Contract:

ENEA – Banco Interamericano de Desarrollo (BID)/InterAmerican Development Bank (IDB)

Manejo de Riesgos en Valparaiso, Servicios Técnicos

Acronym: *"MAR VASTO"*

ATN/II-9816-CH

Contract n. **PRM.7.035.00-C**

GENERAL PROGRESS REPORT N° 1

3			**Name**					
			Signature					
2			**Name**					
			Signature					
1			**Name**					
			Signature					
0	**Date**	**20.08.2007**	**Name**	**M. INDIRLI**				
			Signature	Maurizio Indirli				
				AUTHORS				

INDEX

PREFACE

The activities are foreseen by the Contract n. PRM.7.035.00-C between the InterAmerican Development Bank and ENEA, signed on March 12th, 2007 by Dott. Marcello Garozzo, Director of Environment, Global Change and Sustainable Development Department **[01]**.

This first progress report describes the following work:
- the main results obtained during the mission performed by Maurizio Indirli (ENEA, coordinator of the project) at Valparaiso (Chile), from May 21st to May 31st, 2007;
- the activities performed in Italy after the above mentioned mission, until the end of August 2007;
- the preparation of the new mission at Valparaiso in the next months of October-November 2007.

After the approval of the project, the mission has been planned in order to take contact with the local stakeholders (Oficina de Gestion Municipal de Valparaiso, OGP, and Programa VALPOMIO) and organize the kick-off meeting with the Chilean partners of the project (University of Chile of Santiago, University Federico Santa Maria of Valparaiso), and the "Servicio Hidrografico y Oceanografico de la Armada de Chile" (SHOA).
The project kick-off meeting has been hold on Monday 28th morning (time 10:00-12:00), at the University Federico Santa Maria, with all the partners involved (participants: Maurizio Indirli, ENEA; Gilberto Leiva, Raul Galindo, Carlos Aguirre, University Federico Santa Maria, USM; Rodolfo Saragoni, University of Chile, UC; Paulina Kaplan Depolo, OGP; Patrick Gonzalez Vergara, VALPOMIO).
SHOA was absent (justified), but a separate meeting was organized at the SHOA building the day after, with the participation of Alvaro Vera Tisandie (SHOA, Departamento de Oceanografía) and a representative of OGP (Mauricio Gonzalez).
In addition, the same day (time 12:00-13:00), a meeting took place with the Alcalde of Valparaiso, Aldo Cornejo, with the presentation of the project to the media (TV and newspapers), managed by the Valparaiso Municipality **[02-04]**.
A meeting took place also at ICE (Istituto Italiano per il Commercio Estero - Istituto Italiano para el Comercio Exterior) at Santiago (with the responsible Roberto Santilli and Maruzzella Giannini) and several other technical meetings have been done separately by Mr. Indirli with all the project partners and VALPOMIO representatives (Patrick Gonzalez Vergara, Mónica Riffka Telias De Mayo, Hugo Novella Muñoz). Furthermore, a contact was organized with the Head of the Firemen of Valparaiso, Enzo Gagliardo.
Mr. Indirli together OGP representatives (Sótero Apablaza Minchel and Mauricio Gonzalez) performed in situ investigations in all the Valparaiso city area.
As suggested by OGP and VALPOMIO, a common decision has been taken on structures/areas to be investigated and studied with highest priority in the project:
- three important churches (La Matriz, San Francisco, Las Hermanitas de la Providencia), constructed by different materials and located in different sites of the city;
- a pilot zone in Cerro Cordillera, consisting in a stock of at least 35 residential/commercial buildings (to be identified by VALPOMIO with the agreement of OGP), object of a future rehabilitation program.

Finally, the date of the next mission at Valparaiso of all the Italian technical group has been identified, starting from October 15th, 2007, with the agreement of VALPOMIO.

PROGRESS IN THE PROJECT WORK-PACKAGES

WP01 "State-of-the-art" for all the municipality of Valparaiso

WP 01	*activity*	*sub-activity*	*leader*	*contributions*
	"state-of-the-art" for all the municipality of Valparaiso	**1.1** collection of cartography and maps of Valparaiso; acquisition of high resolution satellite images and aerophotos	**ENEA**	**ALL**
		1.2 collection and analysis of historical material (photos, maps, databases, etc.)		
		1.3 collection and analysis of existing studies/investigations regarding natural and anthropic risks (seismic events, landslides, floods, tsunami, coastal erosion, fire, status of infrastructures and lifelines, etc.)		
		1.4 data homogenization and organization of a digital archive of the "state-of-the-art", in GIS format (Geographic Information System) – see WP6		**-**

In the framework of the mission, the following materials have been purchased:

- a partial DEM (Digital Elevation Model) of Valparaiso (from OGP);
- aerial photos of Valparaiso (from OGP);
- urban planning and thematic maps (from OGP and VALPOMIO);
- a book with the historical cartography of Valparaiso **[05]**;
- an architectonical and historical guide of Valparaiso **[06]**;
- geological maps from UC **[07-08]**;
- seismological data from UC **[09-10]**.
- SHOA report on tsunami (from VALPOMIO) **[11]**;
- videos and CDs on the Calle Serrano explosion and following fire (from OGP and Fire Department);
- about one thousand of Valparaiso City area pictures (examples in Figs. 1-2);
- pictures of the three churches (La Matriz, San Francisco, Las Hermanitas de la Providencia).

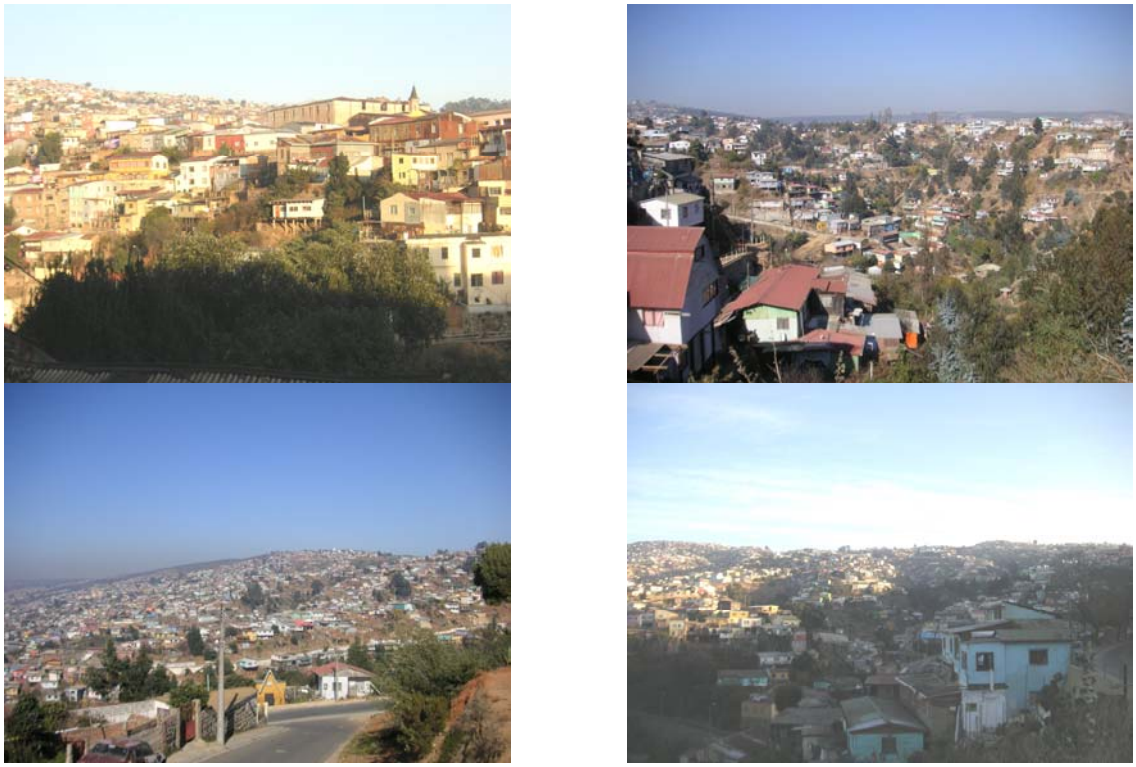

Figure 1: Some overview pictures of the Valparaiso City area.

Figure 2: Pictures of "quebradas" and buildings on the hills of the Valparaiso City area.

The pictures of the geological maps **[07-08]**, even if deteriorated, are sufficiently clear to be interrogated (Fig. 3). In any case, new copies (digital or paper) have been asked to UC **[12]**, and shall be purchased in the framework of the next mission. Other general information has been requested to USM, but without answer.

Figure 3: Valparaiso geological maps.

Analyzing the geological maps, it is possible to say that Valparaiso is located on a superficial covering, sealing reclaimed lands, colluvial layers due to fluvial origin and interconnections of debris flow deposits. Those materials lie on a schist basement and, above them, appearing fluvial terraces (mainly in the SE zone). From a geomorphologic point of view, this place shows two different slopes, respectively exposed to NW and NE. Both of them lead to straight sides, locally interrupted by deep fluvial incisions ("*quebradas*"), only sometimes ploughed by water (Fig. 4). This geomorphologic potential, together with the presence of superficially alterated schist rocks (originating soils with abounding clay fractions), can induce two processes:

- sheet erosion, due to a slow areal erosion of the soil, when the material slides and buildups in the bottom of the "*quebradas*";
- debris e mud flow, i.e. landslides with a prompt evolution (dragging surfacing schists and anthropic debris), acting on the sides and the bottom of the "*quebradas*" (Fig. 5).

Those effects (especially in the slope lower section, where the urban territory is dense and exposed to risk) can be very dangerous, if the natural water movement to the sea is interrupted; in fact, prompt flows can happen in pipelines or primordial creek-beds now shrinked in narrow streets. Thus, in case of great and fast rainfalls, it could be possible that the flowing materials can sweep or damage constructions and lifelines. The ENEA experts shall evaluate (during the next mission by carrying out targeted in situ investigations, made by two ENEA researchers) the susceptibility of the above mentioned phenomena, identify the main flow areas and point out the most affected city zones.

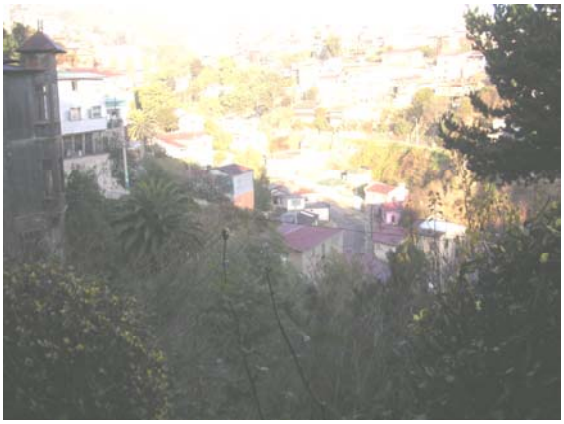

Figure 4: An example of a Valparaiso "quebrada".

Figure 5: A "quebrada" with a potential risk of debris and mud flows.

WP02 Topographic and Laser Scanner 3D survey

WP 02	*activity*	*sub-activity*	*leader*	*contributions*
	Topographic and Laser Scanner 3D survey	**2.1** topographic survey of the GCPs (Ground Control Points) to geo-referencing high resolution satellite images and DTM (Digital Terrain Model) implementation for all the municipality of Valparaiso	**ENEA**	**UNIFE**
		2.2 DGPS (Differential Global Position System) topographic survey in static configuration of the most significant and representative structures		
		2.3 3D Laser-Scanner survey of 1 to 3 significant structures of the UNESCO area in Valparaiso (mainly in Barrio Puerto)	**UNIFE**	**ENEA**

The topographic survey shall be performed by two ENEA researchers in the framework of the next mission at Valparaiso (October-November, 2007), in order to provide data for checking the GIS data-base.
The equipment (Differential GPS Trimble Navigation, model 5700 double frequency L1/L2, for post-processing and real time surveys) will be sent from Italy or rent in Chile.

As decided **[13]** in the meeting of September 20, 2007 at the University of Ferrara (UNIFE), the 3D Laser-Scanner survey will be performed by two experts of the Italian team (UNIFE) in the framework of the next mission, foreseen during the months of October and November, 2007. The Laser-Scanner equipment will be rent in Chile.
The 3D Laser-Scanner survey shall be performed on the following structures:
- Church of "La Matriz"; complete and detailed survey (internal and external) of all the geometric, architectonic, decorative, and structural aspects, in order to provide an exhaustive documentation of the building, including the indispensable data for the preparation of the mathematical models;
- Church of "San Francisco"; geometric and structural (internal and external) survey of the construction, in order to provide the indispensable data for the preparation of the mathematical models; a detailed survey will be provided for the façade (including the bell-tower);
- Church of "Las Hermanitas de la Providencia"; geometric and structural (internal and external) survey of the construction, in order to provide the indispensable data for the preparation of the mathematical models; a detailed survey will be provided for the most significant cracks (in fact, the building still shows the damage due to the 1985 earthquake).

UNIFE will provide the work necessary to translate the Laser-Scanner "clouds of points" into structural models. The ENEA coordinator shall verify some logistic aspects (personnel and equipment transportation in Valparaiso, equipment storing, in situ availability of power, support of the Valparaiso Municipality).
In addition, the execution of additional scannings (to be done in Cerro Cordillera, if possible) will be decided during the days of the next mission.

WP03 Study of seismic hazard

WP 03	*activity*	*sub-activity*	*leader*	*contributions*
	study of seismic hazard	**3.1** evaluation of existing studies and investigations	**ICTP**	**ENEA, UC, USM**
		3.2 suggestion of future deeper analysis through new seismic microzoning experimental campaigns, if necessary		**ENEA**
		3.3 elaboration of seismic hazard scenarios and maps; digital archive of results; also in GIS format – see WP6		

"State-of-the-art" information has been provided by UC **[09-10]**. In **[09]**, using the information stored in original earthquake reports, local newspapers and magazines, a new evaluation of the earthquake intensities scale of the Valparaiso 1906 earthquake was made. In order to identify the local soils effects in the damaged area, the results of other destructives earthquakes affecting the same area were used. With the estimated intensities, an isoseismal map was developed and a relationship between intensity and hypocentral distance was obtained. In **[10]**, large magnitude subduction thrust earthquakes, affecting Valparaiso every 85 years, are analyzed. These earthquakes represent the extreme design condition in epicentral zones of Central Chile and in Santiago. Therefore, their study is the most relevant for earthquake engineering. Among them, the 1906 (M = 8.2) earthquake was one of the most destructive. The damage was concentrated in El Almendral neighborhood of Valparaiso harbor. In this study these damages were studied and classified using 1906 photographs. The obtained microzoning is in agreement with the one resulting from the damages of the 1985 earthquake with an increase of MSK intensities of 1 ¼. This microzonation is also in agreement with the soil structures identified at El Almendral. Good construction buildings performed well during both earthquakes indicating a lower destructiveness of Chilean subduction interpolate earthquakes. The accelerograms obtained in fill and rock for the 1985 earthquake are Fourier-spectrum analyzed. The soil amplification obtained shows the importance of the sandy soil in the damage. However, amplification values obtained for these natural periods are several times larger than theoretical ones, differences maybe due to the influence of earthquake mechanisms. Three centennial surviving buildings of 1906 and 1985 earthquakes were identified. Finally, the 1906 earthquake was only a moderate earthquake of the Valparaiso family of large earthquakes. In the following pages, some significant images are reported (Figs. 6-16).

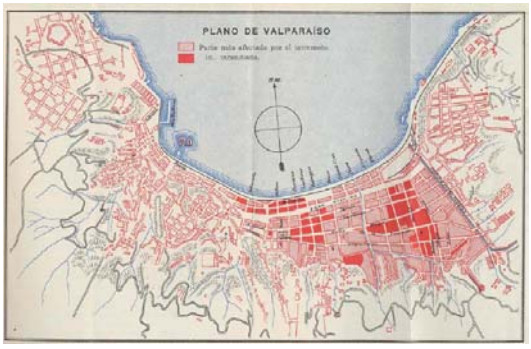

Figure 6. Map of Valparaiso sectors more damaged by the earthquake and by the fire (Rodriguez and Gajardo, 1906).

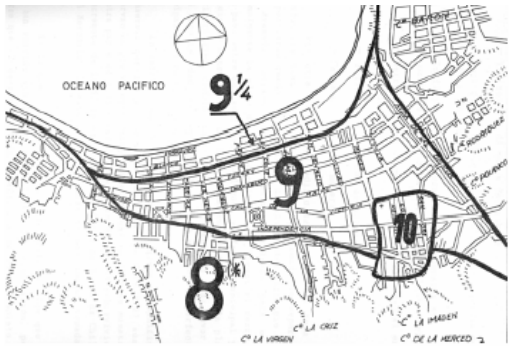

Figure 7. Intensities in Valparaiso city during 1906 earthquake.

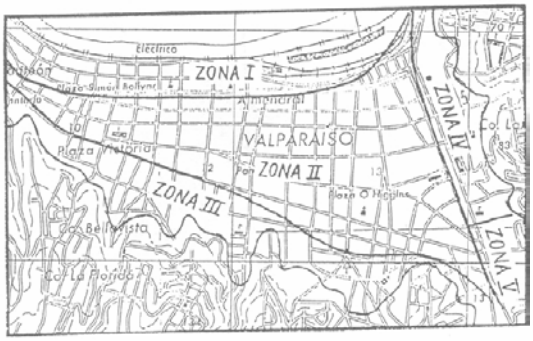

Figure 8. Soil Zonification of El Almendral, showing three soil zones (Carvajal, 1989).

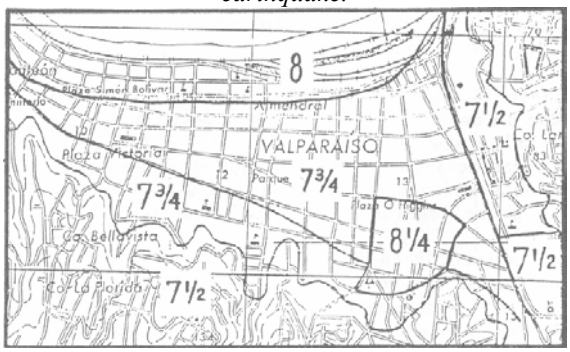

Figure 9. MSK intensities of 1985 Chile Central earthquake at El Almendral (Acevedo et al. 1989).

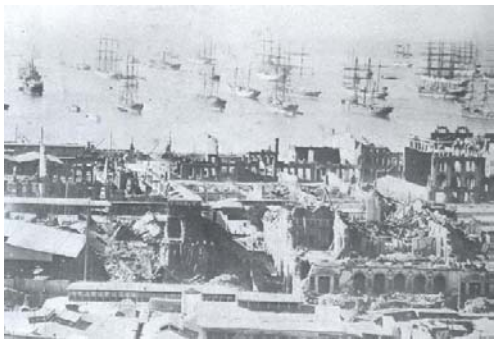

Figure 10. General view of the 1906 earthquake and following fire at El Almendral (picture from Bellavista Hill). The foreground shows the destroyed La Victoria theatre (La Victoria square) and, on the background, near the shore, many undamaged buildings destroyed mainly by the fire.

Figure 11. General view to the East of the damage due to the 1906 earthquake at El Almendral. At the centre of the picture, La Victoria square, showing the undamaged belfry of Espiritu Santo Church and the Huito building.

Figure 12. Damage at El Almendral, 1906 Valparaiso earthquake, showing backing the background the undamaged buildings and houses on the hills.

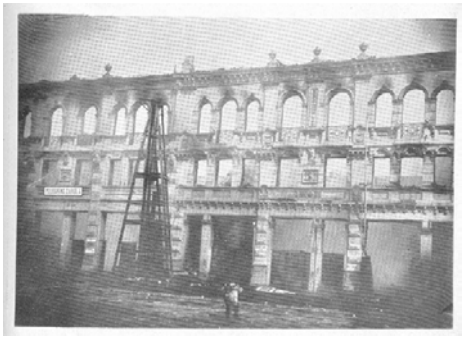

Figure 13. Fire damage of a good construction 3-storey building at a fill soil zone, showing no cracks by the 1906 earthquake. Blanco Street. (Hardy, 1906).

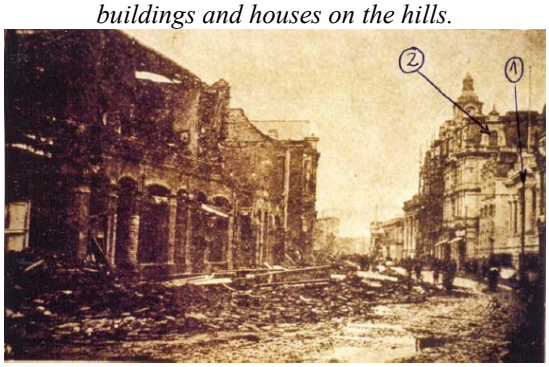

Figure 14a. Comparison between this picture taken after 1906 earthquake of Condell Street near La Victoria Square, showing Lyon Palace (1) and 4-storey Huito building (2), undamaged, with picture of Figure 13b.

Figure 14b. Similar picture to Figure 13a taken after the 1985 earthquake again showing both undamaged buildings. Both buildings are Centennial since they survived both earthquakes.

Figure 15. Centennial El Mercurio brick masonry located at the foot of a hill.

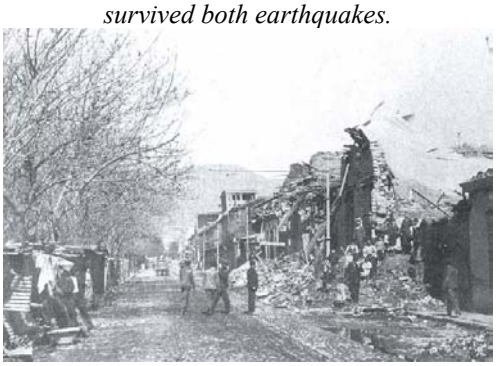

Figure 16. 1906 earthquake damage at Las Delicias Ave. (today Argentina Ave.) where the 1985 earthquake was recorded at El Almendral.

The USM partner was asked for contributes several times **[14]**, without any answer.

ICTP (as WP03 responsible) personnel is analyzing the purchased material. An ICTP scientist shall take part to the next mission of October-November, 2007, and shall meet UC and USM people, in order to take some conclusions regarding the seismic hazard in Valparaiso.

WP04 Study of tsunami and coastal erosion hazard

WP 04	*activity*	*sub-activity*	*leader*	*contributions*
	study of tsunami and coastal erosion hazards	**4.1** evaluation of existing studies and investigations	**ENEA, ICTP**	-
		4.2 implementation of the existing studies and investigation regarding tsunami and coastal erosion risks in the UNESCO area		-
		4.3 elaboration of risk scenarios and maps; digital archive of results, also in GIS format – see WP6		

The rupture areas of both the 1906 and 1985 earthquakes include all the coastal zone of the Valparaiso Region. Thanks to the SHOA mathematical simulations, the possibility of tsunamis for both the events in the Valparaiso Bay has been evaluated **[11]**. Looking at the inundation maps, it is clear that all the coastal line in the harbor zone must be considered at high risk of flooding. For both the events, the wave direction is initially perpendicular to the coast (W direction); near the shore, it begins to deflect.

1) 1906 tsunami: at the earthquake occurrence, an instantaneous increase of 1.8 m over the average sea level could be recorded; at Concón, the increase is a little less (1.5 m); the stream maximum velocity is about 5 m/s (Playa Reñaca);

2) 1985 tsunami: at the earthquake occurrence, an instantaneous increase of 0.8 m over the average sea level could be recorded.

The report on tsunami (duplicated and forwarded to ICTP) has been purchased in paper format from VALPOMIO, but it has been also formally requested to SHOA (the owner of this information) during the technical meeting mentioned in the preface. Moreover, SHOA has been asked (during the meeting and by e-mail too) to send a digital copy of the report to ENEA, in order to facilitate the work, together with batimetry and coastal line data, but without any answer until now **[15]**.

Other e-mails sent from ENEA to SHOA regarded the possible collaboration on the development of tsunami mathematical models, together with ICTP, partner of our project **[16]**. These e-mails have been sent again to the SHOA new responsible of the Oceanographic Department (Andres Enriquez), but, also in this case, with no answer **[17]**. Unfortunately, this absence of dialogue with SHOA is surprising and inexplicable.

ICTP (as WP04 responsible) personnel is analyzing the purchased material. In any case, an ICTP scientist shall take part to the next mission of October-November, 2007, and shall meet again SHOA people (if possible), in order to try again the start up of a good collaboration.

WP05 Vulnerability analysis

WP 05	*activity*	*sub-activity*	*leader*	*contributions*
	vulnerability analysis	**5.1** identification and classification of the structural typologies present in Valparaiso, with particular regard to the UNESCO area	**UNIFE**	**ENEA**
		5.2 visual quick survey (architectonic/structural) for a representative amount of buildings and comparison with data obtained by satellite image processing		
		5.3 visual deeper survey (vulnerability evaluation) of some representative buildings		
		5.4 vulnerability scenarios and maps elaboration		
		5.5 identification of interventions reducing structural vulnerability		**ENEA, UNIPD**
		5.6 suggestion of future diagnostic campaigns, in situ dynamic characterization and experimental laboratory tests; suggestion of numerical simulations		
		5.7 organization of a digital archive for the results and cataloguing , also in GIS format – see WP6	**ENEA**	**UNIFE**

In situ investigations in Valparaiso have been performed by Mr. Indirli together OGP (Sótero Apablaza Minchel and Mauricio Gonzalez) during the last mission (May, 2007). As suggested by OGP and VALPOMIO, a common decision has been taken on structures/areas to be investigated with highest priority in the project:

- three important churches (San Francisco, Las Hermanitas de la Providencia, La Matriz), made by different materials and located in different sites of the city;
- a pilot zone in Cerro Cordillera, consisting in a stock of at least 35 residential/commercial buildings (to be identified by VALPOMIO with the agreement of OGP), object of a future rehabilitation program. VALPOMIO shall identify the building stock before the beginning of the Italian mission at Valparaiso (October-November, 2007).

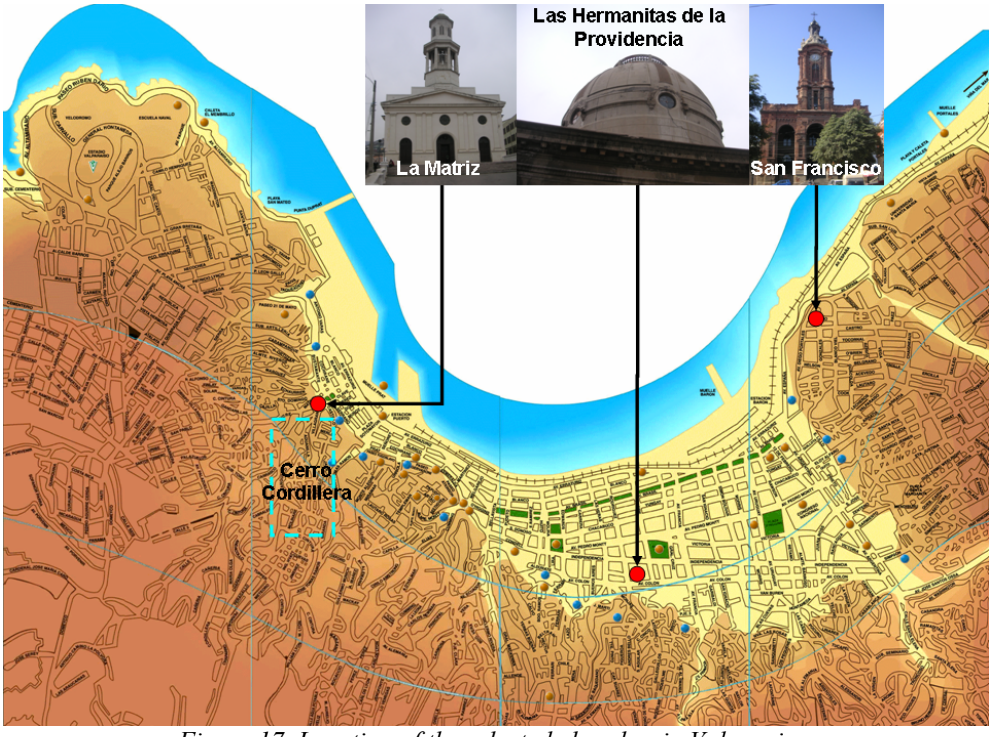

Figure 17. Location of the selected churches in Valparaiso.

- La Matriz

The actual and fourth version of the "La Matriz" Church was constructed from 1837 to 1842, after the disruption caused by the 1730 earthquake; it is built by adobe perimetral walls (height 12 m and thickness 1.30 m), while the roof is made by clay tiles. The bell-tower (height 40 m), modified in 1889, is wooden made and presents an iron spiral staircase inside. The internal colonnades, forming the naves, are also wooden made.

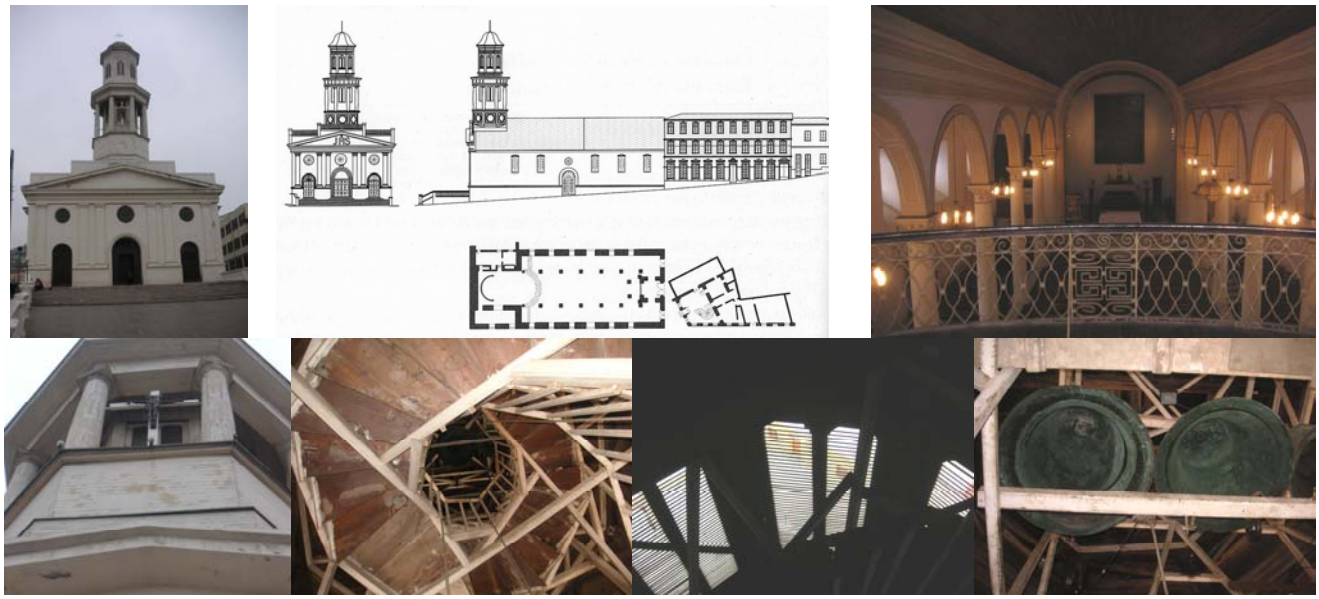

Figure 18. "La Matriz" Church

- San Francisco Church and Monastery

The San Francisco first building was completed in 1865, but a new main façade and the tower were done at the end of 1890. The church, externally in masonry, is located on Baron Hill and it is visible from land and sea. The internal colonnades, dividing the naves, are wooden made.

Figure 19. "San Francisco" Church and Monastery

- Las Hermanitas de la Providencia Church

"Las Hermanitas de la Providencia" is a construction made by a primitive reinforced concrete. Because the church still presents the cracks caused by the 1985 earthquake (without any rehabilitation), it is closed to the public.

Figure 20. "Las Hermanitas de la Providencia" Church

- Pilot zone in Cerro Cordillera

During the last mission in Valparaiso (May, 2007), VALPOMIO has been asked to send a map with the definition of the building stock object of the future investigations **[18]**, without answer until now. In any case, the coordinator of the project will anticipate the Italian team, in order to define the above mentioned buildings.

In a specific meeting hold at the University of Ferrara after the mission in Chile (June 21, 2007), the building survey methodologies to assess vulnerability have been discussed. Several survey sheets (used in Italy for vulnerability and damage evaluation) have been purchased and analyzed:

1) *GNDT sheets for seismic vulnerability evaluation in the urban habitats;* GNDT is the Italian Group for the protection against the earthquakes; it works together the Italian Civil Defense and in connection with the Ministry of the Cultural Heritage;
2) *GNDT sheets for seismic vulnerability evaluation in the buildings (1° level);*
3) *GNDT sheets for seismic vulnerability evaluation in the buildings (2° level, masonry);*
4) *GNDT sheets for seismic vulnerability evaluation in the buildings (2° level, reinforced concrete, 1999);*
5) *GNDT sheets for seismic vulnerability evaluation in the buildings (2° level, reinforced concrete, 1986);*
6) *integration to the GNDT sheets for masonry buildings made by Regione Toscana;*
7) *GNDT sheets for the qualitative evaluation of local effects in strategic/heritage buildings;*
8) *Italian Civil Defense sheets for the damage evaluation in the post-earthquake emergency;*
9) *Damage sheets for churches (Italian Civil Defense and Ministry for Cultural Heritage);*
10) *Vulnerability sheets for churches (Regione Molise, 2° level);*
11) *Calculation sheets (Excel) to evaluate the vulnerability for masonry buildings (University of Basilicata and GNDT);*
12) *Calculation sheets (Excel) to evaluate the vulnerability for reinforced concrete buildings (University of Basilicata and GNDT);*
13) *Sheets "Action plan for the safeguarding of the cultural heritage of the Old city of Jerusalem – Survey form June 2006 –"; Needs Map for the conservation of the historic monuments ad sites (University of Ferrara);*
14) *Sheets for the "Etude sur la Préservation du Patrimoine Architecturale et Urbain du Centre Ville de Djibouti Recensement de la construction, questionnaire parcelle" (University of Ferrara);*
15) *Sheets for the "Euromed enquete study" (University of Ferrara);*
16) *Sheets for the "Survey of the buildings of Old City of Sana'a - 2004" (University of Ferrara).*

In the framework of the work targeted on the mission of October-November 2007, the data sheets are going to be optimized (taking into account wood characteristics of materials and components) and translated into Spanish, in order to apply them in Valparaiso.
The vulnerability survey shall be performed by mixed teams (Italian and Chilean technicians), with the participation of personnel of OGP and VALPOMIO, possibly together with the Firemen of Valparaiso and with the protection of the police in the most "complicated" sectors of the city.
These requests have been mailed to VALPOMIO and OGP **[18]**, without answer until now. In any case, the coordinator of the project will anticipate the Italian team, in order to define with OGP and VALPOMIO the above mentioned questions.

WP06 Development of the geo-referenced digital archive

WP 06	*activity*	*sub-activity*	*leader*	*contributions*
	Development of the geo-referenced digital archive	**6.1** development of the GIS conceptual model	**ENEA**	**UNIFE**
		6.2 analysis and spatial homogenization of the information provided by existing studies and investigations (« state-of-the-art ») for all the Valparaiso area		-
		6.3 ortho-rectification of the satellite images, implementation and actualization of the high definition vectorial base from satellite images of the buildings for all the Valparaiso area		
		6.4 urban classification of Valparaiso from high definition satellite images		**UNIFE**
		6.5 creation of the GIS digital archive for the results obtained from the risk analyses performed for the UNESCO area		**UNIFE, ICTP, UNIPD**
		6.6 spatial elaboration of maps and scenarios (hazard, vulnerability, specific and multiple risks)		

With regard to the organization of the GIS database, the work started in Italy at the beginning of June 2007, using the following materials purchased in Chile, in Italy or in other manner:

a) list of the vectorial thematic tools provided by OGP, in SHP or DWG format:

a01. quoted points;
a02. level (height) curves (1 m);
a03. auxiliary level (height) curves;
a04. wood areas (perimeter);
a5. public gardens (perimeter);
a6. places of trees;
a7. places of palms;
a8 . forest zones;
a9. creeks and rivers;
a10. points of public lighting (not sufficient);
a11: other points of public lighting (not sufficient);
a12. viability;
a13. stepped ways (without documentation);
a14. railways;
a15. buildings;
a16. cadastral units (probably);
a17. streets names;

b) list of the vectorial thematic tools provided by VALPOMIO and other subjects:

b01 perimeters of EPI zones;
b02 map 1:5000 Barón-Yolanda;
b03 map 1:5000 Plaza Sotomayor;

c) list of raster thematic tools in ECWo JPG format:

c01 aerial photograph of the Valparaiso area, with a sufficiently high resolution, geo-referred, but not horto-rectified.

The following observations have to be done, in order to understand the difficulty of the work in progress:

- the aerial photos of Valparaiso, given by OGP to us, were not horto-rectified; thus, the horto-rectification is going to be carried out in Italy by ENEA, using specific procedures;
- the isolines "quota zero" (coastal lines) were missing; these data have been requested to SHOA, owner of the information, without answer until now **[15]**;
- the data of the flight of the aerial survey, the origin of the vectorial files (metadata), and the cartographic references of the utilized maps were missing; they have been asked to OGP and VALPOMIO without answer until now **[19]**;
- vectorial batimetry was missing; this material is property of SHOA, but the information, even requested, has not been given to Italian researchers **[15]**; anyway, a SHOA raster have bee found and used **[20],** see Fig. 21;
- buildings heights were missing, thus it is necessary to create a special layer;
- the GIS purchased by OGP was not complete (see Fig. 22); with regard to the borders of the Valparaiso municipality, the hills Esperanza, Placeres and Baron (the oriental sector of the city) were missing; for this reason, the GIS provided by OGP has been integrated with radar altimetry data coming from NASA Space Shuttle flights (regular mesh 90 m, **[21]**), as shown by Fig. 23;

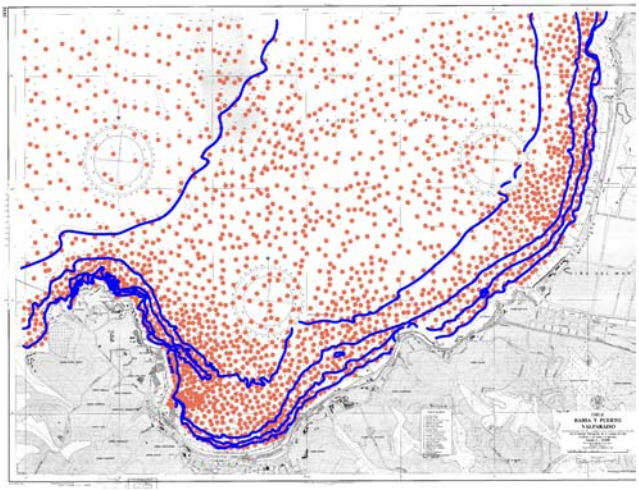

Figure 21.Valparaiso area covered by the DEM (Digital Elevation Model) provided by OGP.

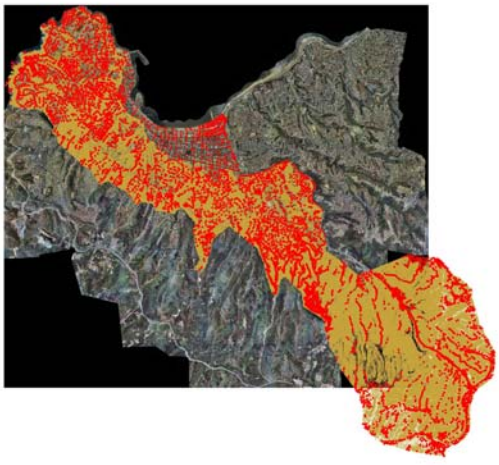

Figure 22.Valparaiso area covered by the DEM (Digital Elevation Model) provided by OGP.

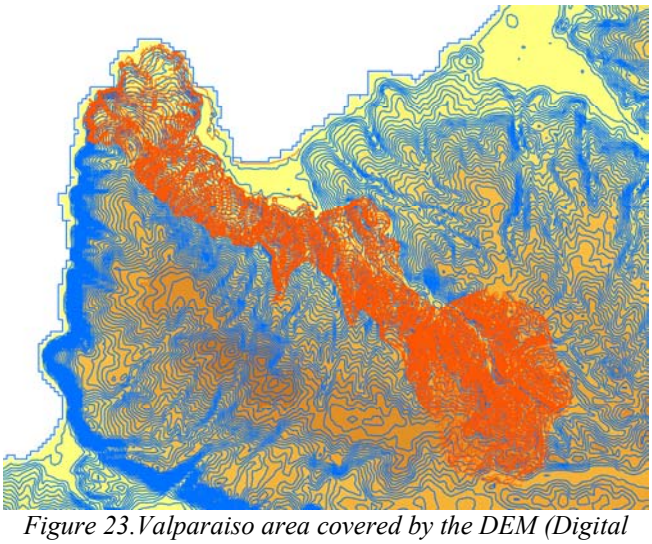

Figure 23.Valparaiso area covered by the DEM (Digital Elevation Model) integrated by ENEA.

- in order to further implement the DEM, satellital photos and maps have been requested also to other private companies **[22]**;
- some relevant historical maps taken from [05] will be digitized, georeferenced (if possible), and then inserted into the GIS database, with particular regard to the situation before and after the 1906 earthquake.

This work will provide a first GIS support for the foreseen mission of October-November 2007. During that period, the presence of Italian researchers, together with OGP and VALPOMIO experts, shall optimize the GIS database.

WP07 Principal final proposals

WP 07	*activity*	*sub-activity*	*leader*	*contributions*
	Principal final proposals	**7.1** natural/anthropic disasters mitigation and vulnerability reduction in Valparaiso and particularly in the UNESCO area	**ENEA, UNIFE**	**ICTP, UNIPD**

No activities are foreseen for this work package in this phase of the project.

WP08 Realization of multimedia products

WP 08	*activity*	*sub-activity*	*leader*	*contributions*
	Realization of multimedia products	**8.1** project and realization of the WEB site, audiovisuals, CD-ROM, WEB-GIS	**ENEA**	**UNIFE, ICTP, UNIPD**
		8.2 international workshop		**ALL**

As already written in the preface, on Monday 28th morning (time 12:00-13:00), a meeting took place with the Alcalde of Valparaiso, Aldo Cornejo, with the presentation of the project to the media (TV and newspapers **[02-04]**), managed by the Valparaiso Municipality.

The project website is under construction and the translation in JAVA language is in progress. The web site shall be continuously implemented, following the work of the team. The internet link is the following:
http://www.bologna.enea.it/lab-risk/Valpa.proj.Presentazione.htm

In the framework of the project (as discussed with the Chilean partners, in particular with Prof. Saragoni of the UC), a book regarding the Centennial of the 1906 Valparaiso earthquake can also be foreseen.

THE ORGANIZATION OF THE NEXT MISSION (OCTOBER-NOVEMBER, 2007)

As scheduled in May, the coordinator of the project will reach Valparaiso - about - on October 12 (the date can shift a couple of days, due to plan reservation), in order to have enough time to organize as well as possible, together with VALPOMIO, OGP and other subjects, all the foreseen activities, before the arrival of the Italian complete team.
This is the experts list and the related period of stay (also in this case, small changes can happen):

ENEA
Maurizio Indirli, project coordinator,
October 12 - November 30;
Augusto Screpanti, topographic survey for GIS implementation,
November 4 - November 15;
Sandro Serafini, topographic survey for GIS implementation, contacts with Firemen and Civil Defense, landslides,
November 4 - November 15;
Fabio Geremei, GIS and topographic survey for GIS implementation,
November 4 - November 15;
Claudio Puglisi, topographic survey for GIS implementation, GIS and geological aspects,
October 21 - November 15;
Nieves Lopez Izquierdo, GIS implementation, historical, environmental and urban planning aspects,
November 4 - November 30;
Bruno Carpani, evaluation of structural vulnerability, protection of cultural heritage,
November 4 - November 15;

UNIFE
Daniel Blersch, laser-scanner activities,
November 2 - November 15;
Alessandro Grieco, laser-scanner activities,
November 2 - November 15;
Enrico Milani, evaluation of structural vulnerability, structural analysis,
November 3 - November 20;
Luca Lanzoni, GIS, urban planning aspects, evaluation of structural vulnerability,
November 3 - November 20;
Marco Miglioli or *Giampaolo Simonini*, GIS, urban planning aspects, evaluation of structural vulnerability,
November 3 - November 20;

UNIPD
Marco Munari, evaluation of structural vulnerability, protection of cultural heritage,
November 3 - November 20;

ICTP
Fabio Romanelli, earthquake and tsunami,
November 3 - November 20.

In the next week, all the necessary contacts shall be done, in order to face all the logistic questions.

REFERENCES

[01] Contract between ENEA – Banco Interamericano de Desarrollo (BID) or Inter-American Development Bank (IDB), "Manejo de Riesgos en Valparaiso, Servicios Técnicos", Acronym: *"MAR VASTO"*, ATN/II-9816-CH, Contract n. PRM.7.035.00-C.

[02] El Mercurio del Valparaiso, 29.05.2007.

[03] La Estrella de Valparaíso 29.05.2007.

[04] UCV Television de Valparaiso.

[05] Nelson L. Vasquez; Ricardo S. Iglesias, Mauricio A. Molina;
Cartografia Histórica de Valparaíso.
Universidad Católica de Valparaíso, 1999.

[06] AA.VV.;
Valparaíso: Guia de Arquitectura.
Junta de Andalucía. Consejer a de Obras Publicas y Transportes, Valparaíso-Sevilla, 2005.

[07] "Geologia del Area Valparaiso-Viña del Mar", prepared by K. Grimme and Leonardo Alvarez in 1964 (Scale 1:10 000); it was used in the studies about the effects of March 1985 Central Chile Earthquake;

[08] "Mapa geologico del área de Valparaiso-Curacavi", prepared by P. Gna, R. Wall and A. Gutierrez in 1996 (Scale 1: 100 000);

[09] Maximiliano Astroza I., Rodrigo Astroza E., Ana Norambuena O.;
A re-evaluation of the Valparaiso August 16, 1906 earthquake intensities;
Department of Civil Engineering, University of Chile, Santiago, Chile.

[10] G. Rodolfo Saragoni;
Comparative study of 1906 and 1985 Valparaiso earthquake damages at El Almendral zone;
Department of Civil Engineering, University of Chile, Santiago, Chile.

[11] Servicio Hidrografico y Oceanografico del al Armada de Chile.
Carta de inundacion per tsunami para la Bahia de Valparaiso, Chile.
Documento esplicativo. Estudios y projectos, Diciembre 1999.

[12] E-mail to Maximiliano Astroza, mastroza@ing.uchile.cl (12:02, 09/07/2007);
Subject: Geologic Maps of Valparaiso.

[13] E-mail to Italian partners, regarding the meeting of September 20, 2007 (20:31, 09/20/2007);
Subject: Geologic Maps of Valparaiso.

[14] E-mail to USM partners (20:56, 06/18/2007).

[15] E-mail to SHOA (21:46, 06/18/2007).

[16] See the e-mail exchange in 2005 between Fabio Romanelli, ICTP, and John Fleming, the former head of the SHOA Department of Oceanography).

[17] E-mail to SHOA (16:28, 06/19/2007).

[18] E-mail to VALPOMIO (16:27 08/31/2007).

[19] E-mail to OGP and VALPOMIO (23:25 06/25/2007).

[20] SHOA raster generated in 1982, with the batimetry surveyed starting from 1985, 1:10000.

[21] Radar altimetry data coming from NASA Space Shuttle flights have been purchased from: http://srtm.csi.cgiar.org/; ftp://e0srp01u.ecs.nasa.gov/srtm/version2/.

[22] E-mail to Topoequipos S.A., and BMP Geomatica S.A. (14:58 and 14:59 09/24/2007).