

## Module - 3

# Integrated Water Resources Management

**OVERVIEW:-** Definition of IWRM, principles, implementation of IWRM, Legislative and organizational framework, Types and forms of private sector involvement.

### Definition

The integrated approach is called integrated water resources management and is defined as a "process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

### Introduction to Integrated Approach

#### → Issues

- Resources under pressure
- population under water pressure
- Impact of pollution
- Water governance crisis

#### → challenges

- Securing water for people
- Securing water for food production
- protecting vital ecosystems
- Managing Risks
- Developing other job creating activities
- Creating popular awareness and understanding
- Ensuring collaboration across sectors and boundaries.

## Development

The development of IWRM was particularly recommended in the final statement of the ministers at the international conference on water and Environment in 1992 (so called the Dublin principles)

→ This concept aims to promote changes in practices which are considered fundamental to improved water resource management.

The IWRM rests upon three principles that together act as the overall framework.

### Integrating the three E's

1. - Social Equity :- Ensuring equal access for all users, means all people must have access to water of adequate quantity and quality - participation in water management by all stakeholders - Best way to ensure equity.
2. Economic Efficiency - Efficiency in water use is core principles of IWRM, water must be used with maximum possible efficiency by bringing the greatest benefit to the greatest numbers of users possible with available financial and water resources.
3. Ecological Sustainability - To achieve ecological sustainability, current water use should be managed in such a way that it does not affect future generations.

Note: Sustainability meaning :- Ability to maintain

## Principles - In Detail

WRM is Based on Four principles -  
The Dublin principles

Principle : 1 Freshwater - is a finite and vulnerable resource, essential to sustain life development and the environment.

→ water sustains life in all its forms and is required for many different purposes, functions and services. Therefore holistic management has to involve for the demands placed on the resources and the threats to it.

→ Creating a water sensitive political economy requires co-ordinated policy making at all levels from national ministries to local government or community

→ There is also a need for mechanisms which ensure that economic sector decision makers take water costs and sustainability into account when making production and consumption choices.

Principle : 2 Water development and management should be based on a participatory approach involving users, planners and policy-makers at all levels.

→ Water is a subject in which everyone is a stakeholder. Real participation takes place when stakeholders are part of the decision making process.

→ participation also occurs if democratically elected agencies or persons law represent stakeholders group.

Principle : 4 Water has an economic value in all its competing uses and should be recognised as an economic good.

→ Within this principle, it is vital to recognise first - the basic right of all human beings to have access to clean water and sanitation at an affordable price.

→ Managing water as an economic good is an important way of achieving efficient and equitable use and of encouraging conservation and protection of water resources.

Principle 3 : Women play a central part in the vision, management and safeguarding of water.

→ Women play a key role in the collection and safeguarding of water for domestic and in many cases - agricultural use, but they have a much less influential role than men in management, problem analysis and in the decision making process related to water resources.

→ The women's views, interests and needs shapes the development agenda as much as men's, and that development agenda support progress towards more equal relations between women and men.

Implementation of Integrated Water Resource Management.

An IWRM implementation is focused on three basics and aims at avoiding a fragmented approach of water resources management by considering the following aspects.

→ Enabling Environment: A proper enabling

3

environment is essential to both ensure the rights and assets of all stakeholders (individuals as well as public and private sector organizations and companies), and also protects public assets such as an intrinsic environmental values.

2. Role of Institutions: Institutional development is critical to the formulation and implementation of IWRM policies and programmes. Failure to match responsibilities, authority and capacities for action are all major sources of difficulty with implementing IWRM.

3. Management Instruments: The management instruments for IWRM are the tools and methods that enable and help decision-makers to make rational and informed choices between alternative actions.

Some of the cross-cutting conditions that are also important to consider when implementing IWRM are:-

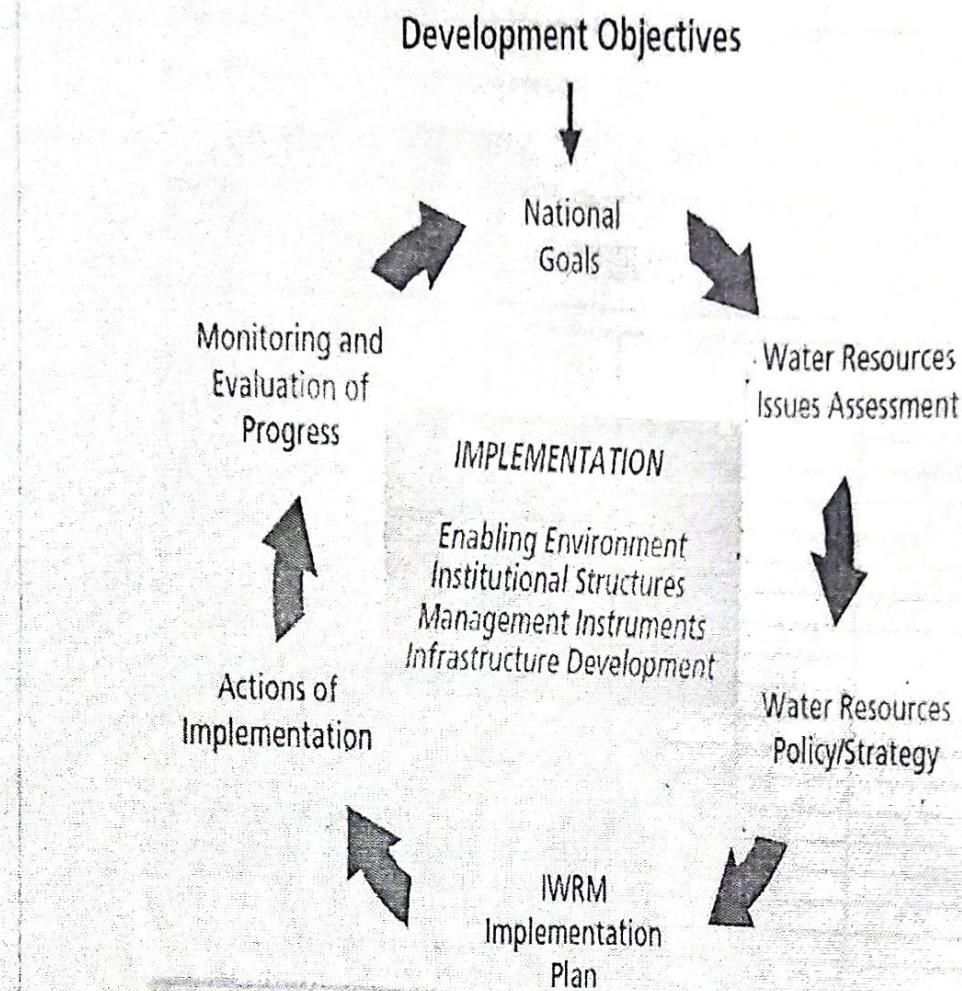
- political will and commitment.
- Capacity development
- Adequate investment, financial stability and sustainable cost recovery.
- Monitoring and Evaluation.

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IWRM should be viewed as a process rather than a one-shot approach.

- There is no correct administrative Model.
- The art of IWRM lies in selecting, adjusting and applying the right mix of these tools for a given situation.
- IWRM has no fixed beginnings or endings

## Development Objectives



## Elements of an Integrated water legislation framework.

- National, provincial and local water and policies determine stakeholders play their respective roles in the development and management of water resources.
- Basin organizations put up by law have a strong mandate.
- Laws and water policies spell out rules responsibility and accountability of public and private sectors.
- water management framework should be a part of an existing national administrative system.

→ Basin and national water policy management plans should be harmonized.

## Assessment of the institutional/ organizational framework.

### Process and Tools:

Assessment of the institutional framework requires a process, to come from an identified present water resources management situation to a desired integrated water resources management situation.

The steps in this process are

- Identification of the present situation.
- Formulation of a desired IWRM situation.
- Formulation of interventions to arrive at the desired IWRM situation and establishment of a monitoring system to see whether the interventions are being carried out properly and whether they really contribute to the achievement of the IWRM goals.

### Step -1

→ The present situation on water resources use and management should be well known before any intervention directing to IWRM can be made.

→ Understanding the water situation is a prerequisite for assessment and analysis of the institutional framework and the water use conflicts between stakeholders.

→ It is essential to have a basic document on the present water management to start the institutional assessment process.

Such a document will represent an experts opinion and will not necessarily be complete...

→ Accurate and representing the opinions, desires and aspirations of all stakeholders.

Important aspects to be dealt with are

- water availability and water use
- stake holders.
- physical conditions.
- socio economic conditions.
- legal framework.
- institutional framework.
- policies and the trends and financial situation.

This report serves as a general background document for the following steps and has to be disseminated accordingly.

#### Physical conditions

The assessment of the physical conditions concentrates on the temporal and spatial availability and use of the water (quantitative, and qualitative). It requires information on the :-

- a) Climate and Meteorology.
- b) Hydrology and hydro geology.
- c) Aquatic Ecosystems.
- d) Availability and capacity of storage facilities.

## Stakeholders and Interest Groups:

Stakeholders are people or groups of people with interest. The stakeholders are considered as private body.

Assessment of institutional frameworks in IWRM the stakeholders can be classified as follows.

→ Water users - Consumptive and non-consumptive uses.

→ water polluters agriculture, industry, domestic etc

→ water managers organisational and operational level.

→ water Policy and law makers - constitutional level.

→ Society - general interests represented by government.

→ Specific interests represented by NGOs

## Inventory of water problems.

The water use flow diagram can be most useful to put the registered problems at. In this stage the inventory of water problems limits itself to those generally known and the registered water problems by the main stakeholders.

### Step-2 : Stakeholder Selection.

Stakeholders inventory will be made in step one.

→ These stakeholders will be the obvious operators of water services, co-ordination bodies and policy and law makers.

For further process a selection of stakeholders has to be made to avoid duplication.

An independent team is formed to identify and select relevant stakeholders from the categories

- water policy makers.
- water managers.
- water service providers
- water using agencies
- water using groups.
- water users and other potential interest holders at constitutional, organisational and operation levels.

These stakeholders will be approached for in depth interviews.

### Step 3: Stakeholder interviews

Experts carry out an elaborate procedure of interviewing the selected stakeholders applying the guidelines for interviews. These guidelines are in the format of a questionnaire, which contain questions relating to the stakeholders interviewed and their perception of the existing situation and what they consider to be the desired IWRM situation. During this interview

- Previously overlooked stakeholders can be identified through the identification of parties that negatively influence the implementation of the stakeholder's duties.

A different set of questions under the issues in the matrix is used for all three functional levels. They are organized under the headings

- Stakeholders
- Awareness
- policy
- Legal framework
- Institutional framework.
- Financial arrangements.
- Human Resource development.

management information systems and decision support systems

Second part of the interview aim to:

1) obtain a description of the stakeholder's concept for improvement of the existing water resources situation, towards more integrated water resource management.

The following aspects and principles should be included

- Equitable and socially acceptable water distribution
- Efficient and economically sustainable water use
- Delegation, decentralisation and other elevation of authority
- Integrated planning
- participation of stakeholders
- private sector participation
- Environmental protection

#### Step 4: Analysis of stakeholder's opinions

The outcome of all the interviews will be collected and an inventory will be made of agreements b/w the different stakeholders on the present situation, the problems and constraints and the steps to be taken to come to a better water management.

→ The results of the interviews are described in a report

→ These stakeholders should also be invited to the workshops that follow in the process.

## Workshop-1 <sup>steps:-</sup> problem Identification:

It is important that all the relevant stakeholders recognise their problems and those of others. Hence,

- 1) The first workshop to which all the relevant stakeholders are invited to deal with the assessment of the existing water resource management situation and problem identification according to the perception of the stakeholders.
- 2) The purpose of the first workshop is to obtain common understanding between all different stakeholders of what the real problem and which should be addressed.
- 3) The analysis report which is formulated in the analysis of step 4 will be used as a reference and will be improved in accordance with the outcome of the workshop.
- 4) The agreed set of problems by the stakeholders will then be used as an input for the further stages on formulation of a desired IWRM situation and necessary interventions.
- 5) End result of this workshop should be a selection of a very fruitful method to arrive at a set of most important problems.

## Step-b: workshop - 2

### Formulations of desired IWRM situation and interventions.

The second workshop one or three months after the first workshop.

- It will elaborate extensively on the principles of integrated water resources management and it will further result in the formulation of a desired water resources management situation in that specific river basin and set of interventions that will be needed to achieve that.
- This workshop outcome provides directions for constitutional, organisational and operational interventions.
- The outcome should be seen as an input for national policy and decision makers

## Step 7: Preliminary - Sub basin report:

Based on the foregoing steps the experts will draft a preliminary country document comprising.

- Assessment of existing water management situation.
- complete problem inventory
- Desired water resources management situation.
- proposed set of general and specific interventions needed to reach the desired situation.

### Step - 9 : Final country basin / report:

Experts draft a final sub basin / basin report which is offered to the government and financing agencies for endorsement and inclusion into the strategy in to specific water related projects for the specific country.

### Step - 8

The draft country / basin / sub basin report is disseminated and a through procedure for collecting comments from the different stake holders at the different levels is followed.

### Step - 10 Monitoring Procedure

A monitoring procedure is developed to see whether the interventions are taking place and whether the envisaged results are achieved.

## Types and Forms of private sector involvement

The private sector is morally bound to do investments in environmental protection as a response to regulation, legislation, and specific incentives

→ The private Sector plays an important role in financing water resource management through investments in Service delivery in water supply and Sanitation.

The motives for growing involvement of the large and international private sector are:

Financial : Government passes on the cost and work of raising funds.

Expertise : private companies, if large or international, bring essential know how in some technical and economic fields.

Risk - Sharing : Private companies are typically more willing to take large risks than public authorities

The main types of private involvement in water service provision are found

Full divesture :- Transfer of all public assets through sales, in which case, the private sector obtains full responsibility of the water supply network facilities and operations.

Joint Ventures : Partial transfer of assets through share sales resulting in shared ownership and operating responsibilities between private and public sector

Concessions: Assets remain in public ownership but use of the system to by private sector for the duration of 20-25 years.

- private sector can return for collection or other form of payment <sup>(collect amount)</sup>

### BOOs (Build, Operate, Own, and Transfer)/ BOO

Build, Operate and own) - Schemes where contracts for the construction of particular infrastructure ownership is required and where project is handed to a public organisation after a specified number of years. In the BOO case ownership remains in the hands of the private sector

Leasing - The water system remains in public ownership, but it leased to private operators.

Contracting out - The least controversial form of private sector involvement. A water undertaking sub-contracts certain functions to private firms e.g. meter reading. Even when water services are provided by the private sector

- The government still has a key role in providing a clear regulatory framework and ensuring that the poor are served and users are protected from excessive costs.

## **IWRM PRINCIPLES – GWP (Global Water Partnership)**

### **1. From Dublin Statement: – Fresh water - a finite & vulnerable resource, essential to sustain life & development.**

- Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems.
- Effective management links land and water uses across the whole of a catchment area or groundwater aquifer.
- Freshwater is a finite resource arises as the hydrological cycle on average yields a fixed quantity of water per time period. This overall quantity cannot yet be altered significantly by human actions, though it can be, and frequently is, depleted by man-made pollution.
- This principle recognizes that water is required for many different purposes, functions and services; management therefore, has to be holistic (integrated) and involve consideration of the demands placed on the resource and the threats to it.
- The integrated approach to management of water resources necessitates co-ordination of the range of human activities which create the demands for water, determine land uses and generate waterborne waste products. The principle also recognizes the catchment area or river basin as the logical unit for water resources management.

### **2. Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.**

- The participatory approach involves raising awareness of the importance of water among policymakers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.
- Water is a subject in which everyone is a stakeholder. Real participation only takes place when stakeholders are part of the decision-making process. The type of participation will depend upon the spatial scale relevant to particular water management and investment decisions. It will be affected too by the nature of the political environment in which such decisions take place.

- A participatory approach is the best means for achieving long-lasting consensus and common agreement. Participation is about taking responsibility, recognizing the effect of sectoral actions on other water users and aquatic ecosystems and accepting the need for change to improve the efficiency of water use and allow the sustainable development of the resource.
- Participation does not always achieve consensus, arbitration processes or other conflict resolution mechanisms also need to be put in place. Governments have to help create the opportunity and capacity to participate, particularly among women and other marginalized social groups.
- It has to be recognized that simply creating participatory opportunities will do nothing for currently disadvantaged groups unless their capacity to participate is enhanced.

### **3. Women play a central part in provision, management, and safeguarding of water.**

- This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources.
- Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.
- It is widely acknowledged that women play a key role in the collection and safeguarding of water for domestic and – in many cases – agricultural use, but that they have a much less influential role than men in management, problem analysis and the decision-making processes related to water resources.
- IWRM requires gender awareness. In developing the full and effective participation of women at all levels of decision-making, consideration has to be given to the way different societies assign particular social, economic and cultural roles to men and women.
- There is an important synergy between gender equity and sustainable water management. Involving men and women in influential roles at all levels of water management can speed up the achievement of sustainability; and managing water

in an integrated and sustainable way contributes significantly to gender equity by improving the access of women and men to water and water-related services to meet their essential needs.

#### **4 Water has an economic value in all its competing uses and should be recognized as an economical good**

- Treating water as an economic good is an important means for decision making on the allocation of water. This is particularly important when extending supply is no longer a feasible option.
- Water has a value as an economic good as well as a social good. Many past failures in water resources management are attributable to the fact that the full value of water has not been recognized. In order to extract maximum benefits from available water resources, there is a need to change perceptions about the value of water.
- Value and charges are two different things and we have to distinguish clearly between valuing and charging for water.
- The value of water in alternative uses is important for the rational allocation of water as a scarce resource, whether by regulatory or economic means.
- Charging (or not charging) for water is applying an economic instrument to support disadvantaged groups, affect behavior towards conservation and efficient water usage, provide incentives for demand management, ensure cost recovery and signal consumers' willingness to pay for additional investments in water services.
- Treating water as an economic good is an important means for decision making on the allocation of water between different water use sectors and between different uses within a sector. This is particularly important when extending supply is no longer a feasible option.

#### **SECTORS BENEFITED BY IWRM**

##### **IWRM Components:**

- Water allocation – to major users & uses.
  - River basin planning – priorities.
  - Stake holders participation – basis of decision making.
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- Pollution control - Managing pollution using polluter pays.
- Principles & appropriate incentives – minimize environmental & social impacts.
- Monitoring – implement effective monitoring system.
- Economic & financial management – sustainable benefits.
- Information management.

### IWRM PROCEDURE

- Managing water at the basin or watershed – integrating land & water, upstream & downstream, groundwater & surface water, & coastal resources.
- Optimizing supply – conducts assessment of surface & groundwater; analyze water balance; water conservation & reuse.
- Managing demand – water efficient technologies.
- Providing equitable access – effective water user's association.
- Establishing policy – eg. Implementation of the polluter pays principle, water quality norms and standards.
- Inter-sectoral approach- decision making, implementation & management.

### INTEGRATED WATER RESOURCES MANAGEMENT

- Maximum development of water resources from a basin based on the quantitative information for planned beneficial use.
  - Involves awareness of present status of development, socioeconomic considerations and policy formulation.
  - Flood routing.
  - Reservoir regulation.
  - River forecasting.
  - Conjunctive use of water resources.
  - Concentration of population irrespective of natural resources situation – Migration to cities.
  - IWRM involves Conjunctive use, deferred & maximum perennial yield computation of gross additional reserves available in basins.
  - Involves integration of scientific inputs into the local management instruments.
- IWRM is Prerequisite

### **THE THREE E-PILLARS OF IWRM:**

#### **1. Social Equity (Social Sustainability):**

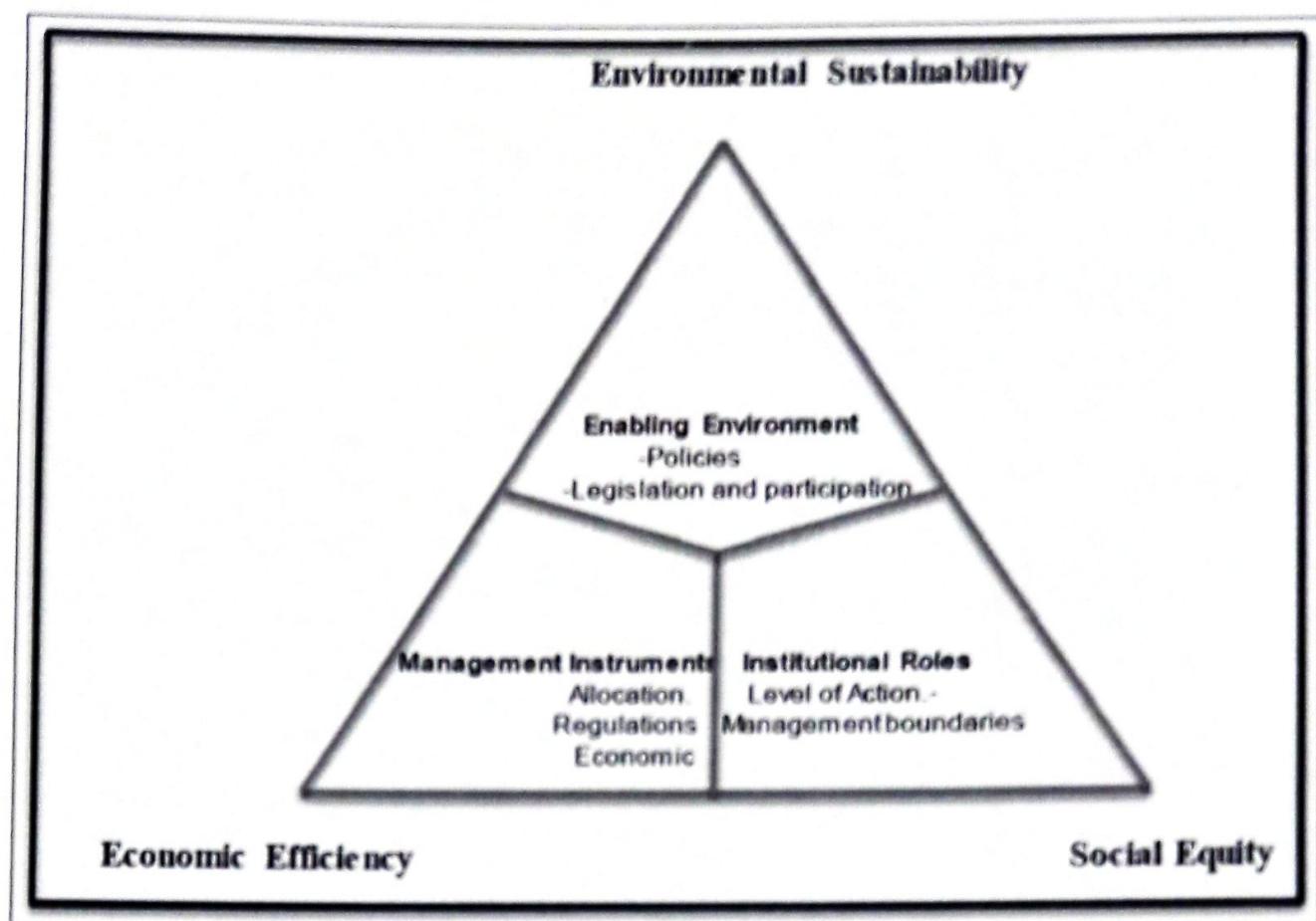
The basic right for all people to have access to water of adequate quantity and quality for the sustenance of human well-being. The social perspective involves the need to meet fundamental human needs in terms of safe household water, water dependent food production, and –in view of present techniques deficiencies- water-polluting income generation activities. Securing societal acceptance of necessary tradeoffs is essential by effective ways of stakeholder participation in planning and decision-making.

#### **2. Environmental and Ecological Sustainability:**

The present use of water resources should be managed in such a way that does not undermine the life support system, thereby compromising use of the same resource by future generations. The ecological perspective involves attention both to terrestrial ecosystems and their environment in local runoff generation and to aquatic ecosystems and their dependence on uncommitted environmental flows. Certain highly valued local ecosystems and their particular water determinants may have to be protected. The long term resilience of the overall system has to be secured for the benefit of coming generations. Freshwater management and the management of environment dynamics have to be integrated. This is equivalent to finding ways and means to merge water management, land use management, and ecosystem management (terrestrial as well as aquatic) within a socio eco hydrological catchment management- with full awareness of the different ethical and political dilemmas involved.

#### **3. Economic Efficiency (Economic Sustainability) of water use:**

Because of the increasing scarcity of water and financial resources, the finite and vulnerable nature of water as a resource and the demands on it, water must be used with maximum possible efficiency. The economic perspective involves not only economic development in general but also attention to benefit cost relations, financing challenges, cost coverage to secure operation and maintenance of water in infrastructures, incentives to encourage implementation, and guidance from the values of water in different functions.



**Figure 1:** The IWRM General Framework