Water Quality Management

Introduction: Most countries now have water quality management policies aimed at achieving sustainable use of their water resources by protecting their quality while maintaining economic and social development .Achieving this objective requires that the needs and wants of the community for each water resource are defined and that these resources are protected from degradation .These community needs generally are called the ***environmental values*** or ***(beneficial uses)*** of the water body and can include water for drinking, swimming, fishing, recreation, agricultural.

Water quality management: Water quality management deals with all aspects of water quality problems relating to the many beneficial uses of water, and its serve to optimize water quality for all beneficial uses.

Water Quality Management process: Before considering in detail the water quality management process and the role of water quality guidelines in this process, a number of important considerations are highlighted:

●Water environments are naturally quite variable systems, particularly in flow and ecosystem types .Therefore, any process that seeks to manage a water resource adequately must be responsive, flexible, and adaptable.

● Water above land surface (in liquid form) is called ***surface water***, and water below land surface is called ***ground water***. Although surface water and ground water are directly connected, these waters are typically considered as separate systems and managed under different rules and regulations.

Figure 1.1 shows the main steps involved in the water quality management process .These are discussed briefly below.

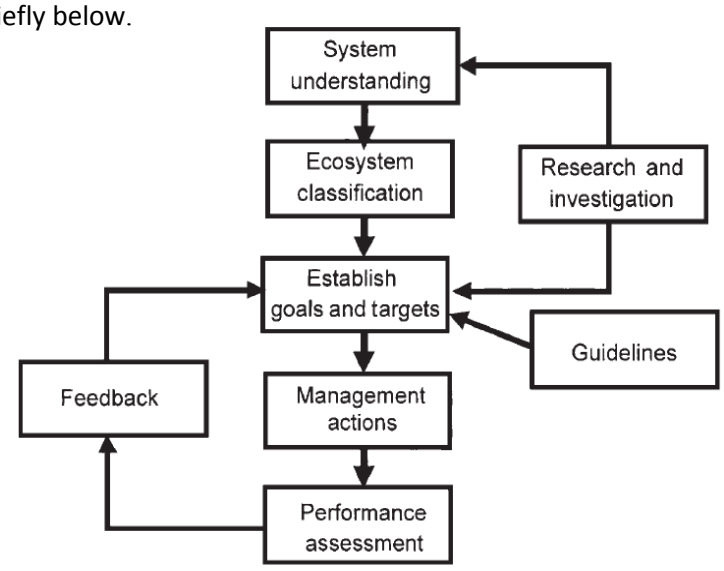

FIGURE 1.1 Water resources management framework.

1- ***System understanding:*** A good scientific understanding of the aquatic system is essential if it is to be managed effectively. Example:

a- The present water quality,

b- Stressors:

i- Toxic stressors: heavy metal, toxic organic compounds,

ii- Non-Toxic stressors: Nutrients, turbidity, total suspended solids, flow and organic compounds.

c- Uses of the water resource.

2- Ecosystem classification :

a- ***Environmental values or (beneficial uses):*** Identification of the community needs and wishes for the water resource (e.g., agricultural water supply, swimming, fishing, and protection of the ecosystem) provides the first step in defining the environmental values of a particular water body.

b- ***Management goals:*** it is essential in any management process to decide why the system is being managed. At the highest level, the goal of managing a natural resource is to improve community well-being through sustainable use and protection of the natural environment.

3- Establish goals and targets:

a- Objectives or targets: Each environmental value requires a certain level of water quality to be maintained. The water quality to sustain environmental value may be defined by establishing water quality objectives that become the goals for management action. The objectives usually aim:

i. To *protect* waterway valuesأهمية (e.g., do not allow waste discharge, no sand extraction).

ii. To *restore* waterway values (e.g., works programs to prevent existing erosion of banks, stabilize beds and revegetate banks).

b- Key indicators of quality: These water quality objectives are established in terms of key indicators of quality that provide a means of identifying and measuring change in the environmental values .They can include physical, chemical, radiologic, biological measures of water quality. Broadly, three types of indicators of environmental quality exist:

i. Indicators that are *normally present* in the water (e.g., salinity and nutrient and heavy metal concentrations).

ii. Indicators that are *not normally present* (e.g., concentrations of pesticides and other toxic organic compounds)

iii. Indicators that are normally present but the *absence of which* reflects a change .

4- Guidelines: These provide an objective means for judging the quality needed to maintain a particular environmental value. Normally they are described in terms of the key indicators of quality.

5- ***Research:*** Obtaining the required information will demand sustained and focused long-term ecological research on these ecosystems.
6- ***Management actions:*** Programs or strategies that might be developed to achieve these objectives could include control of waste discharges, water quality protection, nutrient reduction, etc.
7- ***Performance assessment:*** This requires that an effective monitoring program is put in place and that there is an appropriate feedback mechanism to confirm that the various management goals are being met or that they need to be revised .

Key action to address Water Quality Management:

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1. Water resources protection and conservation.
2. Water pollution prevention and control.
3. Development and application of clean technology .
4. Groundwater protection.
5. Protection of aquatic ecosystems.
6. Monitoring and surveillance الإشرافof water resources and water receiving wastes .
7. Development of legal instruments to protect the quality of water resources.