Chapter 6
Environmental Vulnerability to Climate Change in Mediterranean Basin:
Socio-Ecological Interactions between North and South

Ahmed Karmaoui
Independent Researcher, Morocco

ABSTRACT

The Mediterranean basin (MB) connects the south with the north and the East (Europe, Africa & Asia). It is a highly heterogeneous region where natural and anthropogenic activities interact in complex ways with climate variability. Climate change (CC) impacts are already defined on the Mediterranean. That is why the time has come to formulate a long-term plan for adaptation to CC of the MB. In this chapter the author aims (i) the assessment of the environmental vulnerability under CC provided in the BM during the last 30 years, (ii) the determination of environmental vulnerability indicators that the author call Major Common Indicators (MCI), and (iii) identification of adaptation strategies based on these indicators. For this analysis the author used the results of the Environmental Vulnerability Index (EVI), developed by SOPAC. In this paper, the author extracted, compiled, compared and analyzed the data of the EVI of 8 selected Mediterranean countries; 4 countries in North Africa (Morocco, Algeria, Tunisia and Egypt) and 4 Southern Europe (Spain, France, Italy and Greece).

INTRODUCTION

This chapter highlights how climate change, coupled with the socio-economic conditions, can amplify vulnerability in the developed and developing countries. It is an attempt to identify and better understand the range of factors that affect the environmental vulnerability to climate change, and make the link between population trends and environmental health. Globally, the Mediterranean basin is a concrete example where the effect of climate change is quite obvious. This region is a popular tourist destination because is rich in both natural resources and cultures. The

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Mediterranean Sea connects three continents: Europe, Africa and Asia. It is recognized as one of the most sensitive to climate change (CC), with occurring impacts close to environmental limits. The resilience of the ecosystems and biodiversity facing occurring and future CC impacts is reduced due to ever-increasing anthropogenic pressures (UNEP-MAP RAC/SPA, 2009). The Intergovernmental Panel on Climate Change (IPCC) employs a concept of vulnerability that characterises the effects of climate stresses for coupled socio-ecological systems in a transdisciplinary way (Parry, 2007). The IPCC concept defines vulnerability as the susceptibility of a system to be harmed by climate variability and change including its exposure, sensitivity and ability to cope with or adapt to adverse effects (Sietz, 2011). While after Jäger *et al.* (2007), vulnerability is defined as encompassing the effects of natural and anthropogenic stimuli impacting upon ecosystem functioning and human well-being. Otherwise, regional environmental vulnerability assessment still remains a great challenge (Boughton et al., 1999). Wang, (2008) reports also in this context that studies addressing regional environmental vulnerability evaluations are limited.

The vulnerability assessment is the first step in any sustainable policy to address the variability and CC (Messouli, 2013). But this vulnerability assessment requires the use of indicators and indices to standardize more information to give a comprehensive and integrated view of the state of the environment. The Vulnerability or the potential for harm can be assessed as a function of exposure to change, ecosystem sensitivity and the adaptive capacity of both people and biodiversity (UNEP WCMC, 2003). In this context, the environmental vulnerability index (EVI) for 8 selected countries in the Mediterranean basin was studied (4 African countries: Morocco, Algeria, Tunisia and Egypt and 4 the European countries: Spain, France, Italy and Greece). The EVI is a numerical index that reflects the status of a country environmental vulnerability. This EVI is among the first tools developed to focus environmental management at the same scales that environmentally-significant decisions are made, and focus them on outcomes at the scale of entire countries (EVI, 2003). Vulnerability has received international recognition as an issue of central concern to the sustainable development of countries (EVI, 2003). The factors affecting the degree of vulnerability can include remoteness, transboundary issues, geographic dispersion, natural disasters, a high degree of economic openness, small internal markets and a limited or damaged natural resource base (EVI, 2003). The EVI is based on 50 indicators of environmental vulnerability. Each indicator is rated on a scale of 1–7, with 7 being the most vulnerable and 1 being the least. The EVI focuses on the vulnerability of the environment to natural risks and to human mismanagement, including the effects on the physical and biological aspects of the ecosystems, diversity, populations and organisms, communities, and species (UNEP, 2001). It was also decided that vulnerability indices should be simple to build and based on indicators that are easy to comprehend, intuitively meaningful, and suitable for inter-country comparisons that reflect the relative vulnerability of countries (Pratt, 2000). By using the average values obtained from the vulnerability indicators of the EVI index, we will identify common vulnerability indicators of the Mediterranean selected countries and use the appellation "Major Common Indicators", for all indicators having a score equal or higher than 5 and are common between the 8 selected countries. The objectives of this chapter are defined as follows:

- Assessment of the environmental vulnerability related to impacts of climate change and anthropogenic pressure in order to develop plans and programs of measures;
- Comparison of environmental vulnerability for the selected Mediterranean countries and;