BASIN WATER RESOURCES MANAGEMENT AND ORGANIZATION IN INDONESIA

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*ABSTRACT: This paper introduces basic policy, operational, and institutional aspects of basin water resources management that has been done in Indonesia. H*ow *the government of Indonesia have been adjusted the water resources sector policies, strategies and programs for developing and managing of water resources also presented, to look at all possible ways of achieving an optimal balance, managing both the supply side and demand side of the equation, and of course for sustainable use of water especially at the basin level.*

1. Country overview.

Indonesia is composed of 17,508 large and small islands, and with a coastline of 84,000 km, is largest archipelago nation in the world covering a land area of 1.92 million km^2. The western region of Indonesia comprises large islands of Sumatera (437,000 km^2), Java (32,200 km^2), Kalimantan (539,000 km^2), and Bali (5,560 km^2). The Eastern region includes the islands of Sulawesi (189,000 km^2), Maluku (75,500 $km^{2)}$, the Lesser Sunda Islands (Lombok, Sumbawa, Sumba, Flores, Timor, Solor, Alor, etc) and the western part of Papua (422,000 km^2). Most islands have mountainous areas of volcanic origin and some have active volcanoes. This country is subject to tropical climate, which is marked by two seasons, the wet season from October to March and the dry season from April to September. This seasonal rainfall pattern is most pronounced in the west region from Sumatera to Bali. The east region except Papua has a rainy season, which is normally shorter than that of the west region. Between 53% and 86 % of the mean annual rainfall occours in the October to March rainy season period. Soil of Java and Bali are deep and fertile, while those of other islands are less fertile and particularly sensitive to erosion as the forest and ground cover is destroyed.

Indonesia also has a large and growing population, according to year 2000 census the population is 207.6 million people with over 92% following the Islam religion. The population comprises of nearly 300 ethnic groups that speak more than 500 different languages and dialect. The official language is Bahasa Indonesia, which is of Malaya origin. The population density (nationally 108/km^2) varies considerably from island to island. With the current growth rate of 1.66% annually the population expected to grow to 280 million people by year 2020. Java Island is the most socially and economically progressive island has 59% of the national population with a population density of 919/km^2. This has resulted in both surface and groundwater quality degradation.

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The nation staple food is rice except in the drier eastern islands where maize and cassava are used. Over the past 30 years, massive investment has been made in irrigated agriculture to move the country from the position of being the largest rice-importer in the world, to food self-sufficient status. The country achieved self-sufficiency in rice in the early 1990's, due in large measure to expansion and rehabilitation of irrigation systems. However, as the population has grown and as the economy has diversified and industrialized further, greater stresses on Indonesia's land and water resources have been realized. Rice production has fallen from 48.75 million ton in 1995 to around 44.60 million ton in 2002. The country has imported rice to meet the food gap. Almost 65% of rice production is on the Island of Java and Bali. Base on the water balance studies for 2010 indicate shortfalls of water in Java may increase to 38% of firm water resources.

In Java and Sumatera, urban and industrial development encroaches on agricultural lands and result in conversion to other uses. The combined effect of deforestation, and population growth threaten water quality for existing development, and water availability for future development. At the latest decades, the condition of food self-sufficient status has become worse. That worse condition has not just caused by global climate changes but also suffering a lack of capability to manage water, and lack of sustainable financing management and of course deforestation on the upper watershed.

The increasing in non-agriculture demand, the competition for water uses will increase conflicts between the different types of users, increase water quality problem during low flow. In order to support future development in water resources and to promote long-term water resources conservation and preservation. High priority of the water sector reform was given to adjust water resources policies and programs to improve management of water resources for sustainable development.

2. Governmental and Public Administration System.

The country is divided into 30 provinces and 315 districts (Kabupaten) and municipalities (Kota) that are large urban centers. Each of these entities has their own elected legislative assemblies (DPRD). Thus, there is a three-tier government and public administration comprising of the national, provincial, and district/municipalities or local levels.The lowest level of administrative unit is the village, which is headed by a village chief appointed by the people.

The governmental system should be managed base on the two laws; i.e: (i) Law No.32/2004 on Regional Government, (ii) Law No.33/2004 on Fiscal Balance between Center and the Region. These two new laws give the authority to the regional governments to manage most natural resources and ability to raise and retain revenue. The regional governments have now the authority to formulate their own plans, programs and fiscal policies as well as authority on exploitation of natural resources including water resources. Although, the center and provincial governments retain responsibilities for cross border activities such as national roads, irrigation systems that span two province or districts, management of river basin that are inter-provincial or inter-districts etc.

Under fiscal decentralization the regional governments revenues share will be greatly increased. This include new sources such as taxes/ fees and a variety of locally generated revenues from natural resources such as oil/ gas, mining, forest products, water etc. They will also receive national funds through (i) General Allocation Fund (DAU) and, (ii) Special Allocation Funds (DAK). The National Revenue sharing with the region (province, district/town) is according to an equalization formula. The national DAU allocation is set at 28% of the annual national domestic revenue of which 10% will be allocated to provinces and 90% to the districts and towns. The DAK allocation will vary and would include external development and sector support resources. Implementation of the fiscal decentralization policies are still in a preliminary stage. It is anticipated that in 2004 fiscal decentralization policies has been implemented in the water resources sector. Because of the large disparities in regional resources, including human resources and level of development, there is rethinking on the degree of autonomy to be implemented. The central Government may through other laws and administrative procedures try to retain part of this authority from a view of national unity and social justice (the Water Resources Law No.7/2004 is an example in this direction).

The public administration system as in the past is undertaken under three systems of governance; (i) *de-concentrated and/or co-management* public administration system and, (ii) *co-management* public administration system and, (iii) *de-centralized* public administration system. Under *de-concentrated* system the Governors (head of the provincial government) acts as representatives of the Central Government in the regions and undertake implementation of the policies/ routine programs of the Central Government under the supervision of the Center.

Under *co-management* public administration system, the Central Government may delegate several part of his authority to the Provincial or District/Municipality or village government to undertake implementation of a respective task/ program in the regions or local level. These programs are funded out of the national budget. At the regional level these programs are implemented under purview of regional sector agencies under Provincial or District Government known as Technical Dinas. Both of de-concentrated and co-management activity the Dinas agencies in the region work under the supervision and guidance of the respective central ministries. The Dinas agencies manage its functions through branch offices known as Technical Implementation Unit (TIU) in the field level. In the case of water sector the Provincial Dinas Public Works (Provincial Water Resources Agency) have TIU which are named Balai Pengelolaan Sumber Daya Air (Basin Water Resources Management Units). These will be discussed in a later section.

The *de-centralized* public administration system handles those activities that fall under the responsibility of regional government. These programs are fully funded by regional government budgets. While the central sectoral ministries may provide technical guidance the policies and strategies for de-centralized activities are the responsibility of the regional government. These programs are executed by the Dinas agencies under its authority.

3. Water Resources Management Issues and Problems.

3.1. Water resources condition.

Indonesia surface water potential is provided by over 5,590 rivers big and small. Short and steep rivers in Indonesia, whereas 94.1% are less than 50 km long. Only 15 rivers are longer than 400 km. The geographical diversity could be apprehended from size of the river basin that are dominantly small, about 86.6% has an area less than 500 km^2. Because of high rainfall intensities and watershed erosion, most rivers carry large quantities of sediment which results in river regime problems. In many river catchments volcanic eruption add to the sediment problems. Except for rivers in Kalimantan and Papua, most rivers have short lengths and are subjected to flash floods. The longer rivers experiences flooding in the lower reaches because of flat slopes and inadequate carrying capacity due to encroachment and aggradations.

The nations average rainfall is over 2.500 mm/year of which 80% falls during the rainy season (October to April). However, large regional variations in the rainfall exist over the country. It varies from 5.000 mm in the West (Sumatera) to 1.000 mm in the East (Maluku, Nusa Tenggara and parts of Sulawesi). The surface water potential and the available low flow for some of more important island group are indicated in the following table.

Surface Water Resource Potential and Demand by Island

Island	Area (1000 km^2)	Estimate Surface Water Potential (m^3/sec)	Estimate low flow (m^3/sec)	Irrigation + DMI Demand *			Water Resources Utilization in 2015 %
				1990 (m^3/sec)	2000 (m^3/sec)	2015 (m^3/sec)	
Java/ Bali	139	6,199	786	1,074	1,777	1878	29.8
Sulawesi	187	2,488	561	126	365	529	21.3
Sumatera	470	23,660	4,704	297	497	693	2.9
Kalimantan	535	32,279	6,956	73	93	193	0.6

Source: UNDP/FAO Study 1992

* Irrigation demand is the range of 87% to 95% of the total demand.

The estimated low flows in Java are not adequate to meet the demand, indicating irrigation shortages in dry season, unless adequate storage facilities are available. In general water tends to become a limiting factor in socio-economic development of a country when water withdrawals exceed 20% of the total renewable water resources. Looking at water resources availability based on per capita, it seen that, for fiscal year 2000 population figures, the average annual surface water potential for the whole of Indonesia is about 15,100 m^3 per capita, while for individual islands it varies from 1,580 m^3 per capita for Java and Bali at lower end to 418,800 m^3 per capita for Irian. The UNDP/FAO study reported that for Java and Bali (56% of population) nearly 60% of the natural basin discharge is required

to meet the demand, while for Kalimantan (1.8% of population) it is only 1% of the natural basin discharge.

Groundwater potential in Indonesia is very limited. There are no extensive groundwater basins. In Java, only the eastern part (East Java) has some groundwater irrigation amounting to about 41,000 ha. Much of the eastern islands such as Nusa Tenggara, Timor and Maluku depend on groundwater because of surface water limitation. Groundwater potential estimates for some islands are: 95 m^3/s in Java, 44 m^3/s in Sulawesi, 21 m^3/s in East Nusa Tenggara, and 9 m^3/s in Maluku.

Major use of surface water is for irrigation. Currently over 5.5 million hectares is provided with technical irrigation and another 1.6 million hectares as village irrigation. The infrastructure involves over 12,500 diversion structures and more than 236 reservoirs of various sizes (large dam and medium dam) with a total capacity of about 545 m^3/s. In addition, 3.3 million hectares of swampland has been developed by providing drainage and, 18,000 ha of fishpond in Aceh, North Sumatra and Sulawesi is provided with supplemental water supply. Water resources also supports generation of 2,200 MW of hydropower (20% of countries generating capacity) mostly in Java and some parts of Sumatra and Sulawesi.

3.2. Supply Capacity to meet Water Demands.

The spatial and temporal variation in supply as discussed above and the high ratio of demand to supply on the island of Java and some parts of Sumatera and Sulawesi is major constraint. Coupled to this is the extreme watershed erosion in the densely populated watersheds of these basins. Most demands are met by run-of-river schemes and are thus subjected to extreme fluctuations of river flow. While in most basins of importance the wet season (October to March) flows are adequate to meet demand, it is shortages in the dry season that adversely affects irrigation and non-irrigation demands.

While a number of reservoirs in Java river basin have been constructed the total storage capacity amounts to only 5% to 6% of the river flows. Construction of reservoirs to meet demands is constrained by lack of good reservoir sites, high density of watershed population requiring large resources for relocation, ecological impacts due to high rate of erosion and pollution problems from upstream rural and urban sewage/solid waste and, other environmental issues.

3.3. Sustainable Irrigation Systems.

Sustaining irrigated food production requires an effective irrigation operation and maintenance (O&M) program. Despite the preservation of O&M funding levels at about US$ 70 - 80 million equivalent per year since 1987, efficient and sustainable irrigation O&M is not being achieved by the provincial governments responsible for implementation. Funds are used primarily for staff support and administrative activities. The planned increase in regional fiscal and management autonomy raises further concerns.

The current system of Irrigation Service Fees has failed because of lack of accountability without direct link between revenue and provision of O&M. A ”deferred maintenance culture” together with periodic externally aided rehabilitation has resulted in a costly short-lived irrigation system. Also, the Government’s strategy of expansion of irrigation and swamp

reclamation need review, particularly with respect to the choice of the most cost-effective and environmentally sustainable interventions.

3.4. Water Pollution Control Deficiencies.

Industrial water pollution control has been addressed through programs like PROKASIH (Clean River Program). Some water pollution abatement is being achieved but national discharge standards for each economic sector require stronger enforcement. Municipal effluent disposal and treatment has received little attention and funding, because of difficulties related to financing, cost recovery and available know-how.

A clear operational concept remains to be elaborated regarding the best institutional and organizational arrangements for municipal effluent regulation and, more importantly, for the financing and operation of any treatment works require ensuring wastewater discharge quality. Attention to also needs to be given to water conservation and water pollution caused by mining and non-point sources of pollution.

3.5. Municipal and Industrial Water Supply.

The supply and distribution of water for domestics, municipals and industrials use is undertaken by a number of different agencies and organizations depending in part on the nature of the area covered. Out of an urban population of about 203 million only about 76 million (37.3%) get adequate access to adequate water supply of which some 33 million or 16.2% with piped water and, 43 million or 21.2% with non-piped water but protected supply. Some 127 million or 62.7% lack access to adequate quality water.

The various water supply providers are: (i) Regional Drinking Water Supply Company (PDAMs); (ii) Formal Private Sector; (iii) Informal Sector-Small Scale Private Providers and; (iv) by Individuals.

3.6. Institution Deficiencies in Water Resources Management.

The rapid demand of water in Indonesia has highlighted several institutional deficiencies in water resources management (WRM); such as:

- Indonesia has general water allocation priorities: domestic use, agriculture, industry and electric power generation, sport and recreational, environmental, etc. But these general priorities neither clarify the allocations amongst specific users, nor do they set priorities under long term and emergency shortages.
- Service on safe drinking of water is available to only part of the population. Though goals for expanding the service exist, funding constraints prevent these goals being met. The quality of raw water supplies from particular rivers is deteriorating due urban and industrial waste being discharged into waterways. Remedial programs are slow in execution and adequate measures to promote effective waste management, such as pollution charge or enforcement of standards, are not in place.
- Financial responsibilities are integral to a country's institutions. But for what aspects of resource development and management should society pay? To what extend should activities be subsidized? If the beneficiaries should pay, what facilities and responsibilities should government relinquish to them?

Indonesia's water resources sector faces increasingly complex long-term investment challenges and management problems, such as: legal structures, regulations, policies and institutions. The problems arise from the adverse impacts of population growth, urbanization and industrialization. It is therefore, essential that the government changes their sector policies, use more effective institutional frameworks, and improve planning and management systems as well as increased beneficiary participation to adjust to current and future challenges.

4. National Water Resources Policy (NWRP).

The policy on water resources management in Indonesia was developed base on the three foundations, i.e.: (i) philosophic consideration, (ii) legacy consideration and, (iii) technically consideration.

Base on philosophic consideration, the new Law on Water Resources No.7/2004 declares that water resources are a blessing of the One and Only God that give benefits for the welfare of the whole people of Indonesia. Water resources shall have social, economic and environmental functions and shall be implemented and realized in a harmony.

Base on the legal aspects has been stated in Article 33 paragraph (3) of 1945 Constitution, that land, water and or its resources shall be control by the State and shall be utilized for optimum welfare and prosperity of the people. The new law stipulates that water resources are gift of Almighty God, and as one of the natural resources which very vital and absolutely needed by the people and shall be controlled by The State and are use for the maximum benefits of the people in a fair manner. The State's control of the water resources is undertaken by The National Government and/or the regional governments while recognizing and respecting the traditional communities such as the traditional right of the local, traditional community and any other similar rights as long as such rights are still acknowledged in line with the community's development and the principles of the Unitary State of the Republic of Indonesia.

Base on technically consideration, the new law states that water is actually dynamic resource by nature, flowing to lower places without distinguishing the administrative regions. The nature of water follows the hydrological cycle that is closely associated with the climatic conditions of an area, causing inequality in the availability of water by period of time and by region. To ensure the implementation of WRM, which will give the outmost benefits for the welfare of the people in all aspects of life, WRM scheme shall be established. The WRM scheme shall be prepared based on river basin. WRM scheme shall be based on the principles of balance between conservation efforts and effective utilization of water resources.

In controlling said water resources by the state, the state guarantees the right of every person to obtain water for the fulfillment of daily basic needs and to conduct the regulating of water rights. The state's control of water resources should be conducted by the Government and/or regional governments by maintaining the recognition of and respect for traditional legal community unities and their traditional rights such as the

community's local traditional law, traditional rights and other similar rights, so long as they are still existent and in accordance with the social progress of the people and the principles of the Unitary State of the Republic of Indonesia.

The National Water Resources Policy (NWRP) reform follows the broader Indonesian policy framework as stated by the Law on Water Resources , which stressed that development of regions is essential for overall national development for increasing stability, equality and growth along with prosperity of the people. The WRM policy reform is directed to shift from current narrow sectoral policies to a more holistic and integrated approach in which both structural and non-structural measures are used for effective and efficient WRM.

The mission of the NWRP policy covers: (i) Sustainability of water resources conservation, (ii) Adjusting water use for multi purpose need to fulfill quality and quantity, (iii) Controlling and mitigation of water damages, (iv) Empowerment and intensity the role of community, private and the government in water resources management, (v) Increasing availability and need of data and information system of water resources.

The NWRP will cover water quantity and quality management for both surface and groundwater **in the context of river basin and aquifers, including upper watersheds, floodplains and estuarine areas**. The NWRP were include policy principles to guide legislative, institutional and regulatory interventions that:

1) Introduce **a water use rights framework** for surface and groundwater water allocation and utilization conducive to economic and social development, equity and environmental sustainability;
2) Improve **efficiency in the utilization of water**, particularly for irrigation;
3) Facilitate **conjunctive allocation and use of surface and groundwater** through a unified licensing mechanism;
4) Seek attainment of **regional surface and groundwater quality levels conducive to national socio-economic development and environmental sustainability**, and compatible with both Spatial Land-Use and Basin Development Plans;
5) Develop institutions for prioritized, **integrated spatial and river basin planning processes** based on participatory involvement of stakeholder representatives in publicly transparent water resources and irrigation decision-making activities;
6) Strengthen the **enabling mechanisms for community management and financing of irrigation networks, municipal water supply and sanitary wastewater disposal**;
7) **Establish a monitored planning, programming and budgeting system** for prioritized and sustainable water resources development investment and management under the new legal framework for regional autonomy and related national revenue sharing;
8) **Create a regional water resources regulatory and management structure** to support and implement integrated river basin management under the principle "One Basin, One Management" through Provincial/ District Basin Management Units and, wherever feasible, corporative self-financing entities under Regional Government control;
9) Reinforce the **principle of beneficiary contribution** towards the government costs of public water supply and irrigation services, and the principle of "Polluter Pays" for

the public costs of water pollution abatement applicable to all pollution sources including publicly owned entities and municipal authorities.

10) Improve the regulatory and **incentive framework for publics participation and partnership** in water resources and water quality management, as well as irrigation management through investment, operating and maintenance concessions.
11) **Improve coordination** between forestry, agriculture, conservation and water resources sector public and private activities to promote environmentally sustainable watershed, floodplain and estuarine management; and
12) Establish specific **integrated policies for environmentally sustainable wetland conservation and swampland development.**

5. River Basin Organization.

5.1. Management in Less-Developed Basins.

Water resources development and management in Indonesia has been divided into 90 river basin management units. To strengthen water resources management in less-developed basins, the Provincial Government was setting up a permanent Basin Management Units (Balai PSDA) to implement water resources management concept with river basin approach. The Balai PSDA is set up under Provincial Public Water Resources Service to manage river basins lying across District. The roles, responsibilities, and functions of Balai PSDA are management of: water allocation for several users, rivers, reservoirs, lakes and ponds, flood control and drought handling, swamps, in stream pollution control, river mouth maintenance, and inter-district irrigation system.

At the present, there were 23 Balai PSDA in Java (five Provinces) already functions, and 19 new Balai PSDA in the other island (Sumatera, Sulawesi, and East Nusa Tenggara) has been establish. The necessary regulations are in place to support the functioning of these institutions while detailed administrative and technical guidelines to implement various aspects of management need to be strengthened.
During the Water Sector Adjustment Program (WATSAP) period, the role and responsibilities of Balai PSDA as an operator continuously strengthened through a program of Basin Water Resources Management (BWRM). These programs have been supported by some international donor agency (World Bank, The Netherlands Grant, and Grant Aid from European Union).

All legal, administrative, personnel management, and budgeting arrangements will be put in place for effective functioning of the Balai PSDA as a river basin management unit. The activities started in these Balai included: institutional development, providing basic facilities of office and equipment, setting up of geographical information system (GIS) and database primarily for hydrology, and training. Several guidance and operation manuals for effective functioning of the Balai PSDA has been provided, some of these are: Training Need for Balai Staff, Database Management, Hydrological Data Management, River Infrastructure Management, Water Resources Management Model, Preparing Annual Work Program, Water Quality Monitoring, etc.

The Basin Water Resources Management Plan (BWRMP) is to be prepared by core multi-disciplinary staff in Central Planning of the Directorate General of Water Resources (DGWR). The intent is to develop and strengthen the Provincial Planning Unit to prepare in-house such plans and to enhance the ability of both Central and Provincial Planning Unit to prepare management plan and to monitor such plans. A great number of existing DGWR and Provincial staff have been trained in the areas of expertise required for planning and should be located. An approach of the planning has been adopted through establishing of a twinning team. The twinning team consists of some government staff and some expert both of foreign and local consultant. Since the establishment of Planning Unit in 1997, there were produced management plan in the five river basin and some of them have been enacted by related Governor as a frameworks of the WRM in such basins.

5.2. Management in Strategic River Basins

In developed and strategic basins of national importance, the GOI will strengthen water basin resources management by establishing self-financing, autonomous river basin management corporations. Two river basin authorities have been created, based on existing legislation; The Jasa Tirta Water Service Public Corporation in the Brantas River (Perum Jasa Tirta I) and the Citarum River (Perum Jasa Tirta II), both of which are centrally managed State-Owned Enterprises. Currently one other strategic river basin (Bengawan Solo) was established for incorporation as State-Owned Enterprises along the lines of PJT I. The other four river basin (Jeneberang River Basin in South Sulawesi, Seputih-Sekampung River Basin in Lampung, Jratunseluna River Basin and Serayu-Bogowonto River Basin in Central Java) are targeted for incorporation as State-Owned Enterprises Corporations in line with the provisions of the pending regional autonomy legislation.

Later these entities would become independent public corporations when the new organizations have adequate revenue and implementation capacity. However, the Government of Indonesia will re-evaluate the desirability of establishing three basin corporations as State-Owned Enterprises in consultation with the four Regional Governments concerned.

5.3. Water Resources Institution and Stakeholder Participation.

Integrated WRM implies a very strong degree of coordination between all the sectors interest in or dependent on the use of water. WRM covers inter-sector and inter-regional interests that require integrated actions to maintain the sustainability of the functions and benefits of water sources and resources, and should be conducted through a coordination by integrating the interests of various sectors, regions, and stakeholders. The Water Resources Council, as a coordination body on WRM will be established in national and provincial level, and in district level (if necessary). Coordination body at river basin level may be established in accordance with the needs of WRM at the related basin.

The functions of the Water Resources Council are:

- to coordinate the formulation of WRM policies and strategies;
- to conduct internal and external consultation with all parties in government as well as non-government to achieve integrated policy and conflict resolution inter sector and inter area of government administrative on WRM;
- to give consideration to the President on WRM;

The members of the Water Resources Council shall be composed of representatives of the government and non-government elements in a balanced number based on the principles of representation. Establishment of the National Water Resources Council by the President, and establishment of the Provincial Water Resources Council by the Governor. Head of District/Municipality if necessary will establish a district/municipal Water Resources Coordination Body.

Recently based on Presidential Decree No.123/2001 a Coordination Team for WRM has been established at national level. The member of the Coordination Team consist of 12 Ministry concerns. This team is non-structural institution below and has direct responsibility to the President. This team is, as embryo of the National Water Resources Council comprised of the various ministers responsible for water resources development and management. The function of the national coordination body were guide policy formulation, resource allocation, program implementation and regulatory control in general, and inter-sectoral coordination and issue resolution in particular. A permanent advisory group of stakeholders, NGOs and public representatives were formed to provide input to the team from time to time. A technical committee of Ministry and Agency, Directors General and an Executive Secretariat under the Ministry of Public Works will support the coordination body.

A major step in coordination of WRM activities at the regional level has been taken by the setting up of the Provincial Water Resources Management Committees with representation from both water resources decision makers and water users. These committees will coordinate most WRM policies and strategies based on National and Provincial Laws and Regulation.

To real-time water operations at the river basin level, Basin Water Resources Management Committees (PPTPA) has been setup to coordinate water allocation and water quality management in water shortage or critical basins. To this effect, the government was amend decrees establishing Provincial and Basin Water Resources Committees (PTPA and PPTPA) or replaces them with appropriate legal instruments incorporated into a revised Law No.11/1974 on Water Resources, and Government Regulation PP 22/82 on Water Resources Management and any related Regulations and Ministerial Decrees. The modalities of stakeholder selection, representation and roles are still to be determined.

However, representatives of irrigation, industrial, and the other stakeholders will be included on the PTPA and PPTPAs. Accordingly, the existing Provincial Irrigation Committees will be merged with PTPAs while District Irrigation Committees will become sub-committees of the PPTPA. Whereas only a few PTPAs and PPTPAs are active today in the provinces on Java and in some outer island provinces, we will set up and activate PTPA in all provinces and ensure active PPTPA in all developed river basin in about twelve provinces.

6. Others Institutional Aspect on River Basin Management.

6.1. Data Networks and Management Information System (MIS)

To meet the long-term goals of river basin planning and river basin management, the establishment of comprehensive, compatible and inter-communicative Database (national, provincial, and basin levels) with corresponding interactive Management Information System (MIS) is required. The data management system would have two components; (i) the Database and, (ii) the Water Resources MIS. Database management system would be established primary at three levels (River Basin, Provincial, and National level). The transfer of selected aggregate MIS data from basin level or local government agencies to the Regional and Central Government authorities will become essential for coordinated sector management. Databases and MIS continuously be improved, brought into a common decision support system, and linked through a dedicated data network.

To promote sustainability of hydrological operations and data needs, the government were issue appropriate administrative and budgeting arrangements to upgrade hydrology institutions and organizations, along with a personnel program. These reforms will then be supported an appropriate decree, and implementation plan for establishment and/or strengthening of adequately funded and staffed Provincial Hydrological Units in about eight provinces.

6.2. Secure, Equitable and Efficient Water Allocation

Two aspects that are important for WRM are (i) water use rights system based on licensing and, (ii) a water accounting system for water allocation. As demands increase and inter-sectoral competition increases for limited supplies, public regulation based on recognized water rights would be required to achieve societal goals.

The Government has been establishing draft of an enforceable formal national water and water rights framework as part of the NWRP. In particular, the problem of water rights for irrigation schemes will be explicitly addressed to include prevailing customary water rights concepts. Appropriate regulations and a uniform provincial framework of water licensing for abstraction and discharges that covers all user sectors will support the water rights system. The necessary policies, strategies, regulations, institutional approaches and administration will be detailed in a time bound plan. The basic legal and implementation instruments of the water rights system will be issued as part of the sector reform program.

Based on licensing and an annual allocation plan, a water accounting system for physical accounting of surface and groundwater allocated for various users in the basin would be necessary. Such system is important for recording longer term commitments for major water dependent investments and in stream objectives as well as for financial purposes such as setting up of water service fee, fixing of subsidies and cross subsidies and budgetary allocation. At the present time, appropriate basin water allocation models and GIS system to undertake the water allocation work has been setup in several basins by Balai PSDA.

6.3. Water Quality Management (WQM).

The involvement of institutions in water resources in WQM in Indonesia is currently at an infant stage. At this stage it is proposed that WQM be attempted in two complementary phases, (i) In-stream WQM and, (ii) Off-stream WQM. The in-stream work will comprise of maintaining water quality in rivers, reservoirs and other water bodies through planning, monitoring of ambient water quality, licensing of discharges into the rivers and water bodies, increasing base flows, aeration, flushing, prevention of solid waste from entering the rivers and water bodies, shifting intakes where necessary, improving sediment trap efficiencies, selective dredging of river reaches and in extra cases supporting development of cluster treatment plants.

Under BWRM program some of Balai PSDA have been done a limit activity to in-stream WQM to meet water quality standards in allocating water as judged appropriate. This had primary involve monitoring at key locations the stream water quality and with local institutions in basin and other water quality program such as the “Clean River Program”

6.4. River Infrastructure Management (RIM).

Management of the river system to ensure their functioning both during low and flood flows is important for efficient operation of the irrigation infrastructure and protection of the service area. The RIM component would comprise of activities related to the river morphology, river bed and river bank stability, river corridor management, sand mining, river system dredging, river mouth stability, estuary maintenance and, maintenance of all infrastructure in the rivers such as weirs, barrages, dikes, revetments, bank protection etc.

This management will include both structural and non-structural aspects as it relates to river system maintenance. Both aerial photos and river surveys would be included to develop proper maps. The river survey would be carried out at specific interval to undertake river morphology studies and river improvement. The several Balai PSDA has implemented RIM.

6.5. Flood Management

Historically the former Ministry of public works has planned, designed and constructed number of flood control projects for both rural and urban areas. In most cases it operates and maintains the flood control schemes in coordination with provincial and local authorities. These structural measures in most cases have not been supplemented with non-structural measure such as flood forecasting and warning system, flood plain management, flood disaster emergency plans, flood fighting, flood operation and updating flood hydrology to determine current levels of flood protection.

At the time being, some of Balai PSDA is trying to lay emphasis on the non-structural measures of flood management in the selected river basins. The element of work involves updating of flood hydrology as necessary, to carry out flood routing to establish weak links in the system, identify and establish an appropriate Flood Warning System (FWS) or upgrade existing FWS as necessary for real time flood operation, prepare flood disaster management plans, monitor flood, prepare flood damage surveys and assessment.

6.6. Potential Sources of Revenue.

Effective river basin management will require adequate and timely allocation of funds especially to support the implementation of O&M of rivers and the river infrastructure. The economic benefits of O&M investments are clear-with adequate O&M asset value of the river infrastructure can be maintained. Without O&M the asset value rapidly decreases only to be recoverable through major expenditure in rehabilitation. As the asset value decreases the potential benefit of the asset reduces, ie. The lack of O&M on a dyke gradually reduces its potential to protect against flooding. Whilst major investments for new works or rehabilitation have been obtained from loans without major difficulties, even minimal funding for O&M has historically been a problem.

Cost recovery for river basin management is inherently difficult due to the fact that single largest water user, irrigated agriculture has almost negligible scope for cost recovery. This effectively results in non-agricultural water users having to subsidize the agricultural water users. The Water Resources Law No7/2004 states that the water resources users for basic daily needs and for people's agriculture shall not be charged water resources management fee. The water resources management fee will be paid through a government subsidizes. The users of water resources other than for the purposes as mentioned before shall be charged the water resources management fee. The water resources management fee shall be determined on rationally acceptable economic calculation. The determination of the water resources management service fee per unit of each non-commercial usage shall be exempted from the rational economic calculation. The fund collected from the water resources users as mentioned shall be used for supporting the sustainability of the water resources management in the related river basin.

The financing of water resources management shall be determined in accordance with the actual needs of water resources management. The types of water resources management financing shall include the financing of:

a. information system;
b. planning;
c. construction;
d. operation and maintenance; and
e. monitoring, evaluation and empowerment of the community.

In an urgent situation for the effective utilization of water resources in cross-province, cross-district/ city, and nationally strategic areas, the Government and the related regional governments through a cooperation scheme shall jointly decide the management financing.

7. Conclusion.

1) Water is essential to life, and adequate supply of safe drinking water is a basic human need, the provision of which is a key imperative policy. However, concern about water must extend far beyond concerns for survival and health and productivity of life.

2) Water is essential to the eco-systems of the natural environment, on which all social and economic activity depends. In order to allocate water effectively between social, economic and environmental uses, the chain of water management from source to consumer must be regarded holistically including its natural state, abstraction, allocation and quality.
3) Balancing these demands is a complex and sensitive process, and compromises inevitably have to be made. These compromises are bound to meet with resistance from champions of different demands as against another. These conflicting demands needs to effectively mediated.
4) Reforming WRM policies and strategies is an important way in achieving sustainable development of water resources in Indonesia. Sustainable development of water resources in Indonesia can only be fully realized through implementation a WRM new policy, strategies and systematic programs.
5) Integrated WRM as well as River Basin Management is not a product, but a process which promotes the co-ordinate development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in equitable manner without compromising the sustainability of vital ecosystems.
6) To achieve integrated WRM, there is a need for coherent national policies to overcome fragmentation, and transparent and accountable institution particularly at the basin level.
7) The completion of water sector reform and the enactment of the new Law on Water Resources No.7/2004 will set the stage for real decentralization of authority in river basin management.

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