

# Water Security and Integrated Water Resource Management in Asia

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Asia occupies the largest portion of world's land and population. Asia covers 8.5% of the Earth's total surface area, which is about 29.9% of its land area. More than 60% of world's population, 4.1 billion people, lives in the Asia-Pacific region. There are two most populous countries, China (1.3 billion people) and India (1.2 billion) in this region. Furthermore, there are also other populous countries, Indonesia, Pakistan, Bangladesh, the Russian Federation and Japan. In recent years, the demographic trends show low population growth rate. Since 2000, the annual growth of population was lowered to 1.1%. Asia is a very large as well as diverse region and it is hard to describe it in a simple word. For example, more than 40% of people in the Asia-Pacific region live in urban areas. But the degree of urbanization differs significantly between the countries. While more than 70% of people live in cities and towns in the most urbanized countries, only 33% of people do in urban areas in South and South-West Asia.

Countries in Asia are rapidly changing especially at the economic point of view. But the economic development in this region causes many environmental problems. For example, the commercial logging in Cambodia has resulted in large-scale exploitation of forest. The increased harvesting for fuel wood and agricultural encroachment also has intensified the forest devastation. The increased industrial production in Vietnam has extended the energy use and the associated pollution. The rapid increase in energy supply and demand resulted in numerous environmental consequences such as urban air pollution, acid rain and increased emission of greenhouse gases. The elevated water demand has brought on more intense use of water resources, constraints on production, impacts on human health and the risk of large-scale migration .

As the demographic status differs among Asian countries, the status of water resource does. The precipitation pattern in the Asia-Pacific region is extremely different according to the geographical location and season. The southern slopes of the Himalayas, western slopes of the mountains of India and Indo-China, and the islands of Indonesia have abundant precipitation. The annual precipitation in these regions is from 1,500 mm to more than 3,000 mm. On the other hand, the northwestern part of the Asia-Pacific region is severely dry and the annual precipitation is less than 200 mm. The countries around Indian and Pacific Oceans show the cyclical monsoon rainfall pattern and there are distinctive dry and wet seasons. In many river basins, temporary water shortage occurs in long dry season, while flooding often does in the wet season. Rivers,



lakes and artificial reservoirs are the main sources of the surface water. There are 400 major rivers in India, 200 in Indonesia, 108 in Japan, 50 in Bangladesh and 20 in Thailand. There are also transboundary rivers. For example, Mekong River flows through Viet Nam, Lao People's Democratic Republic, Cambodia, Myanmar and Thailand . In a viewpoint of the water supply, Asia has the lowest water availability per capita in the world. The potential water availability per capita is only  $3.92 \times 10^3 \text{ m}^3$  per year in Asia, while it is 4.24, 17.40 and  $5.72 \times 10^3 \text{ m}^3$  per year in Europe, North America and Africa, respectively. The water use and management are dishonorably inefficient in many countries in the Asia-Pacific region except a few countries such as Singapore, Japan etc. Moreover, the clean water resource is insufficient. Approximately one in five people in this region does not have access to the safe drinking water. And half of the people do not have access to sanitation facilities. Many counties in this region are using too much water resources and it may damage the future water needs. According to the water exploitation index, which is the mean annual total demand for water divided by the long-term average water resources, the current water extraction rates of at least 16 countries are at the water stress condition. Water availability per capita is another useful index of water stress. The water availability per capita is declining in India and other parts of South and South-West Asia as the populations grow. In case of Indonesia which is classified as 'no water stress' by the water exploitation index, it encounters water supply problems in its major cities. Despite Indonesia has relatively rich water resource, the water quality and availability is getting worse by population growth, increasing consumption, environmental damage, agricultural activities, pollution, industrialization etc .

### **Water Quality in Asia**

The Indonesian case clearly shows that both water quality and quantity are important factor. Many countries in the Asia-Pacific region are faced with the least water availability per person as well as the worst water quality. Azerbaijan, China, India, the Islamic Republic of Iran, Pakistan, Thailand, Turkey and Uzbekistan have lack of water resources and the water quality indexes are relatively poor. About 52 urban river stretches in China may be so contaminated and they cannot be used for irrigation. According to the survey of water quality in Islamabad and Rawalpindi of Pakistan, the water samples were contaminated with bacteria (94%), fecal bacteria (34%) and nitrate (12.8%). The contaminated water cannot be used for drinking, but also increases the cost of water purification. In case of Japan and Republic of Korea, they have relatively low water resource per capita. But the higher water quality makes it possible to meet their water needs. The major water contaminants in the Asia-Pacific region are microbial pollutants, toxic chemicals, heavy metals, phosphate and nitrate. The microbial pollutants are generated mainly by domestic sewage. Agricultural activities, waste disposal and industrial production processes cause the contamination with toxic chemicals and heavy metals. Phosphate and nitrate are released from agricultural production, domestic sewage and industrial discharge. There have been some progresses in the management of point sources such as industrial processes. But non-point sources such as agricultural production and domestic sewage are difficult to manage.