ENVIRONMENTAL AND HUMAN SECURITY IN THE MEDITERRANEAN

New Threats and Policy for Reducing Vulnerability

J. GANOULIS
Department of Civil Engineering
Aristotle University of Thessaloniki
Greece

Abstract Heading

The terms environmental and human security and vulnerability are defined in this paper in a broad sense. Human security is directly related to environmental preservation (water, air, soil, ecosystems, and biodiversity). Environmental and human security have been recognised as key factors for socio-economic growth and prosperity and sustainable development. Regulation and policy to sustain environmental and human security in European Union (EU) countries, and more specifically in the Mediterranean region, are briefly reviewed in this presentation. Examples from environmental sectors like water resources may include the EU Water Framework Directive (EU-WFD) and institutional issues for facing water quality degradation and hydrological extremes such as floods.

1. Introduction

Nowadays the concept of *human security* may be extended from its traditional meaning of local, state, regional, and worldwide civil and military security of citizens to also embrace the idea that every human being should be able to benefit from sustainable socio-economic development. This paradigm shift is indicated schematically in Figure 1.

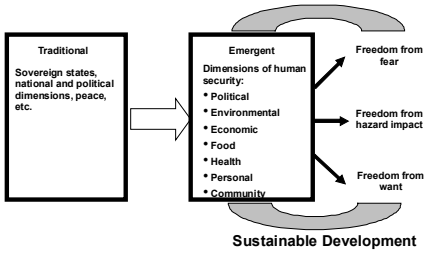

Figure 1: The paradigm shift for the concept of human security [9].

I. Linkov, G. Kiker, R. Wenning (eds.) Environmental Security in Harbors and Coastal Areas, 1-11. © 2007 *Springer. Printed in the Netherlands.*

Environmental security has been recognised as the key factor for social security, economic growth, and prosperity. Human security can therefore be seen to be related to environmental preservation (water, air, soil, ecosystems, and biodiversity) and to socio-economic stability and sustainable development. The concept of sustainable development and integrated management of environmental resources was first mentioned in Stockholm in 1972, during the United Nations World Conference, and then at the Rio Summit in 1992 with Agenda 21.

The term *vulnerability*—as applied to humans, ecosystems, or any environmental system—denotes the susceptibility of the system to be damaged under risk. It may be considered a performance index of the system, indicating the possible degree of a system's damage or the severity of consequences, due to an incident such as a flood or a drought [4, 5].

Regulation and policy to sustain environmental and human security in EU countries are briefly reviewed in this presentation. Examples from environmental sectors like water resources may include the EU-WFD [2] and institutional issues for facing hydrological extremes such as floods.

Examples of recent floods and environmental incidents in Central and Southern Europe and elsewhere [3] illustrate that residual vulnerabilities and risks are always present and that an integrated risk-based management framework is needed in order to prevent and alleviate negative consequences to human society and the environment.

2. Main Threats to Environmental Security in the Mediterranean

The Mediterranean region is facing demographic, social, cultural, economic, and environmental changes. In the last four decades, rapid increase of population, ambitious agricultural policies in several countries, increase of economic activities, as well as unplanned utilisation and mismanagement, have all led to natural resources being extensively depleted and even overexploited in many parts of the region. With withdrawal exceeding the internally renewable water resources, the resulting water scarcity is rapidly becoming a major concern in most countries of the Mediterranean. The varying climate in the north, south, and east of the region creates different conditions for water resources availability. Water resources are relatively plentiful in the countries in the north and scarce in the south and east. Thus today, of the 420 million Mediterranean people (United Nations estimate) more than 160 million live in countries with less than 1,000 m^3 water/year per inhabitant (annual average). Of these 160 million persons, 30 million in the Palestinian Territories, Israel, Jordan, Libya, Malta, and Tunisia live below the line of absolute water-poverty of 500 m^3/year per inhabitant [1 , 6]. See Figure 2.

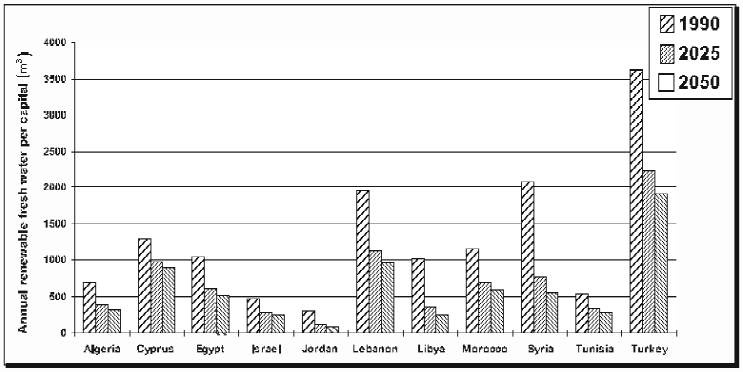

Figure 2: Available fresh water per capita in southern Mediterranean countries, 1990-2050 [10][1].

In addition to their overexploitation, water resources in the region are being threatened and polluted by numerous point and nonpoint sources of pollution generated from anthropogenic activities, such as agricultural (e.g., saline and contaminated irrigation return flows with pesticides or fertilisers), industrial (e.g., discharge of hazardous and toxic industrial wastes, underground storage tanks, or surface and deep disposal of oil and gas brines), and domestic activities (e.g., discharge of inadequately treated domestic wastewater or municipal landfills).

2.1. AGRICULTURE

Agriculture is by far the most important water use activity in the Mediterranean region, and is also probably the least efficient sector in water use. Agricultural activities not only threaten the availability (quantity) but also the quality of groundwater due to the extensive use of fertilisers, pesticides and release of olive-oil-mill wastes (Figure 3).

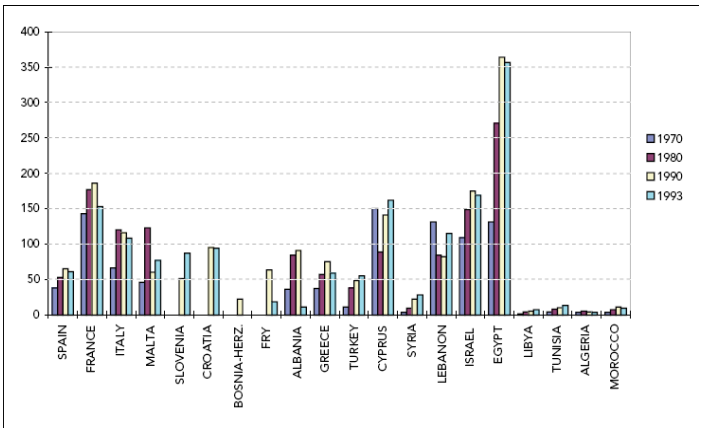

Figure 3: Fertilizer consumption in the Mediterranean countries from 1987-1993 (kg/ha) [12].

[1] 1700 m^3 = periodic water stress; 1000 m^3 = chronic water stress; 500 m^3 = absolute water stress.

In spite of the rapid expansion of irrigated areas, irrigation and drainage have undergone little technological change over this period. Most irrigation systems in the Mediterranean countries perform far below their potential, mainly as a result of inadequate technologies, management practices and policies.

Average losses of irrigation water in the Mediterranean are extremely high (55%), and they are divided between farm distribution (15%), field application (25%), and irrigation system losses (15%). Only about 45% of water diverted or extracted for irrigation actually reaches the crops. Losses vary widely, with those from the conveyance system varying between 5 and 50%.

Such low levels of efficiency in agricultural water use and the unsatisfactory features of irrigated agriculture in the region are undoubtedly the result of water resource mismanagement.

2.2. URBANISATION

The resident population of the riparian states of the Mediterranean was 246 million in 1960 and is currently about 420 million. 'Blue Plan' estimates that depending on the development scenarios applied, this figure will rise to 520-570 million in the year 2030, is expected to reach approximately 600 million in the year 2050, and possibly as much as 700 million at the end of the 21st century. The average annual population growth rate in the southern countries of the Mediterranean is estimated at 3% (Figure 4).

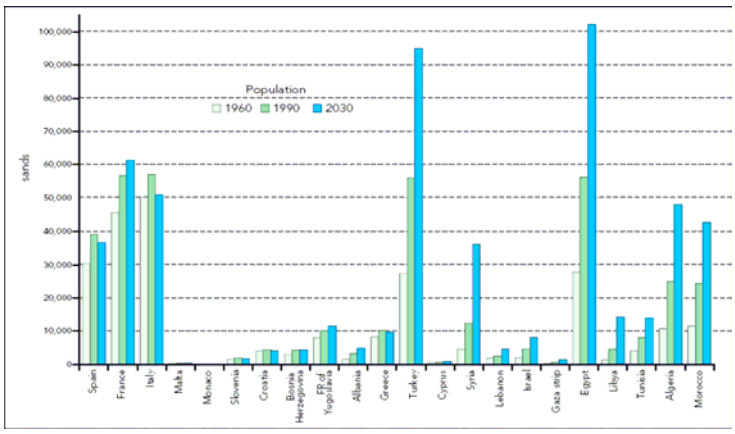

Figure 4: Population increase in the different Mediterranean countries [11].

2.3. TOURISM

The attractive climate and the historical and archaeological significance of the area make the Mediterranean countries the greatest tourist destination in the world, with 176 million visits in1996 increasing at a rate of 2-3% per year, expected to be 250-275 million by the year 2010 and 290-355 million in the year 2025.

Tourism activity peaks in summer, coinciding with the time when natural water availability is at its lowest.

In certain areas and at certain times of the year the population can increase two, three, or even 10 or more times. This increase in population brings about a peak in water demand for domestic use.

Growing demand for drinking water in the localities that receive visitors is not the only effect of tourism. Tourism also involves services and leisure activities that use water extensively, resulting in the construction of huge distribution and purification facilities.

2.4. INDUSTRY

There is a large range of different industrial activities (from mining to manufactured products) scattered all around the Mediterranean basin, and a number of hotspots are concentrated mainly in the north, where there are heavy industrial complexes. Discharges of contaminants from these industries pose a threat to water resources, especially in the area of the hotspots.

The impacts of industry on water resources can be direct or indirect. Direct impacts deriving from industrial effluents involve pollution problems at the site level that contribute to the creation of hotspots. Indirect impacts are related to the location of industries, ultimately leading to a concentration of activities and urban development in the specific regions.

3. EU Environmental Regulation and the Water Framework Directive

EU environmental regulation aims at coordinating different measures taken at Community level to tackle particular environmental problems in order to meet established objectives. Key examples of such regulation are the Urban Waste Water Treatment Directive, the Nitrates Directive and the Integrated Pollution Prevention and Control Directive.

In 2000, the EU issued the Water Framework Directive (WFD) in order to ensure an analysis of the state of water bodies and "a review of the impact of human activity on the status of surface waters and on groundwater." The analysis and review are to be conducted so as to determine how far from the objectives each body of water is [2].

The purpose of the WFD is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which:

1. Prevents further deterioration and protects and enhances the status of aquatic ecosystems.
2. Promotes sustainable water use based on a long-term protection of available water resources.
3. Aims at enhanced protection and improvement of the aquatic environment.
4. Ensures the progressive reduction of pollution of groundwater and prevents its further pollution.
5. Contributes to mitigating the effects of floods and droughts.

Key elements of the WFD include:

1. Technical considerations: monitoring, river basin planning, and management
2. Institutional: adopt the river basin as a single system for water management
3. Environmental: water quality and ecosystems
4. Water economics
5. Public participation

3.1. MONITORING

For many years there have been two different approaches dividing European water quality monitoring practice:

- Control pollution sources through the application of available technologies
- Focus on quality status of receiving environment

There are potential shortcomings when only one of these approaches is applied. Source controls do not take into account the cumulative toxic effects of contaminants from a number of different sources of pollution. The diffuse impacts cannot be estimated. Quality standards applied to water bodies can underestimate the effects of particular substances on the ecosystem, due to lack of scientific knowledge regarding the final outcome of substances in the environment. This approach may also lead to gradual degradation of a water body, if its initial state was better than standard.

3.2. RIVER BASIN PLANNING AND MANAGEMENT

The WFD requires that River Basin Management Plans (RBMPs) are produced for each River Basin District (RBD) by 2009. These will be strategic management documents, developed via the river basin planning process, which will integrate the management of the water and land environment.

Preparation will involve a process of analysis, monitoring, objective setting and consideration of the measures to maintain or improve water status. RBMPs will have a number of functions, but are primarily intended to:

- Establish a strategic plan for the long-term management of the RBD.
- Set out objectives for water bodies and state in broad terms what measures are planned to meet these objectives.
- Act as the main reporting mechanism to the European Commission.

3.3. RIVER BASIN DISTRICTS

Integrated water management within the WFD is based on RBDs. For each RBD there is a statutory requirement to produce and regularly review a RBMP. When the RBMPs

have been produced, the river basins should be mapped and the quality of the water assessed.

3.4. ENVIRONMENTAL

Under the WFD, environmental monitoring programmes are required and specific objectives for water quality are set up. The WFD operates using a cyclical management process. This process begins by identifying water bodies in each RBD and describing their natural characteristics. The second stage is to assess the pressures and impacts on the water environment. This assessment identifies those water bodies that are unlikely to achieve the environmental objectives set out in the Directive by 2015. This process is known as river basin characterisation.

3.5. WATER ECONOMICS

The Directive calls for the application of economic principles (e.g., the recovery of the costs of water services and the polluter pays principle), approaches, and tools (e.g., cost effectiveness analysis), and for the consideration of economic instruments (e.g., water pricing) for achieving its environmental objective in the most effective manner i.e., good water status for all waters. Although the different elements of the economic analysis appear in various parts of the WFD text, these should be well integrated in the policy decision and management cycle in order to aid decision making.

3.6. PUBLIC PARTICIPATION

The WFD recognises the value and importance of involving all those with an interest in the water and land environment in how the WFD is put into practice. In certain areas (e.g., the development of RBMPs), stakeholder involvement is an inherent part of the Directive. In order to develop a coherent and consistent approach to information provision and consultation involvement it is important to provide:

- A framework for stakeholder engagement
- A communication strategy on how to engage the public
- A platform for consultation and involvement

4. Flood Management

Integrated flood risk management (IFRM) can mean very different things according to different approaches such as engineering, social or institutional. It is recommended that IFRM be defined as a multidimensional and multidisciplinary activity, which takes into account technical, institutional, economic, social, and environmental aspects of flood assessment, prevention, mitigation, and control, while promoting a more holistic view of the whole spectrum of human security and vulnerability under risk of flooding. With IFRM, the river basin is considered as a whole, with downstream/upstream solidarity. As part of integrated water management, IFRM contributes to rationalisation of the use of river basin capacities and unifies the social, economical, hydrological, and environmental points of view in a global perspective. These considerations imply good

communication and coordination between all the river basins' actors, perfect transparency, and dissemination of information to all the stakeholders, as well as public participation. The main objectives of IFRM are:

- Protection of human implantations and interests: reduction of flood damages to "acceptable" levels ensure the sustainability of human settlements and activities.
- Restoration of fluvial law, ecosystems, and water cycle: besides the pure environmental aspect, natural mechanisms and cycle rehabilitation are also guarantees of sustainability for human societies. They contribute to flood mitigation and to providing healthy drinking water.
- Promotion of risk culture: it should be understood that total protection is a myth, so that preventive measures can be seen to be necessary. This is a switch from dominating the risk to living with it.
- Promotion of basin wide solidarity and actions: mobilisation of all stakeholders (water agencies, municipalities, inhabitants, companies), and impact studies for any initiatives.
- Preparation against extreme events partly due to climate change: a very long-term validity of IFRM actions is expected, even if climate change amplifies flood (and drought) scales.

In order to meet these objectives, a framework for IFRM (Figure 5) was proposed by Plate and Merz [8], among others. In contrast to other natural hazards like earthquakes, in IFRM it is possible to independently control both the load that is represented by the flood and the resistance of the endangered assets.

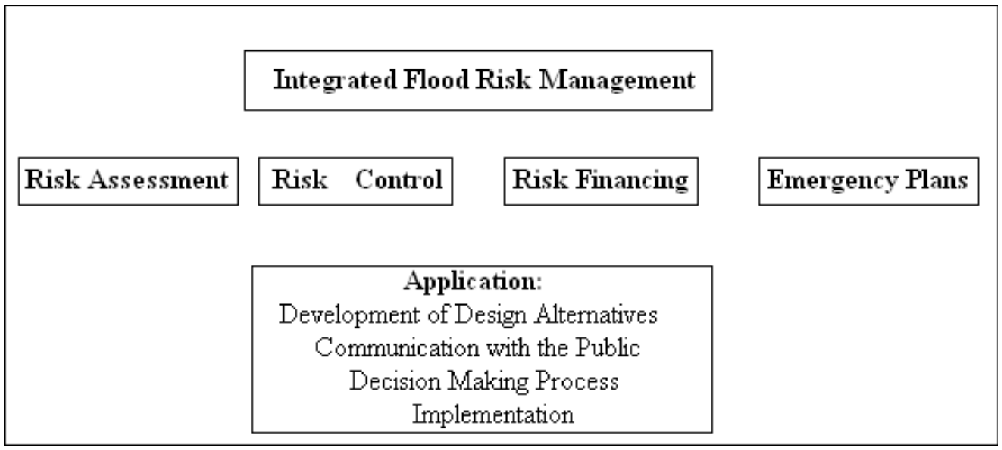

Figure 5: Main elements of integrated flood management.

The four main elements shown in Figure 5 and described by Nachtnebel [2003] are:

1. Risk assessment, which includes the analysis of various failure modes together with the evaluation of the consequences in case of a given failure.

2. Risk control, which includes risk prevention and risk mitigation measures. The first term refers to actions (either structural or nonstructural) to reduce the failure probability by reducing the flood peak. Nonstructural measures may include preservation of inundation areas, increase of infiltration rates by appropriate land use, and establishing river corridors by buying land along the river banks. Structural and nonstructural mitigation measures, have to be considered and aim to reduce the vulnerability of the system by imposing regulations on land use and land development and enforcing technical regulations for any construction works in floodplains.
3. Risk financing has two aspects: risk acceptance by the people concerned and the transferal of risk to a broader community, either by agreements within different groups of the society or by an insurance mechanism.
4. Emergency plans. Due to the fact that some uncertainty will always remain in the system about the time and magnitude of an extreme event, precautionary measures have to be developed to be prepared for emergencies. These include the development of information systems, warning systems in case of emergency, evacuation plans, and response actions to efficiently avoid secondary losses.

The elements described above are mainly elaborated at the expert level, but the involvement of the public concerned is also needed; otherwise the measures will not be implemented or will not work in case of emergency. Public involvement in the selection of alternative strategies and in the communication of risk is indispensable.

5. Conclusions

The Mediterranean region currently faces many socio-economic and environmental challenges due to various demographic, agricultural, industrial, climatic, and flood-related pressures. In order to deal with these challenges and risks, it is important to implement a consistent system of regulation and develop regional cooperation frameworks between riparian countries.

In this perspective, the EU environmental regulation is a very useful tool. It provides an integrated framework in order to take into account technical, environmental, institutional, economic, and public participation issues for protecting both water surface and groundwater resources.

Integration of all these dimensions is essential in order to ensure human and environmental security in the region.

6. References

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