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## **An Ecosystem-Based Mitigation Model for vulnerable settlement systems: the experience of Venice (Italy) in addressing the risk of flood disasters**

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Urbanization and climate change affect the balance of coastal ecosystems, determining impacts on social, economic and environmental dimensions of their waterfronts. Coastal cities use the criticalities deriving by flood phenomena as an opportunity to renew the models for mitigating environmental impacts. Italian coastal cities are examples of waterfronts widely impacted by floods, such as Venice. These waterfronts are characterized by consolidated ecosystems with a dominant identity, thus reinterpreting their flooding mitigation models can be useful in addressing the risk of flood disasters. This paper presents and discusses the flood mitigation strategy implemented in Venice, based on transforming and integrating advanced technology with nature-based solutions, as well as requirements and community needs. The advantages and limitations for protecting local communities and the environment with this approach, its cost-effectiveness and its contribution to enhance resilience are also discussed.

Venice integrates an anti-flooding technological solution called Electromechanical experimental module (MOSE), with its historical lagoon ecosystem, as part of the UNESCO Management Plan "Venice and its Lagoon". MOSE is a system of independent mobile sluice gates, hinged at the bottom and actuated by the floating variation integrated with nature-based coastal reinforcement practices based on environmental elements in complementary operation with the technological solution. The natural and morphological restoration of the lagoon, in fact, represents the first part of an integrated plan for the protection and sanitation of the coastal habitat. This solution indicates the ways in which the needs expressed by the inhabitants can affect the solutions already implemented in place by the technicians and the administration, determining new criteria and tools for mitigation factors such as tangible compatibility and intangible adaptivity.

In order to integrate a non-human (nature and technology) and human (actors) factors, the operation of the technological solution is based on an Actor-Network Theory (ANT) approach. On the one hand, the research acts in the multi-scalar horizon analyzing the actions governed by multidimensional approaches in order to strengthen coastal relational systems. On the other hand, it studies the experimental solutions, reflecting on the need to rethink the nature based solutions in a way that it integrates the socio-ecological interactions associated to vulnerable systems. An Ecosystem-Based Mitigation Model for coastal cities investigates climate mitigation solutions to support decision-making. The model includes the socio-economic and environmental requirements, deriving from the community needs examined, in order to improve the carrying

capacity of an ecosystem by considering a sustainable vision. The example of Venice can be used in addressing the risk of flooding in other coastal cities.

Keyword: nature-based solutions, coastal ecosystems, flood mitigation, anti-flooding technology.