



# Watershed Management

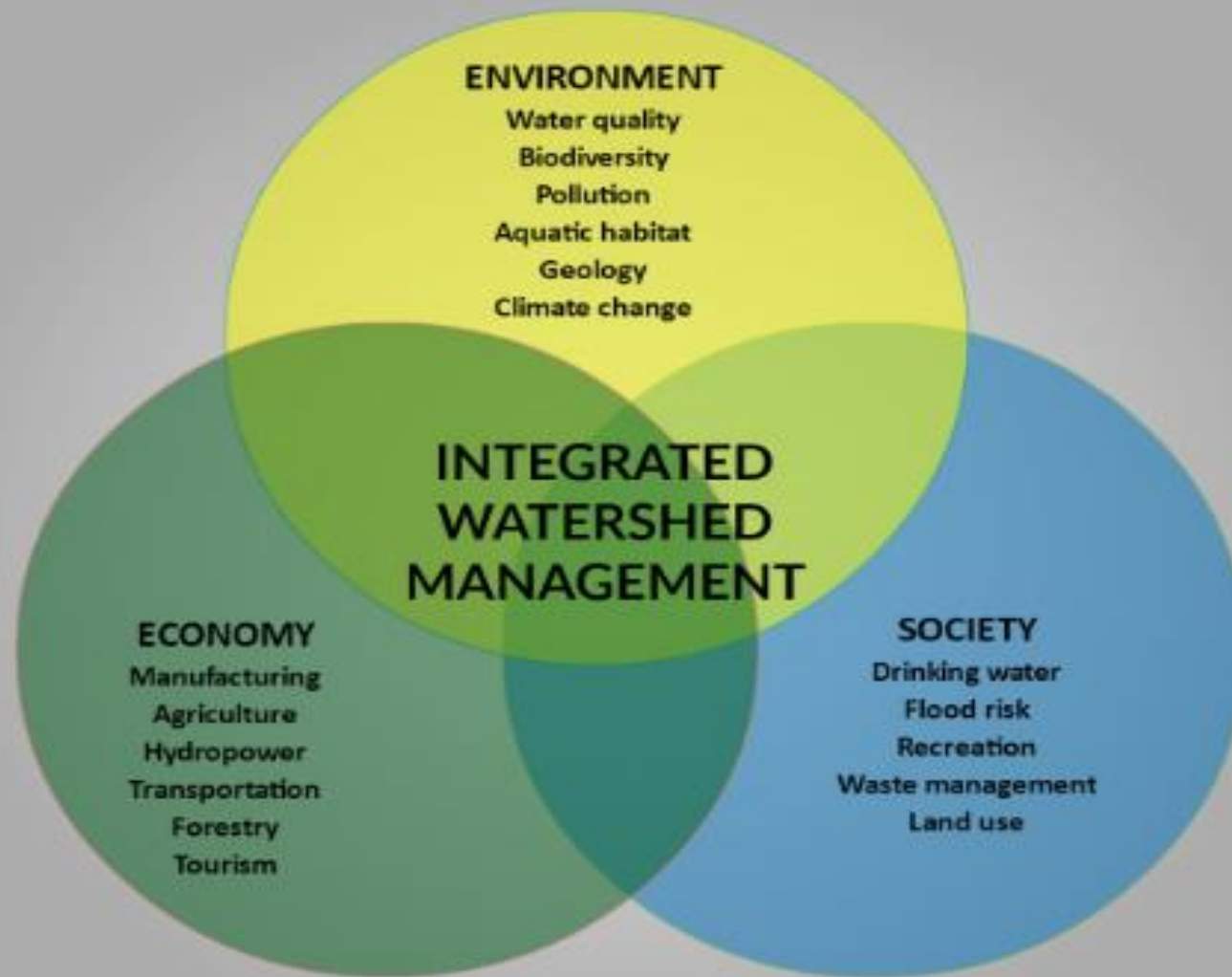
synopses of workshop papers

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# What is a Watershed Management?

Watershed management is the planning and implementation process aimed at preserving the water, soil, and plant resources of a watershed, meeting the social and economic needs of the people within the watershed, and ensuring the sustainability of the watershed ecosystem.



# Why is Watershed Management Important?



## Drought

Proper watershed management ensures sustainable use of water resources and reduces the risk of drought.



## Climate

Climate change can negatively impact water resources and watersheds. Management can help watersheds adapt to climate change.



## Drinking water

Proper watershed management ensures the protection of drinking water resources.

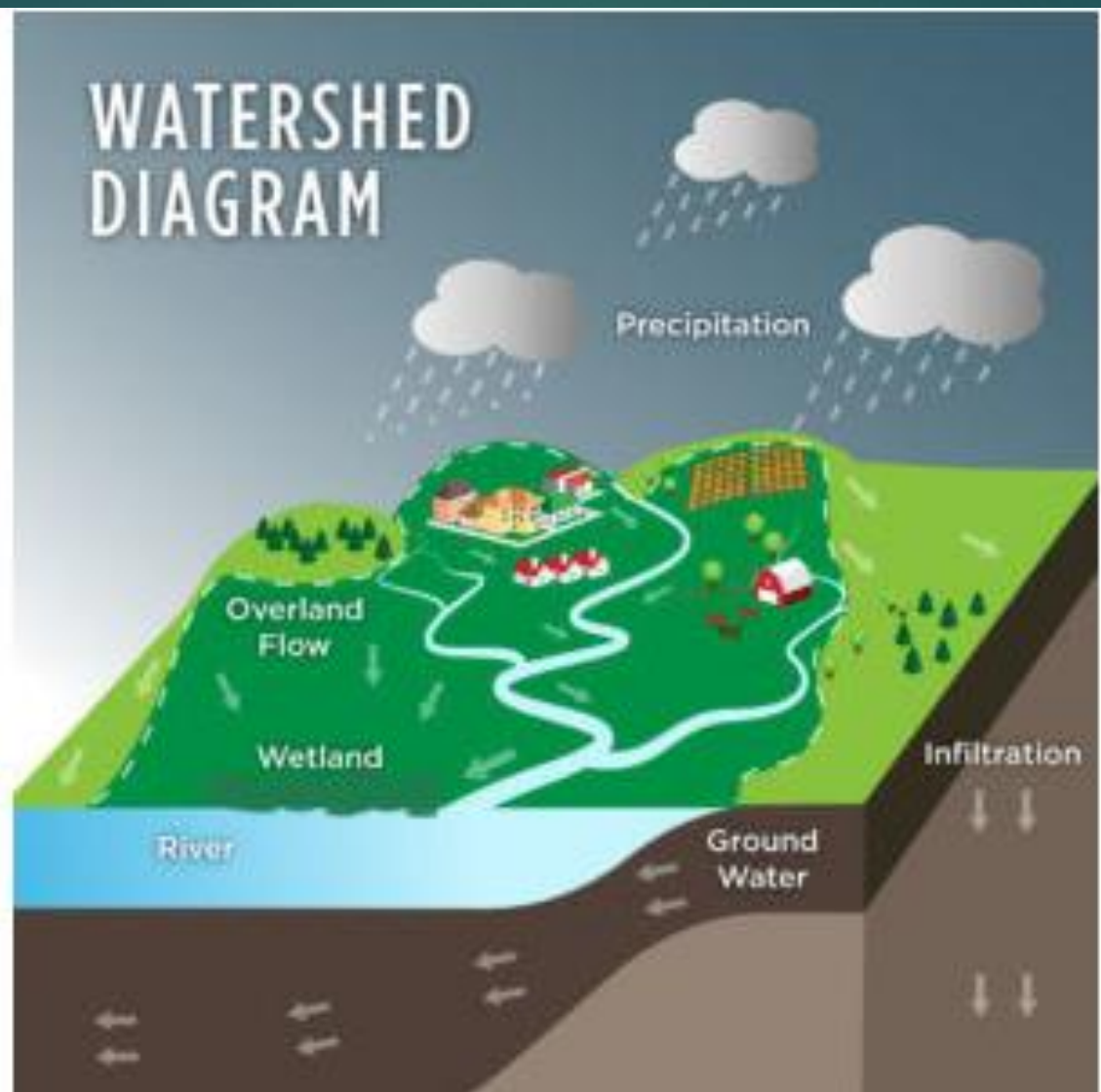
This presentation focuses on addressing the concept of watershed management, focusing on key agricultural and natural resource management issues and highlighting the importance of an integrated approach to addressing these challenges.


The main topics are:

- ▶ The Watershed as a Management Unit and a Conceptual Framework for Integrated Watershed Management
- ▶ Biophysical Principles for Integrated Watershed Management
- ▶ Economic, Behavioral, Social, and Institutional Factors in the Planning and Implementation of Integrated Watershed Management Projects



# WATERSHED DIAGRAM





Today, among the main problems faced by countries are the continuous increase of agricultural production to meet the increasing food demand, the effective management of forest and wood energy resources, the control of the risk of flood disasters in low areas as a result of excessive soil erosion caused by dams and irrigation systems, and the decrease in the productivity of high areas. There are. To overcome these challenges, the watershed is important as a management unit used in the planning and implementation stages.

Although the watershed approach is an increasingly accepted concept in Asia, it generally focuses on the upper reaches of river basins and there are limited examples of fully linking highland and lowland development. This approach has struggled in the past due to the limited political and financial appeal of many spatially and temporally dispersed management activities.




Among the solutions to these problems,

- ▶ Biophysical data are not produced in usable formats for decision makers,
- ▶ Failure to adequately evaluate the negative impacts of large development projects,
- ▶ Although the basic principles of erosion and sedimentation are known, problems such as the lack of specific data from Asia stand out.

In addition, challenges remain, such as the lack of trained personnel to support management activities and the lack of political will for multi-objective planning.





Management activities implemented in watershed-based projects can be politically and financially challenging as they often provide long-term benefits. However, interactions between natural resources, human resources, and social institutions in tropical and subtropical basins present urgent management needs. Research shows that major floods are almost inevitable and that the situation can be worsened by river silting and channelization.

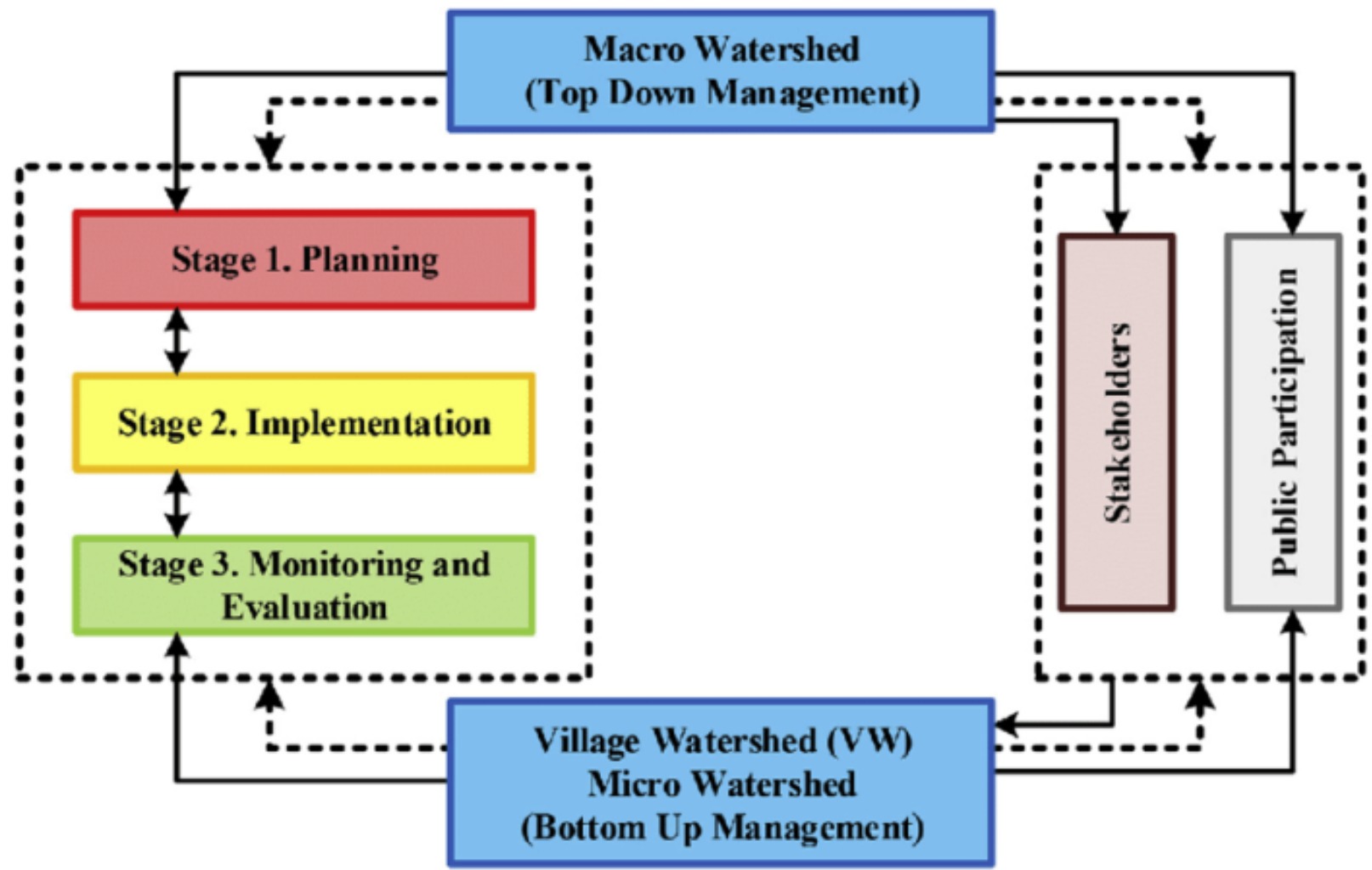
For these reasons, it is an appropriate time to launch a research and education effort. This effort should be based on learning from past experiences and knowledge, and the knowledge gained needs to be integrated into current and future programs and projects. This effort must be interdisciplinary, with methods that can bring together many disciplines. It should also take a long-term and collaborative approach.


# 1. The Watershed as a Management Unit and a Conceptual Framework for Integrated Watershed Management

Watershed management can be thought of as a sequential process of separated but linked stages, namely, planning, design, installation, operation, and maintenance.

- ▶ In addition to this linear sequence, monitoring and evaluation mechanisms provide feedback of information to allow for improvements in project planning and implementation.
- ▶ In the second element of the framework, watershed management is perceived as a planned system consisting of management actions, implementation tools, and institutional arrangements.
- ▶ The third element of the framework approaches watershed management from the standpoint of the activities and tasks that are to be planned and implemented.

These activities consist of land use assignments, on-site resource utilization and management practices, and off-site management practices.





Several criteria may be used to evaluate the appropriateness of the watershed unit.

- ▶ The kind of development envisioned especially the extent to which control or management of water resources is involved can be an important indicator.
- ▶ The watershed should also be distinguishable from other units on the basis of its providing sufficiently strong linkages among economic, social, political, and natural systems.
- ▶ The topography must allow for an adequate definition of the watershed boundaries. The institutional and organizational arrangements should either exist or be developed to support the use of a watershed as a management unit.

Finally, while the watershed has great validity for planning under many circumstances, the institutional and organizational arrangements necessary for the use of the watershed in the implementation phase of the management process are seldom in place. This creates an inherent challenge for the use of watersheds in the implementation stage. Continuous information exchange and education concerning the basic validity of the watershed as an integrating unit will always be required.

## 2. Biophysical Principles for Integrated Watershed Management

Multiple use in watershed management aims to optimize present and future benefits by efficiently utilizing both land units and specific natural resources. This concept involves managing diverse resources within a specific land unit or using a particular natural resource for various purposes. The goal is to achieve the most advantageous combination of uses in a sustainable manner.

Three overlapping options for multiple use management of watersheds are concurrent and continuous use of watershed resources; alternating, rotating, or combining resource products; and/or geographic separation of resource uses.

Despite these challenges, the multiple use framework can be used to provide watershed managers with an array of economic relationships designed to aid decisions.





## Here are some key biophysical principles for Integrated Watershed Management:

### 1. Watershed Functionality:

Understanding the natural functions of the watershed, such as water storage, filtration, and nutrient cycling. Identifying critical areas for maintaining ecological balance and ensuring the overall health of the watershed.

### 2. Land Use Planning:

Assessing and planning land use activities based on the ecological characteristics of the landscape. Integrating agricultural, forestry, and urban development with the aim of minimizing negative impacts on water quality and quantity.

### 3. Soil Conservation:

Implementing soil conservation practices to prevent erosion and maintain soil fertility. Promoting sustainable agricultural practices that reduce soil disturbance and enhance soil structure.

#### 4. Vegetative Cover:

Preserving and restoring natural vegetation cover to prevent soil erosion, regulate water flow, and maintain biodiversity.

Promoting afforestation and reforestation to enhance watershed resilience.

#### 5. Wetland Conservation:

Recognizing the importance of wetlands in water storage, flood control, and biodiversity conservation.

Protecting and restoring wetland ecosystems within the watershed.

#### 6. Biodiversity Conservation:

Protecting and enhancing biodiversity to ensure the ecological balance of the watershed.

Promoting habitat connectivity and wildlife corridors

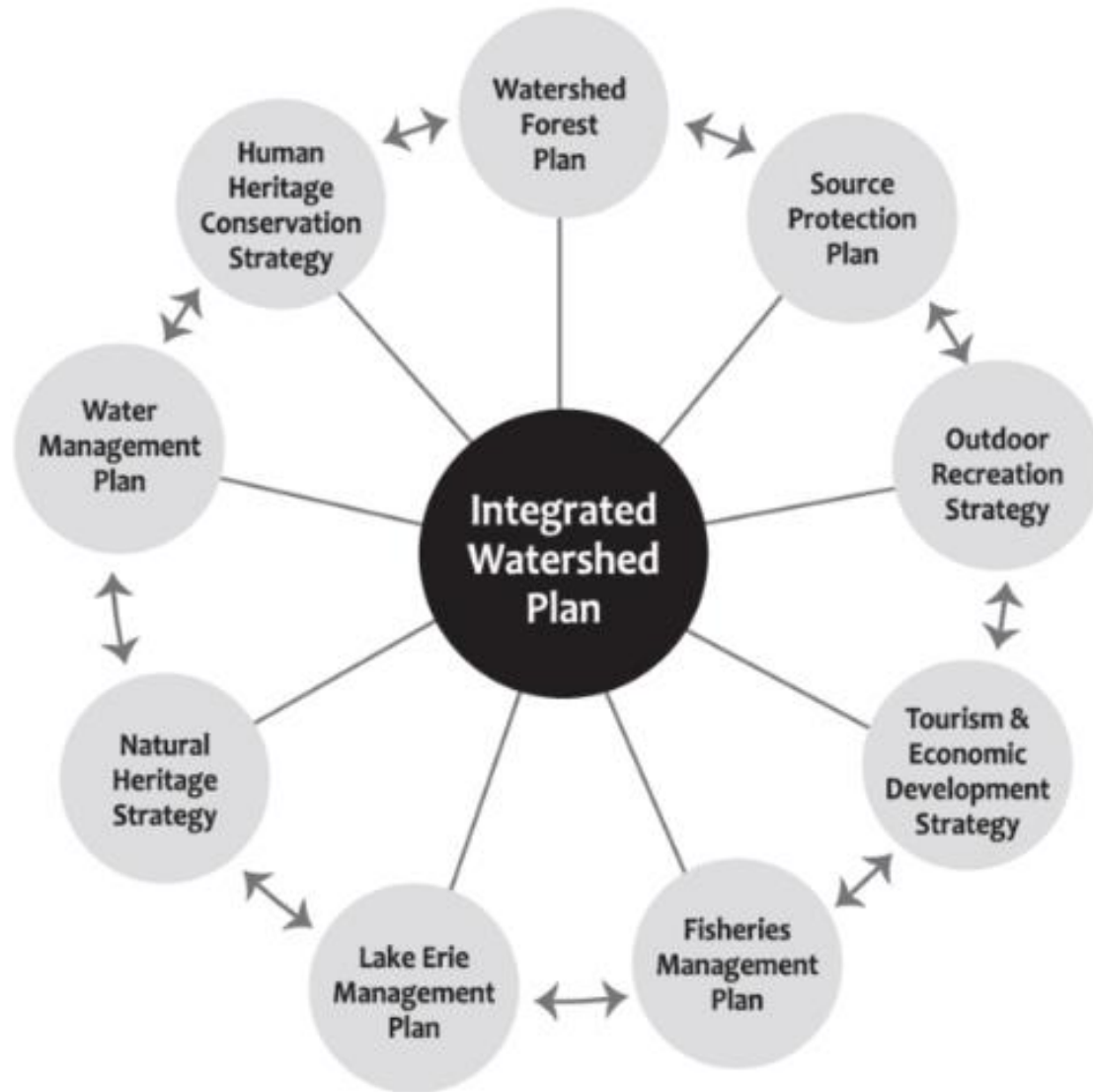
#### 7. Sustainable Agriculture:

Promoting agricultural practices that reduce the use of chemical inputs, promote agroecology, and enhance soil health.

Integrating crop and livestock management with watershed goals.

### 3. Economic, Behavioral, Social, and Institutional Factors in the Planning and Implementation of Integrated Watershed Management Projects

There is a natural logic to the watershed as an organizing unit for physical and hydrological analysis stemming from the unidirectional flow of cause and effect relationships. Likewise, there is a strong economic logic for the use of the watershed as an analytical unit. This follows from the flow of physical factors and the fact that actions in one part of the watershed can have effects on another, sometimes distant and usually downstream, part of the watershed.





▶ Natural Logic of watershed:

Physical and hydrological analyzes of the watershed are based on the unidirectional flow of cause-effect relationships. The watershed contains a natural logic, focusing on the interaction of interconnected physical factors.

▶ Economic Logic of the watershed:

The watershed, as an analytical unit, has a structure suitable for economic analysis. Economic analysis is performed by focusing on identifying and internalizing externalities.

▶ Role of Externalities:

Externalities refer to situations where the benefits or costs of an action are received or borne by individuals not involved in the action. The watershed approach provides an important tool for identifying and internalizing externalities.






▶ Economic Analysis and Evaluation:

Economic analysis of watershed projects is done within the framework of benefit-cost or project evaluation. The analysis may include costs and benefits that directly affect individuals or firms, as well as externalities that affect the well-being of society.

▶ Policy and Institutional Arrangements:

Analyses often highlight the need for policy actions and institutional arrangements to make the project financially and economically profitable. Institutions and administrative procedures should be established to encourage profits from actions taken upstream to benefit people downstream.

This type of analysis is important to develop sustainable and inclusive solutions, not only from a financial perspective, but also by considering the general well-being of society.



In conclusion, the challenges faced by countries in the region, including the imperative to enhance agricultural production, sustainable management of forest and fuelwood resources, and the control of soil erosion, underscore the critical importance of adopting a watershed approach. Although watershed-based projects encounter obstacles related to the diffuse and delayed nature of their benefits, recognizing the intricate interplay among natural resources, human capital, and social institutions is paramount. Thus, immediate attention and concerted efforts are essential to implement effective watershed management, ensuring sustainable development and resilience in the face of pressing environmental challenges.