by radio are adequate.

Weakness of current early flood warning systems is the link to flood affected communities at village level. Usually responsible agency staff receives the information on time, but the communities are frequently alerted only at the last moment. Preparation and distribution of a flood hazard map will make the communities aware that they are living in the flood prone area. Flood forecasting and flood warning system, linked to the flood hazard map and evacuation plan, should be communicated to all communities at risk as precaution, and actual information should be spread quickly through local radio stations or SMS.

Another way to reduce damages is to arrange quick recovery after disasters. This could be done by mobilizing the local communities and banks in providing easy access to loans, and providing adequate budget for emergencies to the agencies, which can be mobilized expeditiously.

Output of the emergency management component (Component E) of the flood management policies will be that communities have assessed their situation and carried out measures to reduce flood damage and ensure essential goods and services are available during and after emergencies. Specific measures will depend on local conditions but may include some of the following:

- Improved communications linkages for receiving early warning information about flooding, including radio linkages and community dissemination of warnings.
- Evacuation routes and refuge sites identified
- Improved availability of water supply and sanitation protected from floods
- Local drainage improved, through cleaning, removal of obstructions, ensuring gates are operable, as well as prevention of new obstructions through river guard (see component A) and better information to local authorities and public.
- Protection of public areas such as markets, schools etc, or vulnerable areas such as locations where chemicals or oil is stored.
- Households more aware of ways to obtain information and to protect themselves and property during floods.
- Enhanced community groups, making optimal use of existing groups, and where necessary and feasible through establishment of new river users groups.

Another output will be inter-agency disaster task forces with updated and improved plans for dealing with floods. They will have carried out training courses and simulation exercises to strengthen their capacity provide emergency services. Trainers will have been able to support community-based flood preparedness. Stocks of emergency supplies and equipment will have been increased and refuge sites will have been improved.

The central activity in this component will be a participatory process through which communities improve their capacity to cope with floods. Agencies will support this, through developing capacity to facilitate community-based flood mitigation, and through improving their own capacity to provide well-coordinated emergency services. These measures will be included in the Flood Awareness guidelines. It is proposed to start with a pilot area to implement the measures to improve the validity of the Flood Awareness guidelines, and to show measures are working.

Flood Management will be more effective if it serves and is supported by Local Governments and communities. Beneficiaries from flood management should actively support implementation and maintenance, both by complying with the rules and contributing labour and/or cash. In accordance with the new law on water resources, both government agencies and communities should be represented in a coordinating body, such as the Provincial Water Resources Council (*Dewan SDA*) or the optional Basin Water Resources Coordination Body as well as inter-agencies disaster task force SATKORLAK, SATLAK and POSKO for emergency measures envisaged in Water Resources Law 7/04. If necessary, additional services should be provided to enhance cooperation between the various interest groups, such as low-cost housing, water supply, sanitation, and irrigation.

Indonesia's national policies are aimed at improving the welfare of people. Floods are threatening that, because it causes deaths, injuries and damages, prevents people to do the normal work during the floods and its aftermath, and limits willingness to invest for development and income generation. Poor people are most affected, because they usually lack the savings to cover the losses during floods or start anew at another location. The areas frequently affected by floods



show a significant lower development of these small industries than the neighbouring areas, and with each flood the area becomes less attractive. This vicious circle has to be broken, which could be done through well-targeted investments in flood management, as proposed in the flood management policies. Potential for improved performance in flood management is based on (i) the value of existing infrastructure, (ii) the high levels of untapped skills at community levels and (iii) the relatively low levels of investment required for preventing or reducing a large part of the annual damages from the floods.

### **3.7 Lesson learned and evaluation**

Efforts on previous flood mitigation management to reduce flood disasters impacts seem not effectively reach their potential targets among others are due to following reasons:

- Lack of awareness on disasters of communities, especially community living in river floodway and flood prone areas which very susceptible for “flash floods”. Many flash floods that were occurred in the past such as in Malang, East Java (2002), Bahorok North Sumatera (2003) that have caused hundred of peoples living in river flood plain loss their live within less than a half hour are not sufficient enough as a “deadly remainder”. The most recent flash floods again occurred on October 18, 2005 in Kuta Cane, Aceh Tenggara more than 21 persons were found dead, 152 persons injured, and about 3,000 persons displaced and hundreds of houses were completely destroyed.
- Lack of direct participation from communities. Inter-agency disaster task force SATKORLAK, SATLAK and POSKO should also involve representative of community, especially local community, NGO, university, private sectors and others.
- Lack of budget allocation for Operation & Maintenance for flood control structures and emergency measures based SOP for flood hazard mitigation. For example, among about 600 river basins that have caused severe flood hazard impacts only not more than 20 river basins have an effective early flood warning system.
- Inter-agency disaster task force currently facing problem of lack of knowledge, skills and equipments for emergency measures. Capacity building to improve capability of these institutions is therefore required.
- Community’s habits (describe in Problem Statement) currently are not conducive for an effective integrated flood management.
- Lack of massive dissemination for communities to learn and practices integrated flood management (IFM). IFM approach need public education and campaign which can be done in partnership with universities and NGOs.
- So far there is no Disaster Information Centre available at national level. This centre will have a function to collect, to record and analyse any data and information on water induced disasters and to transmit flood information to community. This centre could be attached to BAKORNAS or other suitable institution.

## **4. Report on Special Cases**

### **4.1 Bahorok –North Sumatera Flash Flood**

One of flood type that frequently occurs in Indonesia and which causes severe hazard is “*flash flood*”. Flash flood is defined as a flood with large magnitude and occurs in such a short of time. Triggering factors generally morphometry and bio-geophysics of watershed as well as heavy rainfall. Flash flood that occurred in Bukit Lawang village, Langkat District, North Sumatera at November 2, 2003 is one of interesting natural phenomena due to the number of people loss their live in such a short time, i.e., 151 people dead and about 101 persons missing within about 30 minutes. Other interesting factor is the fact that upper watershed of Bahorok is still in good condition and the occurrence of flash flood never been predicted. Based on field fact finding

survey, there are at least two causal factors that lead the occurrence of “Bahorok flash flood” with very high dead toll. Firstly, the large magnitude of water is due accumulation of water generated by high river flows blocked by landslides on the V shape very steep river bank (landslide blocking act as a “dam”). This river bank slides were caused by heavy rainfall (120mm/day) that occurred several time in September 2003. Partly blocked of the V shape river channel (occurred at about 10-15 km upstream of Bukit Lawang village) brought water level of river flow increase sharply. The heavy rainfall (again about 110mm/day) on November 2, 2003 brought a higher water level at blocking site such that this “dam” was overtopped and breach out bringing about 12 meters height river flows on a very steep river bed wipe out a densely populated Bukit Lawang village within 30 minutes. Secondly, the reason why the dead toll is so high is the fact that the surrounding area of river Bahorok is a cool and panoramic resort area. Many hotels, resorts, restaurant, souvenir shops and housing are located at Bahorok river floodplain. Should the flash flood occur at a day time a much higher dead toll might be expected.

Since Indonesia has many rivers that have the similar condition with Bahorok, it is imperative to have an inventory survey of river characteristics including current occupation of river flood plains. Based on this survey, a rearrangement of land use of river flood plains and a review on spatial planning on surrounding area for a safer place for living must be carried out by a relevant authority. We should learn from this hazard and the similar one that occurred in Malang, East Java in 2002. Should we learned from those hazards, the similar hazards that just occurred very recently (October 18, 2005) could be avoided or at least could be anticipated such that the human casualty could be minimized..

## **4.2 Tsunami in Aceh and Nias**

Indonesia was one of many countries in South and South-east Asia impacted by a tsunami on 26 December 2004, the origin of which measured 8.9 on the Richter scale. A direct consequence of the earthquake, which caused the sea floor to rupture (up to 100 km in places), was the displacement of a huge volume of water translated into a *tsunami*, or tidal wave, of colossal proportions. According to a BAKORNAS PBP (National Board of Coordination for Disaster Management)’s record up to March 7, 2005 more than 125,766 people are known to have lost their lives in Sumatra alone, while some 94,494 people still considered missing and the true record of people who lost their lives from this natural disaster will never be known. More than 400,000 has been displaced and are mainly living in more than 2,000 temporary camps. Formal organization of displaced persons settlements are still being worked out by preparing about 753 barracks that can accommodate about more than 45,600 persons. The rests may want to live back on their own houses after assistance is provided for rehabilitation of their houses.

### **Recovery of Water Resources Infrastructures**

The recovery of water resources infrastructures that consist of domestic water supply and sanitation, irrigation, flood control and coastal protection will take place in the following three phases:

- (1) Emergency phase (6 month period, started at the beginning of 2005):  
Emergency restoring of water resources infrastructure focusing on clean water supply to drink by means of drilling of deep tube-wells and repair of domestic water supply system and improvement of living conditions by drainage of wet areas.
- (2) Rehabilitation phase (1.5 years started in mid of 2005):
  - Domestic water supply and sanitation facilities: rehabilitation of destroyed facilities up to existing level of service

- Irrigation facilities: a) to ensure the irrigation water flow in the command area at the minimum level, b) to rehabilitate the damages to the main system to prevent further damages to the existing facilities due to uncontrolled irrigation water flow.
- Flood control: a) to minimize damage against possible flood, b) to conduct urgent rehabilitation/normalization for the river structures/stretchers at least to the minimum level.
- Coastal protection: a) to protect coastline against tidal wave at the minimum level, b) to conduct urgent rehabilitation for the coastal structures.

(3) Reconstruction phase (4 years started in the beginning of 2006):

- Domestic water supply and sanitation facilities: increase the coverage of service level to targeted new settlement areas.
- Irrigation facilities: a) to recover the function of irrigation systems to enable farmers to produce the paddy and other agricultural production to the existing commanding areas (before tsunami), b) to complete irrigation systems and introduce incentives and system for sustainable maintenance.
- Flood control: a) to recover/reconstruction of flood management structures to the original condition or more, b) to protect public and private assets from possible flood damages in all river system.
- Coastal protection: to protect coastline against tidal wave to protect public and private assets at the original level or more based on spatial plan.

The general principles of the implementation program of the recovery plan of water resources sector are as follows:

*Rapid participatory damage and needs assessment:* Emergency and recovery plans should be based on the rapid participatory field damage and need assessment, and the recovery works should be based on the prioritization drawn from the damage and needs assessment. The attention should be paid to prioritization of those works that should be based on the needs of the local population.

*Recovery (rehabilitation and reconstruction) plan:* The prioritization is given to: (a) improving the local working and living conditions in the rehabilitation phase; (b) emphasizing labor intensive infrastructure recovery works to be carried out by local people for small scale works to support them for sources of income, (c) offering the maximum stimulus for the revival of local economic activity.

*Spatial Planning:* Recovery of coastal protection facilities should be depending on the condition of the area to be protected. Where the protection areas are devastated, or the coastal geography was changed and the local people have shifted, the recovery works should be carried out in consideration of the result of spatial planning.

## **5. Actions Proposed for International Cooperation**

- (a) Strengthen the role of the National Strategy for Disaster Reduction and encourage the international community to provide the necessary financial resources to its Trust Fund;
- (b) Support the establishment of effective national and provincial strategies and scientific and technical institutional support for disaster management;
- (c) Strengthen the institutional capacities of national and provincial institutions and take an active role in international joint observation and research, through improved surface-based monitoring and increased use of satellite data, dissemination of technical and scientific knowledge, and provision of assistance to vulnerable countries;

- (d) Reduce the risks of flooding and drought in vulnerable areas by, inter alia promoting wetland and watershed protection and restoration, improved land-use planning, improving and applying more widely techniques and methodologies for assessing the potential adverse effects of climate change on wetlands and, as appropriate, assisting countries that are particularly vulnerable to those effects;
- (e) Encourage the dissemination and use of traditional and indigenous knowledge to mitigate the impact of disasters; and promote community-based disaster management planning by local authorities, including through training activities and raising public awareness;
- (f) Support the ongoing voluntary contribution of, as appropriate, non-governmental organizations, the scientific community and other partners in the management of natural disasters according to agreed, relevant guidelines;
- (g) Improve technique and methodologies for assessing the effects of climate change, and encourage the continuing assessment of those adverse effects by the Intergovernmental Panel on Climate Change;
- (h) Starting to deal with uncertainties of climate change, through research and adaptations measures;
- (i) Develop and strengthen early warning systems and information networks in disaster management, consistent with the International Strategy for Disaster Reduction;
- (j) Develop and strengthen capacity at all levels to collect and disseminate scientific and technical information, including the improvement of early warning systems for predicting extreme weather events, especially El Nino/La Nina, through the provision of assistance to institutions devoted to addressing such events, including the international Centre for Study of the El Nino phenomenon.

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