

Adaptation strategies for improved flood management in the Mediterranean

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Summary

Floods are the most common type of natural hazard in the Mediterranean region, after the earthquakes: in only the last decades, all the Mediterranean countries had to defend themselves from some massive flood and its associated catastrophic effects.

Two main categories of flood may be distinguished in the Mediterranean area, according to the present climatic conditions and its catchments characteristics. The amount and types of damages are clearly influenced by these factors. When a flood occurs within a great river basin, affecting large sectors of alluvial plain, huge economic damages are expected for buildings and infrastructures. Nevertheless, frequently there is enough time to limit the loss of human lives. On the other hand, when a flood is triggered by an intense rainfall over small catchments in arid regions ("flashfloods"), the main cost is in terms of human lives, basically because its quickness does not allow alert procedures.

In the last years, the economic and social impacts of floods are growing due to the increasing urbanization. In terms of flood risk, urbanization is amplifying enormously the vulnerability and causes also a tremendous change in the rainfall-runoff relations.

Flood management concerns any human activity to prevent loss of lives, properties and production after a flood disaster. The level of protection selected is frequently based on costs, willingness of the community, potential damage, environmental impact, and other factors. Sometimes, communities choose a lower level of protection because of the initial financial cost. Structural measures such as dams, reservoirs, channels and catchments modifications, levee-banks, if wisely applied, can greatly reduce the impact of flooding. However, structural measures can be very expensive and disruptive to the environment. Non-structural measures are any procedures altering the exposure of lives and properties to floods, such as flood forecasting and warning, flood insurance, planning controls, public information and education. These measures do not avoid the occurrence and the effects of floods, but are aimed at limiting their social and economic costs.

An overview of the policies adopted by national countries in the Mediterranean area shows that these are based on the integration of specific measures for flood prevention and measures for flood management during the emergency. However, there is not an univocal strategy to mitigate the flood risk, due to the different types of floods that induce different impacts on people and land. For this reason, in national programs against flash floods, emergency responses must have a preferential role, while longer-term preparedness must be planned in large alluvial plains in order to prevent high economic damages.

Concerning land use management, a basic point is the development of River Basin Plans (RBP) for all river basins. These plans must be elaborated at the river basin scale because each structural measure induces some changes in the river hydrology and, as a consequence, in the magnitude of erosion and sedimentary processes. Unfortunately, the elaboration of RBP needs a long period of time, while land use is in fast evolution often without an institutional control due to the distribution of tasks and responsibilities among a complex hierarchy of national and local administrations.

Referring to the project management of structural works, data inputs used in flood risk analyses for the elaboration of forecasting models are often not realistic: for example rainfall data could not clarify the occurrence of an extreme rainfall event in a small catchment. Moreover,

sometimes the need to mitigate the effects of a flood disaster may require a political decision to realize some structures without enough time for a correct project management, inducing remarkable environmental problems. Moreover, it is obvious that maintenance programs for each infrastructure are needed to guarantee its functioning for a long time. Unfortunately, the lack of maintenance increased in the last decades due to the decline of agriculture mainly in mountainous areas.

Regarding non structural measures focusing on saving people before the occurrence of a catastrophic flood, all the Mediterranean countries have a specific legislation concerning emergency plans for flood disasters. In the last years, national surveys for the civil protection are improving these plans due to a significant contribution from new technologies (including mass-media, internet, etc.). However, the success of alert messages is still uncertain now, as suggested by the main flood events that occurred during the last years.

International co-operation in the Mediterranean area includes a large amount of programs and initiatives concerning long-term preparedness and emergency mitigation. Integrated water management programs for sustainable development are providing crucial tools to identify the urgent action to be undertaken at the river basin scale in relation to water as a resource to preserve, but also as a potential factor for triggering floods. The information exchange of hydrologic data between different countries is fundamental as well as the transfer of technologies. However, it is important to highlight that a flood management model reliable for a country is not necessary suitable for all, and the transfer of measures and policies needs always a careful political and technical evaluation.

Multilateral agreements for mutual help during and immediately after a flood disaster are also very important tools. International research projects on flood risk analyses and mitigation are also very interesting and valid, but probably could provide better results if connected directly with the real national strategies against floods.

A long-term perspective of flood management must consider also the variability of flood hazard in terms of magnitude and return periods induced by climate change. In fact, although the influence of human activities on climate change is still an open debate, there is no doubt on the effects of climate change in altering the precipitation patterns in terms of distribution, intensity and duration of extreme rainfall events and a higher frequency of strong precipitation.

Regarding the Mediterranean area, climate change may have particularly serious consequences in some areas threatened by desertification. For these areas, increasing rainfall during winter and spring may lead to some extreme events. As a consequence, torrential rain also in short time may trigger dangerous flash floods.

Mitigation action to stabilize atmospheric concentrations of greenhouse gases at lower levels would generate greater benefits in terms of less damage. Adaptation is a necessary strategy at all scales to complement mitigation actions to lessen climate change impacts. However, adaptation would entail costs and cannot prevent all damages.

Over the years, a wide range of adaptive techniques has been developed, largely in response to local needs. The optimum extent of adaptation can be characterized in terms of the benefits and costs of adaptation. The optimum level of adaptation minimizes the combined costs of adaptation and residual negative effects, with the most cost-effective steps taken first.

Broad distinctions can be drawn among “supply-side” and “demand-side” adaptive techniques. Examples of supply-side adaptations include increasing flood defenses, building weirs and locks to manage water levels for navigation, and modifying or extending infrastructure to collect and supply water to consumers. Demand-side techniques include water demand management, changing water allocations and land-use controls. In order to reduce the effect of climate change as soon as possible, long-term adaptation strategies should be joined with least regret, low-cost, immediate measures.

Adaptation strategies taking into account climate change can reduce its adverse effects and often produce immediate benefits but they cannot prevent all damages (IPCC, 2001). Moreover, it is important to highlight that some changes in the climate system (i.e. melting of ice sheets) are actually irreversible over a period of many human generations.