

# **Integrated watershed management**

## **CONCEPT OF INTEGRATED WATERSHED MANAGEMENT**

Integrated watershed management is the integration of technologies within the natural boundaries of a drainage area for sustainable development of land, water and plant resources to meet the needs of people and animals. The aim is to improve the livelihoods of communities by increasing their earning capacity through optimal production. It involves controlling floods as well as reducing erosion and sediment accumulation. Specific land and water conservation practices include water harvesting in ponds, recharging of groundwater, crop diversification (through improved seeds varieties), and integrated nutrient and pest management practices. IWM is such a holistic approach which requires not only supply management, but also demand management (water conservation, transfer of water to uses with higher economic returns, etc.), water quality management, recycling and reuse of water, economics, public involvement, public health, environmental and ecological aspects, socio-cultural aspects, water storage (including long-term storage), conjunctive use of surface water and groundwater, water pollution control, flexibility, regional approaches, weather modification, sustainability, etc. When the economic, social, environmental, and resource components of watershed are analyzed, the potential development of economic and social components, and of existing or potential problems in environmental and resource components are focused on. These components have mutual interactions, interrelated and interdependent each other, like the links of a chain or the spokes of a wheel.

## **COMPONENTS OF INTEGRATED WATERSHED MANAGEMENT**

Major components of Integrated Watershed Management needing the special attention of watershed managers are:

- ❖ **Management of water resources** (e.g., rainwater harvesting);
- ❖ **Management of soil resources** (soil conservation);
- ❖ **Management of human resources** (qualification of resource managers and users, etc.)

**Additionally, Watershed Management comprises the following components:**

- ❖ **Land management** (land use planning);
- ❖ **Pasture management** (area closure);
- ❖ **Crop yield management** (e.g., storage management, marketing);
- ❖ **Livestock management** (e.g., marketing, dairy production);
- ❖ **Rural energy management** (e.g., decentralised use of renewable energy resources);
- ❖ **Vegetation/biomass management** (reforestation, agroforestry, etc.);
- ❖ **Farm and off-farm activities adding value** (e.g., creation of infrastructure).

There is no universal methodology for achieving effective IWM. However, fundamental principles related to cooperation, balance, fairness, integration, communication, and adaptability can help guide the process:

- ❖ In most situations, the complexity of information processing and the scope of socio-environmental
- ❖ Change requires cooperation to manage a watershed effectively.
- ❖ It requires to balance technical solutions to specific human-generated problems with the wide-scale maintenance of appropriate environmental components that provide similar ecological services.
- ❖ Apply regulations guiding the structure and behavior of the socio-environmental system evenly and fairly throughout the watershed.
- ❖ Accept human activities as fundamental elements of the watershed along with the structure and dynamics of the environmental components.
- ❖ These principles provide only the initial steps in achieving effective watershed management. Cultural values, social behavior, and environmental characteristics will go on develop slowly.
- ❖ Consequences of effective IWM is as follows;
- ❖ adequate planning of water resources that is sustainable over many years
- ❖ good quality of water that meets legal requirements and protect good ecological factors
- ❖ Realization of sustainable economic development.

### **Socio-economic Perspectives**

Social, economic, environmental and technical dimensions should be taken into account in an integrated water resources management framework, which will help to initiate and ensure the participation of a large number of stakeholders in the decision-making processes and the development of a cyclic decision making process where feedback will be given at any point. For IWM, socio-economic factors include both social issues, such as individual beliefs, related institutions, and stakeholder involvement, and economic issues, such as monetary costs and benefits. IWM goals are determined, in part, by political, economic, institutional, and social demands. Choosing between these demands and balancing them with ecological goals is the challenge of IWM. Developing a successful IWM project requires integrating the complexities of the physical and biological systems with the rules and constraints of the underlying socioeconomic systems.

### **Benefits of IWM with respect to socio-economic aspects:**

Significant benefits have been obtained from IWM as follows;

- Obtain more rational structure of land use. eg. reduced cultivated farmland, increased forest and grasslands, reduced waste lands.
- Increase the productivity of land and the per capita income of farmers.
- Increase the grain production in the course of the construction of basic farmlands.

- Reduce water and soil losses.
- Achieve significant ecological and social benefits.

Also,

- 1) After proper management, cultivated farmland has been reduced by 5%—10%, forest and grasslands have been increased by 10%—20%, and waste lands have been reduced by 10%—15%. Also the overall ratio of land use has increased by about 20%.
- (2) The productivity of land and the per capita income of farmers have increased by 1—2 times.
- (3) The grain production has increased by 1—2 times in rain-fed land. In irrigated land, the increase was 3—4 times. Per capita grain supply has reached 300kg—400kg.
- (4) Water and soil losses have been reduced significantly. According to analysis of typical watershed, in areas with 50%—79% of land under control, soil and water losses have been reduced by 57%—78% and 46%—76%, respectively. If the degree of control is 80%—100%, the respective figures are 74%—96% and 70%—92%. The reduction in water and soil losses was beneficial to the downstream of river.

Along with the improvement of ecological environment the habitat of flora and fauna as well as the adjustment of land utilization structure, the renewable resources have been conserved, and the aquatic production, animal husbandry and processing industry are all developing. Hence the livelihood of farmers has been much improved.

## **Socio-economic Challenges to Successful Watershed Development and Management**

One of the biggest challenges to IWM is that its costs and benefits are distributed unevenly, yet cooperation is required to make it work. Uneven impacts result from spatial variation and multiple, conflicting uses of natural resources. The conflict between using upper watersheds for protecting them for regeneration to support downstream irrigation is a good example. If the benefits are large and quickly maturing, those who lose in the short term may be willing to wait for gains, and devising mechanisms to diffuse costs may be manageable. But this is more difficult in the majority of cases where benefits are gradual and incremental. Accordingly, watershed projects need to create mechanisms to encourage natural resource utilization consistent with the common good. After the failure of early projects that focused only on technology, beginning about 1990 they more commonly incorporated efforts to promote watershed governance to share net benefits that are simpler task in village-level micro-watersheds with established social relationships than in macro-watersheds spanning multiple villages.

IWM involves the coordinated use and management of water, land and other biophysical resources within the entire watershed with the objective of ensuring minimal land degradation and erosion and causing minimal impact to water yield and quality and other features of the environment. Therefore, an IWM strategy must be developed for any watershed for the success of the actions towards achievement of sustainability goals.

## **RECOMMENDATIONS**

IWM is a relatively new concept and its application is very complex, so methodology of IWM application should be private for each watershed. Quick overview of the recent findings and recommendations on IWM activities;

- Sharing experiences and lessons learned IWM approaches and methodologies has been achieved in different parts of the world and sharing these results and identifying appropriate mechanisms for disseminating such information are important issues in order to benefit watershed management users/new projects from experiences learned and to avoid the duplication of efforts.
- Using the appropriate participatory processes. The experience of participatory approaches is important and Participatory processes are recognized as primary at all stages of IWM. Experiences have shown that one-sided bottom-up or top-down approaches do not work. Various approaches and methods should be pragmatically used and adjusted according to specific circumstances.
- Including sustainable and replicable activities. The support of all the concerned agencies, organizations, officials and members of the IWM should be solicited to sustain. There should be strong support financially and technically.
- Reviewing and developing the institutional/organizational and legislative arrangements such as decentralization of authority, interagency collaboration.