

# SECTORS OF FRESHWATER UTILIZATION

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# Fresh water 'Use':

- Water is one of the most versatile materials in nature, capable of meeting multifarious human demands.
- They are divided into two broad categories :
  - 1. Consumptive use of water
  - 2. Non-consumptive use of water

# 1. Consumptive use of water – three sectors are:

- A. Domestic: drinking ,cooking,bathing and washing needs
- B. Agriculture : irrigation of the crop lands
- C. Industry

## 2.Non-consumptive use of water

- A. Fisheries
- B.Navigation
- C. Ecosystem/Environment

# A. Domestic:

- This is the most prioritized section of freshwater demand.
- Water is in demand for various types of household chores.
- Freshwater demand and consumption rises with increasing income and standard of living – within a country as well as between countries.
- High income countries consume 11% of the total water withdrawn for consumptive use in the domestic sector and low and middle income countries 8%.
- USA shows high consumption , more than 20%. Residential water use around 400-500 liters per capita daily.

**Table 4.1 Proportion of Consumptive Water Use (in percent)**

|  | <b>Domestic<br/>use</b> | <b>Industrial<br/>use</b> | <b>Agricultural<br/>use</b> |
|--|-------------------------|---------------------------|-----------------------------|
| <b>High income countries</b>           | 11                      | 59                        | 30                          |
| <b>Low and middle income countries</b> | 8                       | 10                        | 82                          |
| <b>World</b>                           | 8                       | 22                        | 70                          |

*Source: World Bank 2001.*

- The real problem in the use of freshwater in the domestic sector is reflected in the lack of access to safe water and sanitation in the developing countries.
- Water use in the domestic sector is much more complex and varied in the urban centers.
- Urban populations are growing at the fastest rate in history, and this is most conspicuous in the megacities of over 10 million.
- The level of urbanization is presenting profound challenges to urban water supply, which are made more difficult by the relative lack of resources and capacity in those countries where the speed of urbanization is most dramatic.

- The domestic sector in Bangladesh has been given top priority –in allocation terms- in the country's National Water Policy, formulated in 1999.
- 1.4million tubewells have been sunk in rural Bangladesh with the aim of providing access to safe water through at least one tubewell serving 20 rural households.
- It is estimated that the consumption or use in rural areas is only 50 lpcd; in small and medium sized towns, it is 100 lpcd; while in Dhaka and other metropolitan cities, the use is about 160 lpcd (BWP 2000).



- The situation in urban areas of Bangladesh is more critical, where the population is growing at an annual rate of 5-6% .
- Rapid urbanization in Dhaka has compounded the problem of water supply and sanitation.
- With an estimated population of 12million consuming daily 160 liters of water per capita, the city needs a supply of about 2.000 liters of water every day (Rasheed 2008).
- Dhaka Water and Sewerage Authority (DWASA), however, can meet up to 80 percent of the demand, mostly using groundwater through deep tubewells; but a significant part of that is also lost through pilferage and leakage from faulty pipelines.

# Agriculture :

- Agriculture is the main user of freshwater , consuming **70%** of the total withdrawals for human use.
- The way of supply extend from total dependence on direct rainfall to full irrigation.
- Full irrigation : when no crops can be reasonably grown unless water is artificially supplied.It is needed for virtually any agriculture in arid and semi-arid regions.
- 60%- Rainfed agriculture
- 40% -Irrigated agriculture

# Cont.

- Supplementary irrigation : means supply of water to crops to increase yields and to reduce risks to crop failure due to insufficient rain.
- In Bangladesh , supplementary irrigation is common toward the end of the Kharif II or aman crop season.
- At present, agriculture accounts for 70% of all water withdrawals for irrigating croplands.
- Such consumption can range from 30%-40% for flood irrigation to as high as 90% for drip irrigation. The rest recharges groundwater or contributes to drainage or return flows.
- Irrigation raises agricultural productivity and it has been a key ingredient in green revolution.

# Cont.

- One of the biggest landmark achievements in water resource management has been the increasing use of **inexpensive diesel or electric pump** that gave the farmers control over self-managed groundwater irrigation.
- In Bangladesh, Pakistan and India, private investment in groundwater development through tubewells has been an engine of growth.
- About 66% of the cultivated land in Bangladesh is irrigated, and groundwater accounts for nearly 70% of the total irrigated area (WARPO 2000).

- Water supplies for agriculture will have to be augmented by an additional 15 to 20 percent over the next 25 years, even after favorable assumptions regarding improvements in irrigation efficiency and crop yield performance.
- It has been recognized globally that feeding the ever-growing world population and solving the looming water crisis are inextricably linked.
- On the one hand, the specter of food shortages encourages greater use of freshwater resources for agriculture, while on the other hand, there is a need to divert water from irrigated food sector to other uses, and to protect the ecosystem.

- Modern or mechanical methods of irrigation were introduced in Bangladesh since the 1960s with a view to intensifying dry season rice production.
- These methods are low lift pumps (LLP), shallow tubewells (STW), deep tubewells (DTW), hand pumps, and canals. LLPs and canals use surface water, while STWs, DTWs and hand pumps use groundwater. LLPs are operated using a centrifugal pump operated by a diesel engine or an electric motor. STWs - a suction mode device - are the most popular irrigation method, also operated by a diesel engine or an electric motor.
- The proportion of total irrigated area by modern irrigation methods is **around 93%**, the rest being irrigated by traditional or indigenous method.

# Industry :

- Industry is the third consumptive sector of freshwater use. Water is an essential component in most manufacturing processes.
- Virtually all manufacturing processes require water to a greater or lesser degree. It is needed, in varying amounts, in the following ways:
  - as raw material, like in chemical, pharmaceutical, food/beverage
  - industries;
  - for processing and washing of raw materials as well as of finished products;
  - for cooling of the boiler in the factories
  - for discharging effluents from the factories.
- Industrial use of water increases with the income of different countries - rising from 10% for low and middle income countries to 59% for high income countries .

- In southwestern Bangladesh, the ability of some industries to use surface water for cooling has been seriously compromised due to access of saline water from the south following diminishing upstream flows. The situation can be reversed only by ensuring increased freshwater flows from upstream sources which could push back the saline front southward.
- A substantial part of water use in the industrial sector is in the field of energy generation, primarily for hydropower production (where water is the key resource), but also in nuclear-based energy generation and coal slurry technology.
- Water discharged by industries may be of poor quality, and unless adequately treated, threatens the surface and groundwater resources into which it is discharged. Industry can pose a chronic threat to resources by the continuous discharge of effluents, or an ,acute threat when a catastrophic failure generates a critical pollution hazard over a short period.



- Damage to water resources by industrial activity is not just limited to "local" freshwater ecosystem. The increasing concentration of population and industries in the coastal zones is resulting in the impoverishment of the coastal habitats and the people depending on them.
- Industries are the main source of water pollution in Bangladesh. Industrial nodes in the country are mostly located along the banks of the rivers, and the industrial units discharge their effluents directly into the rivers or nearby water bodies without any treatment.
- The National Water Policy of Bangladesh has highlighted the effluent discharge problem as a critical water management issue, and has set broad guidelines to prevent water pollution caused by industries.
- **'Polluter Pays Principle'- Strategy**

## 2. Non-consumptive use of water

# Fisheries:

- Freshwater and terrestrial ecosystems are integral parts of the water cycle. Their protection and conservation requires careful management of the entire ecosystem.
- Freshwater is an important habitat for world fishery resources.
- This ecosystem includes lakes and rivers, wetlands and floodplains, small streams, ponds and springs.
- Water requirements for fisheries in Bangladesh comprise the broad fish habitats like rivers, floodplain depressions, *beels*, oxbow lakes and ponds.
- In Bangladesh, there are two types of fisheries activity, viz., capture (open water) and culture (closed water) fishery. It is normally a complex task to estimate water requirements for capture fisheries because of the pronounced seasonal variation in fishing grounds.
- Even if culture fisheries are given greater emphasis for overall fish production as opposed to capture fisheries, the preservation of wetlands is a must for satisfactory fish harvest.

# The **average** water requirements for freshwater fish can be summarized :

- (a) Sufficient volume of water in the dry season water bodies with a range, of depths for different fish species; and
- (b) Appropriate river and floodplains flows along with adequate fish friendly hydraulic connections between the floodplains and the river system to allow normal fish migration.

- During the past three decades, the annual fish catch in Bangladesh has declined to an alarming level.
- The most significant causative factors for this decline are:
- (a) draining of wetlands for agricultural expansion, and
- (b) often uncoordinated implementation of flood control, irrigation and drainage schemes which altered and eliminated fish migration pathways.
- In addition, past interventions in the water resources sector, especially flood control drainage/irrigation works caused the disruption of the hydraulic connectivity between the main rivers and the floodplains - which forms an essential plan of the movement of the migratory aquatic species.

# Inland Navigation:

- Inland waterways throughout the world have played a significant role in the development of trade and industry. A minimum depth of water is required for the vessels to operate in the waterways - which varies from wet to dry season.
- As a result, the length of navigable waterways diminishes in the dry season.
- Navigation water requirements take the same form as capture fisheries; the demands in both cases are in the form of specifications in terms of certain dimensions of supply (including depth and sedimentation rates) rather than discharge.

- Principal issues concerning inland navigation are the allocation of stream flows to maintain navigation depths and the control or prevention of activities which might restrict or impede normal navigation.
- In order to ensure adequate amount of water in the water routes of Bangladesh the following steps may be suggested:
  - (a) ensuring water supply from upstream sections of the rivers through international agreements:
  - (b) control and prevent excessive water withdrawal from the rivers which are important for navigation
  - (c) making provisions for periodic dredging in the siltation-prone river sections of the principal water routes in order to maintain acceptable navigability, especially near ferry points.

# Environment/ Ecosystem :

- Until recently, little formal recognition was given to the need for allocating water to the sustenance of environment .Such needs revolve around the tasks of watershed development and management, protecting the wetlands and aquatic species, maintaining and improving the quality of water in rivers, and ensuring the rivers natural flow regimes.
- Water planners are now overly concerned to secure adequate freshwater supplies to meet today's need for nature.



- Environmental flows are described as the quality, quantity and timing of **water** flow required to maintaining the components, functions, processes and resilience of the river ecosystems.
- **Water requirements for environmental protection in Bangladesh are related to the following issues and ecological aspects:**
  - Water Quality : This is an extremely important public health issue.
  - Channel morphology: Inadequate water flow in the river channels would enhance siltation at river beds leading to the reduction of depth and navigability, and increase flood proneness due to the rivers' diminishing conveyance capacity.

- Flushing salinity: In the coastal areas, tidal water from the sea enters into land through the mouths of rivers bringing saline Water, and this has exacerbated since the flow has significantly diminished in the Ganges in the dry season due –to upstream abstractions.
- Resuscitation of wetlands:Wetlands or permanent water bodies shrink or dry up due to the reduction of water.Such wetlands can be rejuvenated by ensuring continues flow of water.
- Sundarban Conservation: Adequate water supply is essential in the rivers flowing into the Sundarban. Specially Gorai river in order to maintain the health of the Sundarban forest.

# Class Activity:

Find a case study related to consumptive and non-consumptive use of water in developed and developing countries.