Coastal areas management against seismic and tsunami risks: socio-economic impact

DURATION : 2012 – 2013

TARGET COUNTRIES: Portugal, Morocco and Agreement countries with coastal areas

PARTNERS INVOLVED:
Coordinating Centre: CERU Lisbon, Portugal
Other Centres: CEPRIS Rabat, Morocco,
Other Partners: IDL, Portugal

OBJECTIVES OF THE PROJECT

Global objective for 2012-2013:

- Format scientific knowledge of hazards for prevention needs, including the decision-making, education and awareness-raising components;
- Develop digital models for tsunami generation, propagation and coastal amplification;
- Prepare flood maps for selected areas in order to understand the possible effects on these regions;
- Using the vulnerability model, the disasters recorded, identification of their characteristics and people's capacity to recover in connection with the concept of resilience, we will be able to demonstrate the geographic variation in the social component of vulnerability and the spectrum of relative causes;
- Publication of handbooks and leaflets.

Specific yearly objectives:
2012:

2013:
WP 1: Seminar: Presentation on the progress of work and planning for the second year
WP 2: Action plans for better adapting towns and cities to cope with geological, seismic and tsunami risks
WP 3: Disseminate the findings of the study and present them in practical form for use in involving stakeholders in the decision-making process
WP 4: Roving seminar to present the results of the project to the public

EXPECTED RESULTS

2012:
Awareness-raising and launch of the project among the scientific community, the authorities and the target population.
Geoscience summaries: Multidisciplinary scientific work relating to the project.

2013:
Initiate co-operation with local authorities on public information and education campaigns.
Initiate co-operation with local and regional authorities in order to develop plans for adapting towns and cities to earthquakes and tsunamis and to reduce the associated risks. Publication of leaflets.

RESULTS OBTAINED PREVIOUSLY

IDL (University of Lisbon) has been working with the CNRST on tsunami studies for some years now.
Two doctoral theses have been presented at the University of Ibn Tofail (Morocco) under the joint supervision of a researcher from Portugal:
Omira, Rachid (2010) "Modelling tsunami impact in NW Morocco and SW Iberia"
Kaabouben, Fatima (2010) "The impact of tsunamis on the coast of Morocco"

RESULTS OBTAINED IN 2012

Work package 1 (prepared by CERU, CEPRIS)

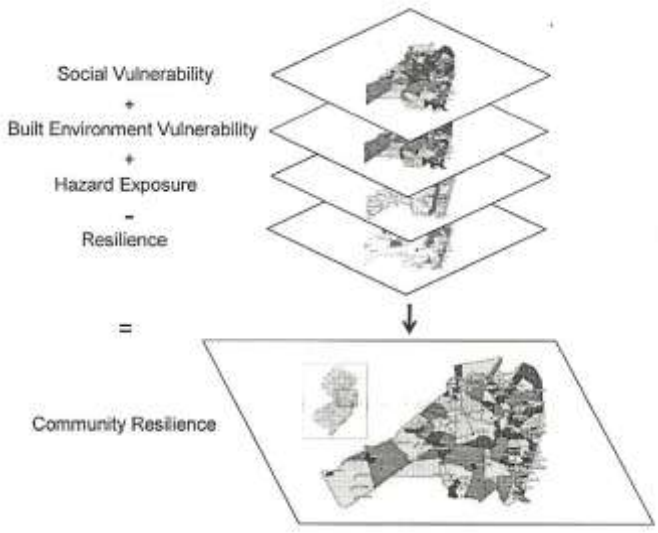
Description:
Presentation of the work programme for the two centres, participants' methodologies and approaches;
Adoption of a common approach to vulnerability assessment;
Start of work centred around four towns;
Preparation of the project brochure;
Proposed venue: Cascais or Lagos (Portugal);
Organisation costs for CERU;
Defrayal of Moroccan invitees' expenses.

Associated deliverables:

Report on the main decisions taken during the seminar. Draft version of the project brochure.

The kick-off meeting of the project (Vulresada Seminar) took place in Cascais (Portugal), from 18 to 20 of June 2012, with the support of Cascais Municipality. During this seminar the main objectives of the VULRESADA project were addressed and the major issues discussed. The seminar was attended by 20 persons among researchers (geophysics, geologists, engineers, sociologists, etc.), officers and stakeholders that have an active role in the many aspects of risk mitigation in costal zones, 17 from Portugal and 3 from Morocco. The Portuguese participants belong to 7 different institutions from Lisbon, Coimbra, Cascais and Lagos, and the Moroccan participants belong to the CEPRIS (2) and the University Mohamed V – Rabat (1). Twenty-five presentations were performed (10 from Morocco and 15 from Portugal), according to the established program.
Portugal and Morocco share a common source of destructive earthquakes and tsunamis: the Gulf of Cadiz, where the 1st November 1755 event was generated. The state-of-art from the evaluation of the seismic hazard and tsunami hazard for both countries was presented and discussed. The methodologies and the approaches proposed by both participants concerning the estimation of the building and infrastructure vulnerability, as well as the social vulnerability were presented.
The use of geographic information systems (GIS), with all associated tools, on the management of natural risks and aid to decision, the actual operational technologies of information, the vulnerability and resilience of the physical phenomena and social factors, and the urban and heritage vulnerability of the historical centres were also discussed.
The seminar ended with the discussion on the way to implement this project in the 4 selected towns: Cascais and Lagos (Portugal), Tanger and M'Dieq (Morroco)
During this first year of the project the main objective was to compile all the available information, to analyse it and to get complementary information, in order to perform the necessary geophysical studies concerning mainly tsunami impact (inundation maps). Vulnerability studies (urban, heritage and social) were also initiated, as well as contact with the local authorities in order to get their support on the field experiments and for the purposes of prevention, education and awareness of the local population.
A first draft of the project brochure was prepared.

Vulnerability and resilience methodology
Understanding resilience as the capacity of socio-ecological systems to support disturbances and reorganize, the relationship between resilience and planning is very relevant. The development of a set of core indicators that measure social vulnerability is the key to the improvement of resilience and sustainability of coastal communities. The development of coastal resilience indicators is in its infancy and at present is no standard methodology or framework for conducting baseline assessments of resilience.
The identification of metrics and standards for measuring resilience is still a challenge. This project aims at exploring the replication of a methodology developed in Hazard and Vulnerability Research Institute (HVRI), University of South Carolina - USA for a set of indicators to measure characteristics of community based on their potential resilience. By setting the basic conditions, it becomes possible to monitor changes in resilience from time to time in certain locations, allowing a comparison between different places. We will apply the model as a proof test for two Portuguese coastal cities: Lagos and Cascais. The impacts of natural disasters within this region are widespread and vary extensively: different natural hazards can be identified to these cities but this project only concerns the characterization of geological hazards taking into consideration past occurrences and the probability of future events due to the regional geologic and geophysical conditions.
Cutter and colleagues (Hazard and Vulnerability Research Institute - HVRI, University of South Carolina) using the model of disaster places (DROP model – Disaster Resilience of Place), suggests that social vulnerability is a multidimensional concept that helps to identify those characteristics and experiences of communities (and individuals) that allow them to respond and recover from natural disasters, and in this sense it is not disconnected from the concept of resilience:

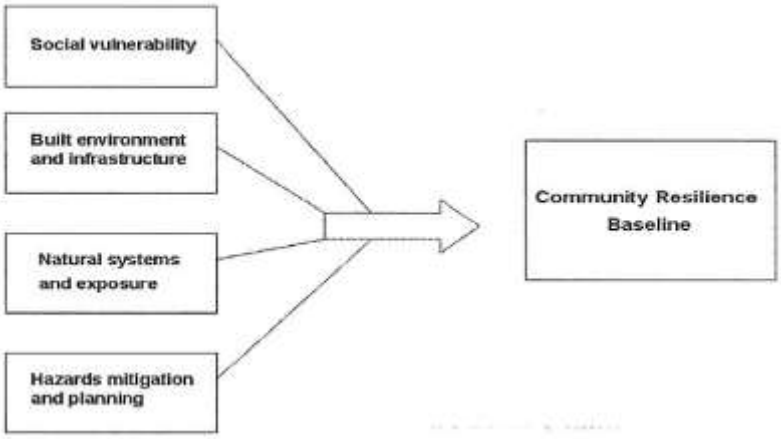


Community resilience

Since it is often difficult to measure resilience in absolute terms, we use a comparative approach and employ variables as proxies for resilience. Two considerations for variable selection:
1) justification based on the extent literature on its relevance to resilience; and

2) availability of consistent quality data from national data sources.

The DROP model presented the relationship between vulnerability and resilience in a manner that is theoretically grounded and amenable to empirical testing.
There are four key set metrics that are necessary to build profile or baseline of community resilience:



Community resilience baseline(from Susan L. Cutter, Urban Paper for the Urban Coast Institute, s.d.)

DROP framework explicitly focused on antecedent conditions, specifically those related to inherent resilience.
Disaster impacts may be reduced through improved social and organizational factors such as increased wealth, the widespread provision of disaster insurance, the improvement of social networks, increased community engagement and participation, and the local understanding of risk as well as through improvements in resilience within natural systems.
There is consensus within the research community that resilience is a multifaceted concept, which includes social, economic, institutional, infrastructural, ecological, and community elements.
Based on these findings, our index comprises these subcomponents that were then further defined for analytic and comparative purposes. The systematic development of such locally-based vulnerability assessments provides the basic understanding of the risk and its likely impacts and is the starting point.
Once we know where and how communities are vulnerable, strategies for improving their resilience can be targeted more effectively.
It would be of great interest to use and test the DROP model in Cascais and Lagos to provide an approach for establishing a hazard resilience measurement baseline that could serve as a benchmark for monitoring progress towards disaster reduction.
To achieve these objectives, it is necessary to develop a methodology for historical reconstruction of socio-demographic variables used for the Census. Thus, it is necessary to monitor changes in levels of social vulnerability (total) and dimensions that contribute to it (longitudinal analysis).
In addition, the analysis should be planned for the future, using analog data to develop realistic scenarios for the future of social vulnerabilities to reduce the risk. This methodology may also be useful to compare the levels of vulnerability of several coastal (and urban) areas elsewhere.

Work package 2 (prepared by CERU, CEPRIS):

Description:

- Comprehensive geological and topographical analysis of the four sites in a regional geodynamic context;
- Tsunami risk assessment: identification of the main tsunamigenic earthquake sources relative to the four towns. Preparation of scenario studies and tsunami risk studies;
- Analysis/determination of the bathymetry of the 4 towns;
- Flood maps;
- Assessment of the current urban sprawl and of the vulnerability of urban and social infrastructure at the sites vulnerable to tsunamis;
- Preparation of vulnerability maps in GIS format;
- Presentation of the situation to national and local institutions in the fields of town planning, infrastructure development and natural disaster prevention.

Associated deliverables:
Activity report together with the main results: geological mapping, flood maps and vulnerability maps for the 4 towns.

As the state of research progress is not the same in the two countries, different actions were undertaken to develop and implement the project in the four towns. Detailed description can be found in the technical report of both Centres.
Cascais

- Geological analysis in the context of the geodynamic environment
- Evaluation of tsunami risk – definition of the main tsunami sources
- Elaboration of tsunami scenarios and estimation of potential inundation maps

Lagos

- Revision of the geologic and geophysical studies performed some years ago
- Revision of the tsunami risk and the inundation maps performed for some selected scenarios

Tanger

- Acquisition of numeric data concerning the topography and hydrography
- Acquisition of numeric orthophotomaps and aerial photos
- Acquisition of recent bathymetric data with 10cm of resolution
- Elaboration of a new digital terrain model (DTM)
- Building surveys on the coastal areas and inside the two port zones
- Building digitalization and preliminary classification

For M'Dieq no field survey was performed up to now, but the project was already promoted by the local and regional authorities.
All the work was developed in collaboration and with the support of the municipalities of the four towns.
Collaboration between the two Centres, concerning tsunami propagation and elaboration of inundation maps, was performed in terms of a short stage of one Moroccan researcher in Portugal (Instituto Dom Luiz – IDL collaboration)

ACTIVITIES PLANNED IN 2013

Work package 1 (prepared by CERU, CEPRIS):

Description:
Seminar in Tangier (Morocco) to report on the progress of work:
Organisation costs for CEPRIS. Defrayal of Portuguese invitees' expenses.

Associated deliverables:
Progress report.

Work package 2 (prepared by CERU, CEPRIS):

Description:

- Assessment of current urban development and of the vulnerability of buildings at the sites vulnerable to earthquakes;
- Public information and education campaigns to be launched at local level;
- Comparative identification of the socio-democratic characteristics of the research sites, as a factor in identifying the inherent social vulnerability to risk. Also, identification of the protection and resilience factors of the populations at the research sites;
- Development of a methodology for historical reconstruction of the socio-demographic variables used for censuses;
- Monitoring of change in (total) social vulnerability levels and the underlying dimensions (longitudinal analysis);
- Characterisation of heritage (co-existing/types, altimetry/volume structural systems; state of preservation/detection of fragility in traditional buildings; use) vulnerable to earthquakes.

Associated deliverables:
Report on the activities carried out and main results

Work package 3 (prepared by CERU, CEPRIS):

Description:

- Co-operation with national and local authorities responsible for the planning and development of the four sites;
- Organisation of local and regional events to validate and disseminate the results of the study;
- Establishment of generic standards to ensure the resilience of heritage assets.

Associated deliverables:
Handbooks and leaflets. Report on the main findings of the project

Work package 4 (prepared by CERU Lisbon, Portugal, CEPRIS Rabat, Morocco):

Description:
Roving seminar to present the results of the project to the public, covering the 4 towns (Portugal and Morocco)

Associated deliverables:
Report on the seminars conducted in the 4 towns