Integrating GIS, Impact Chains and Participatory Mapping for Territorial Vulnerability Assessment in Castel Volturno

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Abstract. This paper presents an integrated geomatics framework for assessing territorial vulnerability in Castel Volturno, a low-lying coastal and riverine municipality in southern Italy. It combines GIS-based spatial analysis, a qualitative Impact Chain and a participatory mapping protocol designed in ArcGIS Survey123. The framework distinguishes mapped hazard and potential exposure from interpretative impact pathways and social dimensions requiring additional evidence. The empirical GIS analysis uses updated Flood Risk Management Plan (PGRA) hazard data and Campania Region DBT/CTR 2020 building and road-network layers. River-flood scenarios cover substantial portions of the municipality and intersect a large share of mapped buildings and road infrastructure; the PGRA Sea Water component, representing marine inundation, is restricted to the coastal sector and involves comparatively limited exposure. The Impact Chain relates these spatial conditions to possible mobility disruption, housing damage, temporary isolation, economic loss and recovery processes. Its relationships are qualitative and have not been independently validated as a causal model. Coastal erosion remains conceptual and is not quantitatively assessed. Survey123 is a protocol for a subsequent empirical phase: participatory data are not yet available for empirical analysis. The framework supports interpretation and the identification of candidate adaptation options without inferring actual impacts or measured vulnerability from spatial intersections.

Keywords: GIS, Impact Chains, Participatory Mapping, Territorial Vulnerability, Castel Volturno, Coastal Risk.