



Watershed Management in Mediterranean



The Greek Case Study

M.A. Mimikou, NTUA Professor

Laboratory of Hydrology and Water Resources Management
School of Civil Engineering

Environmental Management in Mediterranean Regions

Mediterranean regions face similar environmental and development problems. The most important of them relate to:

- Comprehensive watershed management and water resources development
- Pollution control at a watershed scale

There are identifiable and significant differences between the Mediterranean watersheds determining the way of action. Those differences relate to the characteristics of their natural and built environment

Natural Environment

The landscape of Mediterranean watersheds is affected by the shared Mediterranean weather:

- dry conditions
- rather long summers with increased irrigation demands

However, watershed management is greatly influenced by the local availability of water resources:

- Countries of north coast (including Turkey) with temperate climate have adequate water quantities to support their needs
- Countries located on south or southeast coasts (with the exception of Egypt and the Nile river), neighboring to deserted areas, have limited water resources

Built Environment

The population trends of the Mediterranean countries exhibit two distinct dynamics:

- The north coast countries experience aging population with flat or slightly increasing growth
- The south and east coast countries have rapidly increasing young population

Financial growth also varies significantly between the Mediterranean countries:

- Approximately 90% of the total income per capita of the Mediterranean countries is produced by 5 out of the 21 countries: France, Italy, Spain, Portugal, and Greece

Natural and Built Environment are Interdependent

In each country, the viability and prosperity of the built environment is reciprocally connected to the viability and prosperity of the natural environment

Examples:

- **Extreme storm events** produce floods
 - Possibly exaggerated by natural or man-induced ecosystem destruction, the floods may endanger the **population** located close to water bodies
- **Rapid population growth** and irrational water use results to excess groundwater pumping
 - Water level declines endangering the **ecosystems**

A comprehensive Water Resources Management approach is a necessity that benefits both natural and built environment

Water Resources Management Definition

- According to Grigg (1999), Water Resources Management is the set of measures (structural and non-structural) and actions that have to be completed to satisfy water needs
- Water needs include both the ecosystem and the human requirements for water:
 - adequate water quantity and quality to support vegetation and animals
 - adequate water quantity and quality for the municipal water supply system, the irrigation networks, industry, and hydro-electric power production
- The complicated nature of Water Resources Management derives from the necessity to satisfy all above categories

Water Resources Management Objectives

Thus, Water Resources Management aims to:

- Maintain and protect the balance of existing natural water resources
- Improve the quality of degraded water resources
- Manage water demand having as criteria efficient use of resources and sufficient supply of the various sectors

All above goals have to be achieved taking into account the specific characteristics of each area:

- Environmental
- Financial
- Technical
- Social and Cultural

Tools to Support Effective Water Resources Management

- An effective management of water resources must include the ability to evaluate and adopt new technologies as well as fresh ideas
- The recent advances in science and technology have allowed the creation of new tools to support data analysis and understanding
- Basic ingredients of a modern, successful Water Resources Management strategy are the following:
 - Use of suitable software for the analysis and management of raw data
 - Creation of reliable data bases that include sufficient collection of regularly updated records
 - Application of Geographic Information Systems for the evaluation of the spatial variability of parameters

Water Resources Management in Greece

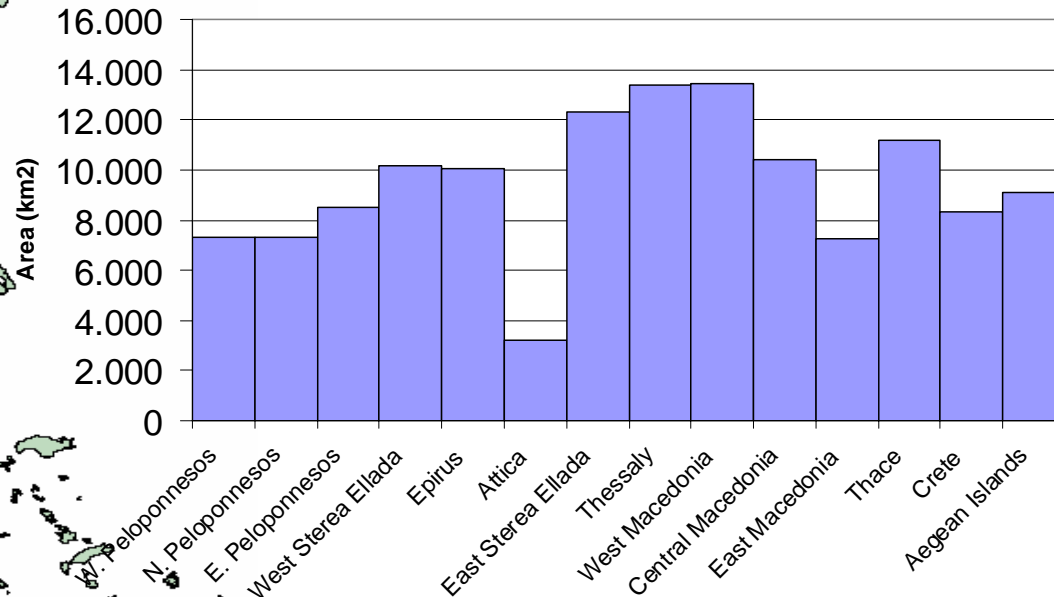
Greek geomorphology:

- Relatively small country (132000 km²), rugged landscape, long coastlines and limited continental land
 - Watershed delineation led to many smaller basins dealing with different issues and demanding different but easily adoptable managerial policies
- Law 1739/87: Divided Greece to 14 Water Districts
 - Each Water District included watersheds with similar hydrologic characteristics
- Even though such division makes sense, it still presents weaknesses:
 - Responsibilities are divided among many Competent Authorities
 - Coordination issues and issues of competitive use of water arise

The 14 Water Districts of Greece



Water Districts



Total area: 131957 km²

Largest Water District
West (Ditiki) Macedonia: 13440 km²

Smallest Water District:
Attica: 3207 km²

Important Problems Related to Water Resources Management in Greece

The following interconnected problems are distinguished:

- Lack of systematic and reliable monitoring/recording of main variables related to natural and man-made water resources systems
 - Brief and sporadic historical data sets
 - Limited current measurements of hydrometeorological variables
 - Poor records of water quality data
- Lack of appropriate data assessment methodologies
- Lack of an operational National Data Base which registers all data sets handled by different authorities
 - The National Data Bank of Hydrological and Meteorological Information (NDBHMI) created during the period 1997-2001 did solve this significant issue
 - Since 2001, NDBHMI was neither regularly maintained nor readily available to interested parties, limiting the benefits deriving from that important effort

Water Framework Directive (2000/60/EC)

The driving force for the implementation of comprehensive Water Resources and Watershed Management in EU is the introduction of the Water Framework Directive (2000/60/EC).

The new Directive

- Recognizes that water systems obey to natural and not political boundaries
- Encourages a comprehensive water management approach at a watershed scale
- Proposes the use of the river basin as the basic unit where all water related objectives would be achieved

Thus, Watershed Management in Greece should fulfill 4 major requirements of the WFD legislation

Major Steps for Effective Watershed Management in Greece

1. Define the River Basin Districts taking also into account groundwater and coastal waters. Ensure appropriate administrative arrangements for the application of rules with each River Basin District
2. Describe and analyze the characteristics related to each River Basin District, review the impact of human activities on surface water and groundwater, and evaluate the economic analysis of water use
3. Install adequate monitoring networks for a comprehensive overview of water quantity and quality within each River Basin District
4. Design comprehensive Watershed Management Plans that include all measures necessary to achieve WFD objectives

WFD Time Table of Implementation until 2010

(adopted from <http://ec.europa.eu>)

Year	Issue	Status
2000	Directive entered into force	Finished
2003	Transposition in national legislation/ Identification of River Basin Districts and Authorities	Finished (Article 3 reports)
2004	Characterization of river basin: pressures, impacts, and economic analysis	Finished (Article 5 reports)
2006	Establishment of monitoring network/ Start public consultation	Under development
2008	Present draft river basin management plan	
2009	Finalize river basin management plan including program of measures	
2010	Introduce pricing policies	

Law 3199/2003

- For the implementation of the transposition of Water Framework Directive to the National Legislation, Law 3199/2003 was voted by the Greek Parliament
- In this law, among others, a Central Water Authority under the auspices of the Ministry of Environment and Public Works is envisioned
- The Central Water Authority is now under operation with a main task to implement WFD

Conclusions:

Effective Watershed Management

An effective Watershed Management strategy should :

- Encourage design and realization of plans through a dynamic process capable of adopting to continuously changing conditions (environmental, climatic)
- Support balance between competitive water uses through an efficient allocation plan that includes financial measures, environmental benefits and costs as well as social values

Essential components for designing and applying successful Water Resources Management strategies are human resources and scientific support

Conclusions: Watershed Management in Mediterranean and Greece

- The Mediterranean countries may share several common climatic and regional characteristics but also present significant social, cultural, financial, and development differences
- Their individual similarities and differences dictate the adoption of different watershed management policies
- The comprehensive Watershed Management Strategy in Greece is planned through the application of Water Framework Directive to local characteristics, demands, and pressures. It is a very difficult task given the serious problems of all water sectors in Greece