20. From Hazard Mapping to WebGIS Decision Support: Integrating Multiscale Geospatial Data for the Documentation of Small Mountain Rural Settlements (SMRS) in the Italian Alps

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Small Mountain Rural Settlements (SMRS) in the Italian Alps combine demographic fragility, accessibility constraints, and exposure to hydrogeological hazards. This paper presents a multiscale GIS workflow for integrating heterogeneous institutional geodata and transforming them into comparable decision-support information. The method combines settlement, hazard, road-network, and building-footprint datasets across four nested scales: national, regional, territorial, and settlement. Particular attention is given to the data harmonization from multiple sources and the structural incompatibility of avalanche datasets from Piedmont and Valle d'Aosta. Rather than imposing a common ordinal classification, the workflow preserves native attributes and derives binary exposure indicators that can be compared across regions. These indicators are combined with access-corridor exposure in a Hazard Constraint Score (HCS, 0-6). The workflow is tested in Ollomont, Macugnaga, and Elva and operationalized through a WebGIS proof of concept. Results show that the approach supports cross-regional comparison while retaining building-level detail and makes explicit the trade-offs introduced by data harmonization.