

## **Current State of Water in Myanmar**

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### **Abstract**

A potential of water resources in Myanmar is abundant for demand of agriculture production and other sectors. Agriculture is a major economy of country so as to enhance irrigation system for promotion of agricultural production especially for rice based system development. After the construction of irrigation system, crop production can be promoted any time with an availability of stored water in the reservoir in irrigation system. It is also urgently necessary to adopt more appropriate ways for generating the complex water resources project in Myanmar to meet requirement of all sectors. At the same time, water conservation with appropriate management and planning practices are also required in view of the rapid socio- economic development of the country as well as for protection against water related environmental degradation. The paper discusses the water potential in Myanmar, water resources utilization and challenges, opportunities and threats in water resources development scheme, water quality protection and its standard and government actions for pollution control, water sector profile and international cooperation. In connection with technical and institutional bodies of water resources utilization should be adjusted to support for solving economic, social and environmental issues through successful implementation of IWRM.

**Keywords:** Water resources utilization, opportunity and threats, Legal and institutional frame works, water quality protection.

### **Introduction**

Myanmar is rich in water resources. The total utilization of the nation's water resources is only about 5 percent or 45 million acre- feet (56 km<sup>3</sup>). It is clear that the physical potential for further development of water resources in Myanmar is substantial. Among them, the freshwater resources are mainly used by the agriculture sector with small quantities being used for domestic, industrial and other purpose. Due to the importance of the agricultural sector, the Government has accorded high priority to its development, and numerous irrigation facilities have been implemented since last two decades for irrigation and water supply to monsoon and summer paddy crops. Apart from the agricultural sector, the hydropower sub-sector is also the most important in terms of economic development and investment. Moreover, dry-season irrigation, especially by use of river pumping project, has been successfully increased as a result of power demand is also increasing annually. In fact that, renewable hydropower generation is very important to contribute considerably to socio-economic growth in country. Therefore, electric power generation projects are being implemented wherever possible in order to meet the demand for electricity supplies.

At the same time, the Government is implementing plans for water conservation with appropriate management and planning practices so as to support for the rapid socio- economic development of the country as well as for protection against water- related environmental degradation.

## **Water Potential in Myanmar**

Myanmar is geographically located between 9° 32' and 28° 31' North Latitude and 92° 10' and 101° 10' East Longitude. It is characterized by mountain ranges in the north, east and west and a long coastal strip in the south and west. Lengthwise, it stretches about 1280 miles (2060 km) north to south and approximates 587 miles (945 km) east to west thus leading to the area coverage of 67.65 million hectares (676553 sq km) for the whole country. It has common international borders with China in the north, Thailand and Laos PDR in the east, India and Bangladesh in the west and again with Thailand in the south.

The water basin characteristics in Myanmar are quite variable due to the differences in physiographic features. The principal water courses flowing separately in Myanmar comprise four major rivers, the Ayeyarwady, Sittaung, Thanlwin., Bago and their major tributaries. All rivers with the exception of the Thanlwin within Myanmar territory and can be considered nationally own water assets. Their drainage area is spread widely over the country, amounting some 876.73 million acre-ft (1,082 km<sup>3</sup>) of water volume per annum from a drainage area of about 284,800 sq-miles ( 738,230 km<sup>2</sup>).

The monthly distribution of river flow vary according to the pattern of rainfall, ie. about 80 percent during the rainy season ( May- October) and 20 percent in the dry season ( November- April). The estimated groundwater potential in Myanmar is about 495 km<sup>3</sup> in eight principal river basins in Myanmar.

On the basis of stratigraphy, there are eleven different types of aquifers in Myanmar. Depending on their lithology and depositional environments, ground water from those aquifers has disparities in quality and quantity. Out of these, ground water from Alluvial and Irrawaddian aquifers are more portable for both irrigation and domestic water use. However on the water scared regions, ground water from Peguan, Eocene, and Plateau Limestone aquifers are extracted for domestic use.

## **Water Resources Utilization and Challenges**

Myanmar is an agricultural country with an abundance of water resources. The agricultural sector is the most basic economic of the state as well as the main source of livelihood in rural areas, since the rural population represents some 70percent of the nation's population. At present, the state has been systematically disseminating advanced techniques and support for the development of the nation's economy. Dams are now irrigating more than, 1.7 million ha of farmland. In addition to the dams, river water pumping stations, underground water tapping stations and small dams have been built throughout the nation.

A total of 305 river pumping projects are irrigating about 188,000 ha of cultivated land. In addition, 8136 numbers of tube wells have been provided to irrigate 48,000 ha of farmland. Total irrigated area is increased up to 18% of the sown area in 2006-2007.

Tributaries originating in the western hill region and southern part of the country constitute some 10 percent of the catchment areas and surface runoff. The hydropower potential of these tributaries is considerable. According to studies by the United Nations and other sources, the hydropower potential of Myanmar is estimated to be as much as 41,000 MW. By 2008, 35 hydropower stations ( including 15 medium scale projects) had been completed with a total

estimated generated power of 390 MW, which is almost 1 percent of potential generated hydropower in Myanmar.

Moreover, the Development Affairs Committee under the supervision of the Department of Development Affairs (DDA) has implemented projects for sinking 15,715 no of tube wells to supply drinking water for about 10,602 villages by using funds from the Government, the DDA and donors from inland and abroad. The projects have been implemented with participation by international and non- governmental organizations.

The water sector faces some challenges including unusual and uneven rainfall patterns in some years, flooding and drought in some of the main agricultural areas of the country due to climate change, and also negative basically by the impacts of shifting and slash and burn, cultivation, illegal logging in watershed areas as well as management conflicts of interest and lack of coordination and cooperation within agencies. The most important challenges includes,

- (a) to strengthen the legal framework for ensuring the effective and harmonious integration of water resources management, development and protection activities into the socio- economic development process of the country.
- (b) to Enhance and consolidate the existing systems
- (c) to function the operation, maintenance and rehabilitation of facilities safely, reliably and efficiently
- (d) to enhance organizational capacity and effectiveness of the water resources coordination system.

### **Mission and Vision Statements**

The mission statement of the water sector is “to establish a beneficial framework and effective mechanism for managing, developing and protecting water and related resources in an environmental and economical sound manner in order to meet the needs of the people of Myanmar. "This statement is adopted by the Government and will provide a guiding light towards establishing national strategies for both short and long term efforts by all agencies, people and stakeholders for achievement the common goals of national socio- economic development and environmental conservation.

The vision statement of Myanmar is : Sustainability of water resources to ensure sufficient water quantity of acceptable quality to meet the needs of the population in terms of health, food security, economy and environment' and which clearly identified in Myanmar Agenda 21 for more efficient freshwater resources management.

### **Opportunities and threats in water resources**

A different kinds of Water Resources Projects has been constructed throughout the country. It consists of isolated and multiple- reservoir systems, ground water and river pumping projects, diversion head- works and sluice gates for flood protection and saline water intrusion. According to the country's agriculture base economic development policy, those infrastructures were implemented especially for irrigation in conjunction with hydropower generating for industrial and domestic water supply, and environmental sustainability. Although Myanmar has abundant water resources and no scarcity of water at present, proper management and a strong policy on sustainable and continuous development of the economy

and the conservation of the environment are required for the water security of future generation.

Sedimentation is one of the major adverse effects of storage dams and in the lower courses of rivers. Mining and deforestation along the upper reaches of river basins cause serious watershed erosion problems. Transported sediment is reducing the storages capacity of reservoirs and the bed level in the lower reaches of river is rising.

Flooding in the downstream of river and navigation faces serious problems. Although some nutrients and some sediment are needed to support the aquatic environment, the Government is emphasizing the implementation of the terrace farming system to reduce shifting cultivation.

The development of industry and increasing population density will cause increasing demand and also increasing river pollution and health risk for people living close to the rivers. Careful management of groundwater extraction is also required in order to avoid contamination of arsenic.

Moreover, current legal and institutional frameworks also threaten to the water resources development in Myanmar. Present organizational arrangements at the national and provincial levels generally support the achievement of national policies, but the current institutional problems in the water sector are mainly related to (a) weak of coordination and collaboration between agencies within the sector and with those of other sectors and (b) inadequate communication and coordination between the national agencies and authorities.

Despite the many Acts, Laws and regulations related to the water sector, should be amended and reviewed with a view to enacting a unified water resources law in order to promote a more effective legal framework for coordination and management of water resources.

Other weaknesses in the water sector are limited manpower, scare financial resources, and a lack of appropriate monitoring facilities, proper and systematic record keeping and regular monitoring and surveillance of water quality. As for water quality control, basic standards of quality for drinking water were recommended in 1990, but have not yet been approved. Anyway, joint efforts of the Government, local communities and NGOs, will be the key to the success of water resources management programmes. Moreover, institutional strengthening, capacity building and public awareness are essential elements of development work.

### **Water Quality Protection and Standards**

The main causes of deteriorating water quality are sewage, solid waste industrial waste and agrochemical waste. For water conservation through water quality protection is undertaken by concerned local City Development Committee. Actually, the control of wastewater is both a municipal and industrial problem. In cities that are undergoing rapid industrialization , the municipal treatment issue is complicated by the addition of untreated or semi treated industrial discharges into the municipal sewage system, thus stricter law to control the water quality should be imposed. Mover over, there is still facing the problems of direct discharging waste water from factories into the river or stream. Recently, NCEA ( National Commission for Environmental Affairs) and NGOs propose effluent standard for proper disposal of waste water from factories. By the way, it is seen that dissemination the knowledge about the proper

disposal of waste water and public cooperation are essential to conserve the quality of natural resources.

In agriculture sector, the government and ministry concerned has banned impact of some toxic pesticides and encouraged utilization of conventional bio- fertilizer as a substitute for chemical fertilizer to mitigate the water quality deterioration. At present controlling of water quality for various purposes are based on the WHO standard. Deforestation in the catchments area and environ of water sources caused a serious problem of degradation water quality and quantity. It physically generates topsoil loss and land degradation by gully and sheet erosion leading to excessive level of turbidity in receiving water and off- site ecological and physical impact from deposition in river and lakebed. And chemically, the silt and clay fractions, the carrier of absorbed chemical, are transported by the sediments into the aquatic system.

In order to control the quality of water resources, effluent quality standard of domestic water and industrial waste water discharging on the land mass or discharging into water body should be established.

In the current situation, concerned ministries and departments have organized a forum of expert on Water Quality issues. WHO proposed standard was adopted as a reference. Water quality control measures were being taken as case- wise, especially for bottle drinking water production. Arsenic and other parameters have been tested in collaboration with Water Resources Utilization Department (WRUD), Department of Development Affairs (DDA) and United Nation International Children Emergency Fund (UNICEF).

### **Laws regulation and legislation and legal support**

Since the early 1900s, there have been established in laws, regulation, legislation and legal support for water resources development, management and utilization in the water related sector. However, there is still needs that to be reviewed, improved and amended in line with IWRM improvement for the sectors. The existing laws and legislations in the water sector and water related sectors should be reviewed and, if necessary, new ones in line with national and international laws for IWRM should be added in the sectors.

### **Laws of Govern Pollution**

In relation to pollution, Myanmar has no specific laws to govern water pollution. There is a general provision in section 9 of the Public Health Law of 1972 which empowers the Ministry of Health to carry out measures relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution and food and drug safety. However, detailed provisions do not exist to ensure more effective and comprehensive regulation of these matters. In the regulation for hotels and tourism, there are no provisions for pollution control. Although the " Burma Ports Act of 1908" contains a paragraph about harbor pollution, this merely focuses on the detriment to navigation. The only control of water pollution in the country is through guidelines issued in June 1994 by the Myanmar Investment Commission. These guidelines require that new investment projects have waste water treatment systems. River and Lake pollution from sewage, industrial waste and solid waste disposal are serious problems in Myanmar, but are not regulated explicitly by any laws, so new laws relating to pollution should be enacted.

### **Water sector profile in Myanmar**

At present, Myanmar can be identified as low stress country concerning with water use. However, Myanmar has now reached a major turning point in the use of water resources for all-round development of the country. Several government agencies and departments under different ministries are operating their own programs independently without proper coordination with the principal executing agency.

In fact that, from fragmented sectors water resources management to a holistic integrated management, Myanmar has to strengthen the capacity to undertake IWRM exercises, developing projects in water supply, irrigation and hydropower without regard to the intersectional effects. Provision of the agricultural water is the first priority in water resources management for the country at present and in the future as well. It was found out that about (91) percent of the water use was for agriculture, about (8) percent was for domestic consumption and (1) percent was for industrial purpose.

### **International Cooperation**

Myanmar becomes a permanent member of International Committee on Irrigation and Drainage (ICID) since 1982. MCID was established in 2001 and had formulated its constitution in 2003 and actively associated with irrigation and drainage activities in the region as well as international level. In 2003, Irrigation Department as a focal point agency of Myanmar, cooperating with FAO and UNESCAP, has launched program to develop “Myanmar Water Vision” with a view to implement and realize the World Water Council’s Water Vision. Moreover, this “Myanmar Water Vision” can become a basic guidelines and framework for the preparing of IWRM which is formulated by the year 2006 in Myanmar. After that UNESCAP discussed with Irrigation Department ( ID ) to carry out Strategic Planning Management (SPM) as the follow up activity.

Myanmar, former SEATAC member is actively participate in GWP-SEA activities and attended series of meeting and training programs for upgrading awareness. Moreover, Irrigation Department as a focal point agency of Myanmar has closed cooperation with other organizations such as WEPA, AQUJARINE, PWA, and INWRAF and so on.

### **Institutional bodies for water resources utilization**

Several government agencies and departments under different ministries are engaged independently both in surface and ground water use but the extent and type of water use are different from one another.

Agriculture is the main sector of the utilization of water in Myanmar as water is very important for cultivation of crops. The Irrigation Department is harnessing such resources, not only concentrates in providing efficient increase irrigation for the development of the agriculture sector, but also embraces objectives pertaining to adequacy of drinking water, protection of environment and generating of hydro-electricity.

Water Resources Utilization Department also takes parts on developing water resources, both surface and groundwater, for socio-economic development through provision of irrigation water and drinking water.

Department of Hydroelectric Power Implementation is being the primary user of water for power production. Public works, the Department of Development Affairs, City Development Committees, and the Department of Human Settlement & Housing Development are responsible for domestic water supply and sanitation works in urban areas and underground water controlling works in Yangon City, while Department of Health taken care for the water pollution and water borne diseases.

Department of Meteorology and Hydrology is responsible for measurement of discharges of major rivers yearly to compute Runoff data for each stations and monitoring water quality at some places.

Fisheries Department involve in water sector to enhance food security conjunction with sustainability of mangrove ecosystem and conserving natural resources. Forest Department also take responsible for the conservation and management of watersheds.

### **Watershed Protection**

With the aim of ensuring sustainability of water resources of country, forests of Myanmar are well conserved and safe guarded covering 50% of the nation will contribute to fulfill the human needs. Shifting cultivation and slash and burn practices provide significant contribution to forest loss and at the same time, it can adversely affect the environment in a number of ways such as soil erosion and degradation, deforestation, rapid silting of reservoirs, rising of river bed, causing flood at the downstream and navigation problem, etc. Therefore the government is making arrangement to reclaim the highlands and major watershed areas to substitute terrace farming for shifted cultivation.

In recent years a special programme has been launched by Forest Department for greening of 13 districts in central dry zone which is the most critical region in terms of degradation of land conservation of forest and establishment of forest plantation as follows:

- (a) Plantation of fast growing multipurpose tree species at the rim and its periphery of the basin boundary such as 50,000 trees for high dams, 40,000 for medium dams and 20,000 trees for low dams to prevent watershed degradation as well as to restore ecological balance.
- (b) Land rehabilitation and soil conservation activities in the most critical watersheds of upper Myanmar.

### **Concluding Remarks**

Myanmar being an agro- based country; development of the agriculture sector is one of the key factors that can spell the enhancement of people's economic life, living standard and food security. As water is the most fundamental requirement for agriculture, steps are being taken to ensure that there is sufficient water for the cultivation of crops at the required time. The construction of irrigation facilities meant not only for the agriculture purpose but also for greening the environment, for supplying drinking water to local people and for generating electricity wherever possible. In this case proper water resources management is important to ensure the long term benefit and improved socio- economic life for farmers, the majority of the population.

It is also important to emphasize and disseminate new practices and farmers participation on-farm level for effective use of irrigation water. In Myanmar, several agencies are engaged with supply and management of water. Lack of cooperation and coordination among water related agencies is main issues for the proper management of water resources.

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t is important for the enhancement of public awareness and public participation for successful implementation of IWRM in the country. We would like to call on the stakeholders, national entrepreneurs, and international organization to make concrete efforts to participate for the development of agriculture, livestock, and power and forestry sector in Myanmar.