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Multi Hazard Assessment: The Azores Archipelagos (PT) case

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The COPERNICUS EMS Risk & Recovery Mapping (RRM) activity offers services to support efficient design and implementation of mitigation measures and recovery planning based on EO data exploitation. The Azores Archipelagos case was realized in the context of the FWC 259811 Copernicus EMS RRM, and provides potential impact information for a number of natural disasters.

The analysis identified population and assets at risk (infrastructures and environment). The risk assessment was based on hazard and vulnerability of structural elements, road network characteristics, etc. Integration of different hazards and risks was accounted in establishing the necessary first response/ first aid infrastructure.

EO data (Pleiades and WV-2), were used to establish a detailed background information, common for the assessment of the whole of the risks.

A qualitative Flood hazard level was established, through a “Flood Susceptibility Index” that accounts for upstream drainage area and local slope along the drainage network (Manfreda et al. 2014). Indicators, representing different vulnerability typologies, were accounted for. The risk was established through intersecting hazard and vulnerability (risk- specific lookup table).

Probabilistic seismic hazards maps (PGA) were obtained by applying the Cornell (1968) methodology as implemented in CRISIS2007 (Ordaz et al. 2007). The approach relied on the identification of potential sources, the assessment of earthquake recurrence and magnitude distribution, the selection of ground motion model, and the mathematical model to calculate seismic hazard.

Lava eruption areas and a volcanic activity related coefficient were established through available historical data. Lava flow paths and their convergence were estimated through applying a cellular, automata based, Lava Flow Hazard numerical model (Gestur Leó Gislason, 2013).

The Landslide Hazard Index of NGI (Norwegian Geotechnical Institute) for heavy rainfall (100 year extreme monthly rainfall) and earthquake (475 years return period) was used. Topography, lithology, soil moisture and LU/LC were also accounted for.

Soil erosion risk was assessed through the empirical model RUSLE (Renard et al. 1991b). Rainfall erosivity, topography and vegetation cover are the main parameters which were used for predicting the proneness to soil loss.

Expected, maximum tsunami wave heights were estimated for a specific earthquake scenario at designated forecast points along the coasts. Deformation at the source was calculated by utilizing the Okada code (Okada, 1985). Tsunami waves’ generation and propagation is based on the SWAN model (JRC/IPSC modification). To estimate the wave height (forecast points) the Green’s Law function was used (JRC Tsunami Analysis Tool).

Storm tracks’ historical data indicate a return period of 17 /41 years for H1 /H2 hurricane categories respectively. NOAA WAVEWATCH III model hindcast reanalysis was used to estimate the maximum significant wave height (wind and swell) along the coastline during two major storms. The associated storm-surge risk assessment accounted also for the coastline morphology.

Seven empirical (independent) indicators were used to express the erosion susceptibility of the coasts. Each indicator is evaluated according to a semi?quantitative score that represents low, medium and high level of erosion risk or impact. The estimation of the coastal erosion hazard was derived through aggregating the indicators in a grid scale.