Water Demand

This lecture provides a brief overview of :

- The reason for the paradigm shift from water supply management to water demand management.
- What comprises water demand management,
- The benefits to be gained from its application and
- Approaches to demand management.

Water is

- one of the essential requirements of all life.
- a natural resource and a social good
- an economic resource

The water supply management approach has been to

- develop new supplies and
- construct structures to utilize available supplies to meet water needs.
- consider water needs as necessary requirements and not as variable demands

This approach has caused

- new water supply sources to become less accessible and
- development of sources to be more expensive and less environmentally acceptable.
- solutions to be provided which are not permanent and cost-effective

Water demand management solutions are

- centered on lowering or mitigating proposed demands in a more socially beneficial manner
- usually not capital intensive structures- only after all else has been fully explored.

Water demand management signals a shift to management of the water resources for sustainability

What is water demand management?

Water demand management refers to any socially beneficial action that reduces or modifies average or peak water withdrawals or consumption from either surface or groundwater, consistent with the protection or enhancement of water quality.

Water demand management relies much more on socioeconomic techniques like economic analysis, public education, and establishment of incentives and disincentives which have proven to be cost effective.

Benefits

Experiences in countries like Singapore, USA, Israel, and Canada have demonstrated that demand management can

- reduce water demands by 30 to 50 percent with no deterioration in lifestyle.
- significantly reduce capital requirements and operating costs for expansion of supply
- reduce the generation of pollutants, and therefore the requirements for new or expanded wastewater treatment systems.

- enhance the development and adoption of new technologies
- lead to financially sustainable water systems
- facilitate expansion of the coverage of available water development funds
- assist with meeting the needs of present and future generations by promoting more efficient water use

Approaches to water demand management

Water demand management relies upon a range of tools and techniques which can be divided into

- economic
- structural and operational, and
- sociopolitical categories

Its techniques encompass both the concerns of

- water supply and
- waste disposal

Economic techniques

The aim of economic techniques is to promote better water use practices by moving toward increasing conservation and promoting sustainability in the use of water resources.

Economic techniques depend on monetary

- incentives such as rebates, tax credits and
- disincentives such as real cost, penalties, fines

Realistic water pricing is one of the fundamental keys to water demand management.

- It is a direct means of controlling water demand and generating revenues to cover cost
- It should be complementary to the other measures of demand management
- It is based on the quantity consumed
- It should be accompanied by a price-setting policy

Structural and operational techniques

Structural techniques are measures used to achieve better control over water demand. Examples include metering, retrofitting, controlling flow and recycling.

Operational techniques are actions by users to control demand patterns more effectively by modifying existing water use procedures.

Included are leakage detection and repair and water use restrictions during periods of water shortages

Social Techniques

In the context of water demand management, social techniques refer to

- policies such as economic policies
- effective public/stakeholder education and awareness measures
- laws such as land use and appliance modifications and
- the wise use of water.

Water Quality Management

This lecture provides a background to support the necessity for water quality management in the sustainable use of water resources.

It also identifies

- what is water quality management
- what comprises assessment for water quality
- problems
- key actions required for effective water quality management

Background on Water

- Water is essential for all life
- Water is a finite and vulnerable resource
- Water is inextricably linked with the environment.
- The nature of water is such that its characteristics vary in both quantity and quality in time and space.
- The quality of water is a significant factor on the amount of available water that may be used for various purposes.
- What nature provides as available quantities may be reduced if the quality of water does not permit its use

Some factors causing water quality deterioration

- The rapid growth of population and urban communities
- Industrial and agricultural activities
- Pollution of the environment
- Human Activities
- Water Use

Management

Water must be managed holistically taking into consideration the integration of sectoral water plans and programmes within the framework of national economic and social policy.

Management must also recognize the interconnectedness of the elements related to freshwater and freshwater quality.

What is Water Quality Management?

Water quality management deals with all aspects of water quality problems relating to the many beneficial uses of water.

Water quality is a reflection or response of water composition to all inputs and processes, whether natural or cultural.

Water quality management should not be equated to water pollution control which generally is the adequate treatment and disposal of wastewater.

Water quality management serves to optimize water quality for all beneficial uses

Water Quality Assessment

Water quality is assessed by its physical, biological and chemical characteristics. Contamination can alter one or all of these characteristics and may originate from point or from ambient sources.

The investigation and management of water resources systems for water quality must include consideration and evaluation of

(a) the physical, chemical and biological composition of headwaters and significant groundwater discharges.
(b) water quantity and quality requirements for all existing and potential water uses
(c) the means of water withdrawal and their effect on water quality and quantity
(d) the existing and future water and wastewater treatment technology used to alter water quality

(e) the wastewater outfall configuration and effluent mixing

(f) the eutrophication status of the receiving waters

(g) the waste assimilative capacity of the receiving waters.

(h) the ecological changes that might be caused by wastewater discharges

(i) the potential effects of discharged waters.

Water Pollution

The World Health Organisation (WHO) considers waters to be polluted

when they are altered in composition or condition, directly or indirectly, as a result of man’s activities so that they become unsuitable, or less suitable, for any or all of the functions or purposes for which they would be suitable in their natural state.

Some problems affecting water quality

- inadequately treated sewage
- poor landuse practices
- loss and destruction of catchment areas
- inadequate controls on the discharges of industrial waste waters
- poor siting of industrial plants
- deforestation
- uncontrolled and poor agricultural practices
- lack of integrated watershed management

Some effects of water quality problems

- leaching of nutrients and pesticides
- threatened ecosystems
- public health risks
- erosion, sedimentation and deforestation leading to land degradation

To effectively control water quality

Water quality must be described in precise technical quantitative terms to allow the decision for effluent discharge limitations or a beneficial use of the water to be formulated.

Any requirements for water quality must be imposed taking into consideration the concomitant level of treatment requirements of wastewater effluents or water supply intakes upstream and downstream from the point of interest.

Actions to address water quality management

- Development of appropriate, cost effective and reliable data programmes that can inform sound judgments on environmental policy, management and regulatory needs.
- water resources protection and conservation
- water pollution prevention and control
- development and application of clean technology
- groundwater protection
- protection of aquatic ecosystems
- protection of freshwater living resources
- monitoring and surveillance of water resources and waters receiving wastes
- development of legal instruments to protect the quality of water resources