



Main natural hazards and vulnerability studies for some historical constructions and urban sectors of Valparaíso City (Chile)

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The Project “MAR VASTO” (“Risk Management in Valparaíso/Manejo de Riesgos en Valparaíso, Servicios Técnicos”, 2007) started in March 2007, with coordination of ENEA (Italian Agency for New Technologies, Energy and Environment), participation of several partners (Italy: University of Ferrara, Faculties of Architecture and Engineering; University of Padua, Faculty of Engineering; Abdus Salam International Centre for Theoretical Physics of Trieste; Chile: Valparaíso Technical University Federico Santa Maria, Civil Works Department; Santiago University of Chile, Division Structures Constructions Geotechnics), and support of local stakeholders.

Being Valparaíso included since 2003 in the UNESCO World Heritage List of protected sites, the project main goals are the following: to collect, analyze and elaborate the existing information, with a satisfying evaluation of main hazards; to develop a GIS digital archive, well organized, user-friendly and easy to be implemented in the future, providing maps and scenarios of specific and multiple risk; to provide a vulnerability analysis for three historical churches (San Francisco del Barón, Las Hermanitas de la Providencia, La Matriz, made by various materials - masonry, concrete, wood and adobe - and located in different city sites) and for a building stock in the Cerro Cordillera (partially inside the UNESCO area), analyzing more than 200 constructions; to suggest guidelines for future urban planning and strengthening interventions.

In the framework of the MAR VASTO Project, the most important hazards have been investigated carried out. With regard to seismic hazard, “state-of-the-art” information has been provided by Chilean partners and stakeholders, using materials of several studies and stored in original earthquake reports, local newspapers and magazines. The activities performed by the Italian team regarded the definition, for the city of Valparaíso, of earthquake scenarios and maps based on the neo-deterministic approach. With regard to tsunami, the information has been provided by SHOA (Servicio Hidrográfico y Oceanográfico de la Armada de Chile). Tsunami scenarios and inundation maps (for both the 1906 and 1985 earthquakes) have been evaluated by the Italian team, taking into account also worse scenarios (namely the 1730 seismic event). Landslide hazard (identifying main flow areas and pointing out most affected zones, with a deeper investigation in the Cerro Cordillera, pilot area for the MAR VASTO Project) and fire hazard have been also evaluated. Finally, a GIS database has been developed, to store the hazard maps produced in the project. In addition, the GIS database has been verified by using the data obtained by a DGPS survey, performed during the in situ work in Valparaíso.

In the framework of the MAR VASTO Project a building stock located in the Cerro Cordillera, partially inside the UNESCO area, has been investigated. The work done in the above said Cerro Cordillera sector by the Italian team can be considered a pilot experience which would be enlarged to all the Valparaíso City area in the framework of the town planning, actually in progress.