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INTEGRATED GOVERNANCE FOR FLASH FLOOD PREVENTION AND RESILIENCE IN THE MEDITERRANEAN: THE LOCALL4FLOOD PROJECT

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Introduction: Flash floods are a significant hazard in the small river catchments of the Mediterranean region, with their frequency and intensity increasing due to climate change. These events cause substantial human and material damage. However, many current initiatives to address flash floods rely on top-down approaches prioritising high-level experts, thus neglecting the knowledge and experience of local actors. Such initiatives also lack multi-stakeholder engagement and as a result, often treat prevention, adaptation, and mitigation actions in isolation.

Background: Flash floods are characterized by a rapid and significant increase in water level or discharge in specific areas, often in response to torrential rains that occur over a short period. This type of flooding can develop within minutes to hours, making it one of the most challenging hazards to predict and manage (CRED, 2016). Its sudden nature can cause devastation in minutes, resulting in human losses, damage to infrastructure, and considerable economic costs. In quantitative terms, the IPCC (2021) indicates that the frequency of flash floods has increased by approximately 30% in the last two decades globally, underscoring the urgent need for adequate risk management plans. Factors such as uncontrolled urbanization contribute to making these floods more severe. Soil impermeabilization, caused by infrastructure development, prevents water absorption and increases the volume of water that quickly flows into nearby drains and bodies of water (Cortès et al., 2017). In the Mediterranean basin, where torrential rainfall is more common, this risk is even more significant. Gaume et al. (2016) emphasize that flash floods are particularly frequent in this region, highlighting the urgent need to implement appropriate risk management strategies.

In parallel, flood risk management has recently undergone a significant transition, moving away from traditional state-led approaches toward more complex actor

networks and non-hierarchical processes, introducing an integrated management approach. This evolution reflects a broader shift from "government to governance" in managing flood risks (Walker et al., 2014). While several countries have started adopting integrated flood risk management systems (Ishiwatari, 2019), limited attention has been given to understanding how these models can be specifically applied to the unique challenges posed by flash floods. Furthermore, although states have diversified their governance strategies to align with EU Directives, they remain central players, continuing to rely heavily on state-led, top-down decision-making processes.

Objectives: The LocAll4Flood project, a three-year initiative funded by the European Commission under the Interreg Program, aims to promote and contribute to flash flood risk prevention & resilience in small watersheds and non-perennial streams in Mediterranean area, by implementing an integrative approach combining into an Integrated multi-stakeholder governance model - IMGM- i) prevention, ii) adaptation, and iii) mitigation actions, and prioritizing nature-based solutions (NBS)

Methodology: This model emphasizes a bottom-up approach to flash flood management by fostering dialogue among diverse entities and populations to co-create shared solutions. Those solutions integrate prevention, adaptation, and mitigation measures for reducing flash flood risks. This model also helps highlighting roles, responsibilities, and interactions of all stakeholders involved directly and indirectly in flash flood management. First, the model focuses on developing an early warning system that provides high-resolution information about potential flooding events. The system integrates hazard data from Pan-European platforms with localized data, ensuring accurate and timely alerts. Second, adaptation efforts include creating educational and awareness-raising activities to enhance citizens' knowledge about flash floods and how to reduce its impacts. Insights based on surveys assessing public risk perceptions related to flash floods guide the design of those participatory education programs. Third, the project extensively reviews and promotes the adoption of NBS as a mean to reduce flash flood risks.

The IMGM is tested in nine pilot catchments across diverse settings in the Mediterranean, including Catalonia and the Balearic Islands (Spain), Greece, Italy, Bulgaria, and Malta (see Figure above). These areas, characterized by varying flood risk management contexts, socio-political cultures, stakeholder dynamics, ecosystems and topographical features (urban, industrial, rural, and coastal), provide an opportunity to evaluate and compare the model's application in different scenarios.

Expected results: Testing the IMGM across these pilot sites generates several insights into its adaptability and effectiveness, with also the aim of ensuring transferability to other vulnerable regions. The anticipated outcomes of the project include enhancing the response chain, raising awareness, improving forecasting through the early warning system, and encouraging the adoption of nature-based solutions. More specifically, concrete outcomes will be:

- A validated early warning system to anticipate flash flood events and their impacts.
- Replicable education solutions to adapt the use of the territories to reduce flash flood impacts based on social awareness assessments.
- A catalogue of co-designed and co-implemented nature-based solutions to mitigate flash flood risks
- An integrated multi-stakeholder governance model to tackle flash floods with a bottom-up and Mediterranean perspective.

Conclusions: By integrating local knowledge, fostering multi-stakeholder collaboration, and addressing prevention, adaptation, and mitigation holistically, LocAll4Flood aspires to provide a sustainable governance model for managing flash floods in the Mediterranean and beyond.

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