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## Managing Indonesia's Water Resources

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**W**ITH an average of 2,700 mm of rainfall per year, Indonesia has abundant water resources. However, more than 50% of the water flows on earth and becomes surface run-off, making it unavailable for human use.

Based on Bakosurtanal (Center for Natural Land Resource Survey) data, total availability of surface and ground water in Indonesia was 2,287.04 km<sup>3</sup> per annum in year 2000, spread over all the islands of Indonesia. Islands with the biggest potential water are Kalimantan (30.4%), Sumatera (24.6%), and Papua (23.8%). Java and Bali have only 6.4% but is inhabited by about 70% of total population of Indonesia.

There are three main categories of water users: agriculture, domestic, and industry. Total withdrawal of water in 2000 was estimated at 113.29 km<sup>3</sup> per annum or about 4.9% of the total water supply. Agriculture was still the biggest user of the water resources. Total water withdrawal was estimated at 92.76 km<sup>3</sup> (81.8%) to irrigate 7.9 million ha of land areas. Domestic water use was estimated at 13.13 km<sup>3</sup> (11.6%), while industrial water use was relatively low i.e., 7.40 km<sup>3</sup> (6.6%)

Demand for water for domestic and industrial use, however, is gradually increasing over time. Since piped and surface water supplies in most Indonesian cities are relatively limited, most households and industries still make use of groundwater as their source of water.

Nevertheless, national and island level water balances remain positive, mean-

A villager collects drinking water in an almost dry spring in Wukirharjo village near the Indonesian city of Yogyakarta.





Women collecting water from a dried up lake in Gunung Kidul, Central Java, Indonesia.

ing that there is more than enough water to meet consumption levels. At the national level there is a 1,854 km<sup>3</sup> surplus of water except in Java and Nusa Tenggara which will face a water deficit during the dry months between July to October. Even some of the major and important rivers in Java, including Bengawan Solo, Brantas, Ciliwung, Citarum, Cimanuk, Citanduy, and Ciujung, are expected to face water deficits during the dry season.

Rapid population growth, urban development and industrialization in most cities have put pressure on the increasingly scarce water resources of the regions. Demand for water has increased in conjunction with the development of the cities. At the same time, discharge of waste from households and industries has also increased. Consequently, pollution of both surface and ground water resources has mounted.

Water resource management in both quantity and quality is increasingly important on Java as well as the on the other major islands of Kalimantan, Sumatera, Sulawesi, and Papua. Each location has different characteristics and hence different approaches need to be taken. Java, for example, is characterized by overpopulation, and natural and water resources degradation and depletion. Other islands are mainly characterized by natural and water resources degradation due to widespread deforestation, improper open mining practices and new plantations opened on the watersheds.

A major problem is total groundwater extraction in some of the big cit-

ies in Java (Jakarta, Bandung, Surabaya) far exceeds the annual natural recharge rate of the aquifer. The depletion of these aquifers raises hydrological, social and economic problems. Unfortunately, these effects have received less attention because their consequences are not immediately felt.

These problems are due to two main factors. First is the lack of enforcement of groundwater resources which has led to *de facto* open access to aquifers. Secondly, the separate management of surface and ground water resources as two separate systems, is inefficient due to the lack of coordination and overlapping allocation of tasks and responsibilities among the many institutions involved.

The above institutional arrangements give rise to three problems. First, the unintegrated nature of decision-making by authorities responsible for water allocation has led to overexploitation of the resources. This occurs because decisions are made on a sectoral basis, with no considerations for their implications on other sectors. Second, inadequate attention is paid to the economic value of water resources. Surface water and groundwater, for example, are substitutable and so should be priced the same. Another example, domestic use of groundwater should also pay the same amount as those using piped water to take into consideration the cost of extraction and other external costs. Finally, this management approach neglects the quality considerations of resources in making allocation decisions. Thus, the current institutional arrangements cannot guarantee economic efficiency due to the potential externalities such as contamination of pollutants entering groundwater, salinization of aquifers,

and land subsidence due to the large drawdown of deep groundwater levels in areas with high groundwater extraction. From the economic perspective, over-extraction of groundwater results in external costs which include the costs of lowering shallow groundwater table and table in deep wells, of land subsidence, and costs of pollution on shallow groundwater.

To improve the economic efficiency of water resource use, both surface and groundwater resources should be managed integrally under a conjunctive surface and ground water resource use management system. Integrated water use management would make groundwater and surface water consumption an interrelated issue. With this approach, better water resources planning, development, and management can be attained. The economic aspect cannot be ignored as it is an important factor in determining how resources are to be allocated efficiently among water users.

The current government of Indonesia has determined five strategic policies on water resources management. These include: (1) Water resource conservation - to conserve and maintain the availability, natures, and functions of water resources in order to meet the water needs; (2) Optimal use of water resources - including various efforts in the provision, use, development, and management of water resources to meet the various water demands; (3) Control of potential water-destructive capacity - to reduce and cope with the potential impacts of flood, drought, erosion, and abrasion on the area of agricultural and industrial production, human settlement, and other infrastructures; (4) Empowerment and improvement of community, private and government participation - to achieve a productive, effective, efficient and just water resource management system; and (5) Increase transparency and availability of data and information on water resource management - to provide more access to all stakeholders to participate in the implementation of water resource development programs.

Although improvements in water resources management have been made, the worry is that potential problems could arise when water resources are over-regulated. The challenge is in finding the right balance to ensure that Indonesians -- living in an archipelago surrounded by water -- do not find themselves suffering from a shortage of water to sustain their lives in the years to come.