INTEGRATED WATERSHED MANAGEMENT: SOCIO-ECONOMIC PERSPECTIVE

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Abstract: Integrated watershed management (IWM) is becoming increasingly important in such a country where the economy depends predominately on agriculture, but there are also fast-growing urban populations that depend on water and food supplies on an unprecedented scale and attention is shifting to overall socio-economic benefit along with better water and soil conservation. The ever-increasing pressure on the natural resources is further increased the intensity by the even faster economic growth the country has witnessed in the past decades. Unprecedented economic activities in areas such as agriculture, industry, power, and communication, are affecting land-use patterns in many ways.
The aim of this paper is to emphasize the importance of the effective IWM, to point out the relations between its components and to realize on beneficiaries in any watershed. In particular, social, economic, environmental, and resource systems are all considered in order to improve the applicability of IWM approach.
This paper presents that watershed management integrates various aspects of forestry, agriculture, ecology, soils,
water use and other sciences to provide guidelines for the choosing appropriate IWM alternatives within the social and economic context. Addressing social and economic aspects is an essential part of evaluating the effects of IWM.

Keywords: IVM, social, economic, environmental

INTRODUCTION

IWM is becoming increasingly important concept in all over the world and attention is shifting to overall socio-economic welfare along with better water and soil conservation. Global population is continuing to grow rapidly. The ever-increasing pressure on the natural resources is further increased the intensity by the even faster economic growth, the country has witnessed in the past decades. Unprecedented economic activity in areas such as agriculture, industry, power, and communication, is affecting land-use patterns in many ways.

Major increasingly challenging problems of socio-economic development in watersheds, e.g. scarcity of natural resources and environmental deterioration, have arisen. IWM is a useful tool for dealing with these issues and maintaining sustainable development at the watershed scale. According to Bouwer (2000), 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.

Application of the effective IWM approach within a comprehensive public involvement program on watersheds systems maintains a balance of protection of watershed's natural resources and economic growth opportunities, provides a framework for long-term stream sustainability, and fullfils all the requirements of beneficiaries as equitable.

IWM involves the management of the socio-economic, human-institutional, and biophysical interrelationships between soil, water, and land-use, and the connection between upland and downstream areas (Wang et al, 2005).

German Agency for Technical Cooperation (GTZ) defines IWM as the process of organizing land use and the use of other resources in a watershed in order to provide sustainable desired services to the people without adversely affecting soil and water resources. This definition recognizes the interrelationships among land use, soil and water, the linkages between uplands and downstream areas, and the numerous types of stakeholders (Kotru, 2005).

Liu and others (2007) stated that a watershed management system is usually divided into social, economic, environmental, and resource components. The relationships among these components complicated at the watershed scale (Fig. 1).

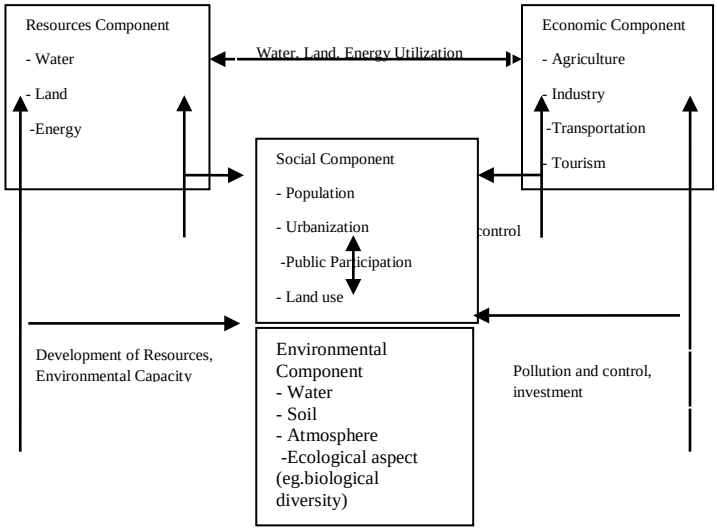

Figure1. The Components of Watershed

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, as seen in fig.1. Damage to any one watershed component runs the risk of damage to all. For example in the case of environmental pollution, the scarcity of water resources as accepted key problems of watershed, driving forces of watersheds components are the financial budget and national policies, which can greatly influence as essential elements changing in the watershed. Social, environmental, and economic components are associated with the sustainability goal. Effective indicators of sustainability provide a balanced view of environmental, social, and economic conditions at the scale of interest (community, ecoregion, basin, county, etc.). This is particularly attractive because of our social and economic success that

stems from fertile agricultural valleys and productive forests, abundant fishery resources, and a diverse array of recreational opportunities. The economic policies, which are including raising the price of water in urban areas, the development of watersaving agriculture, the implementation of cleaner production methods, and the establishment of a subsidiary system for developing water saving techniques, could be adopted to reduce water resource utilization and, hence, to reduce wastewater discharge. The goal of these policies would be to protect water quality and reduce the financial burden of environmental investment in the watershed.

Integrated Watershed Management (IWM)

IWM is a process of conservation, development and optimal utilisation of the available natural resources in a watershed on a sustained basis. It is a process with a multidisciplinary approach with people in the watershed as chief functionaries (decision makers and main actors) in the process(Winnegge, 2005). The concept of IWM are increasingly important in the case of shortages of land or water or of both need to be addressed, since it is the only approach capable of balancing growing demand for a limited resource with a sustainable resource base.

The Technical Advisory Committee of Global Water Partnership has adopted the following definition: IWM is 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 (Gooch, and Stålnacke, 2003).

The distinction between “integrated” and “traditional” management of water, river basins or water resources to a large extent relies on the scope and sphere of operation of the two. Whereas traditional one is typically sector-oriented (water supply, irrigation, hydropower, etc.) and focused on satisfying the perceived demands within each sector, the integrated one attempts to take a cross-sectoral approach and focus as much on management of the water or in terms of water resource management on the demand, supply, and use of water (Gooch and Stålnacke, 2003).

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 socioenvironmental 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 socioenvironmental 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 (Thomas and Durham, 2003).

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. Values and attitudes of stakeholders towards possible restoration outcomes must be considered and incorporated at the beginning of a project, as must the economic costs and benefits, community goals, and institutional constraints related to those outcomes. A successful watershed programme in any area will have its impact on the skill development of the people as well as on their social aspects besides economic impact in terms of increase in the incomes as well as on household expenditure (Prabhakar et al, 2010).

The effects of social and economic factors on IWM have received increasing recognition in the literature (for example, Joshi and others 2004, Mansoor2008, Stinchfield 2009, Dr.Nafo 2010, Prabhakar and others 2010). These studies argue that both socioeconomic and ecological knowledge is necessary for successful IWM.

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.

Lixian (2002) has studied on pilot watersheds in China and he has published the below mentioned results in his paper ;

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 microwatersheds with established social relationships than in macrowatersheds spanning multiple villages (Kerr, 2007).

CONCLUSIONS

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 (Baloch, 2008).

Increasing populations and higher living standards will requires heavy demands on natural resources in the future. IWM approaches will be necessary to develop sustainable systems and prevent catastrophes. Much greater local, national, and international efforts, cooperation, and expenditures are needed to meet future vital requirements.

In conclusion, IWM has not only one formulation, management strategies should be formed for each watershed according to its own conditions including IWM key components (participation, sustainability etc.). IWM should be flexible enough to accomodate future changes and perspectives.

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 (Paleyan and Wacangan, 2008).
- Reviewing and developing the institutional/organizational and legislative arrangements such as decentralization of authority, interagency collaboration.

- Being adequate IWM policies/strategies
  Coordinators and analysis of the IWM must at all times inform and update through transparency the concerned stakeholders, officers, staff and concerned members in all the IWM activities.

Much greater local, national, and international efforts, cooperation, and expenditures are needed to meet future food and water requirements in sustainable, peaceful, and environmentally responsible ways(Bauver, 2000).

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