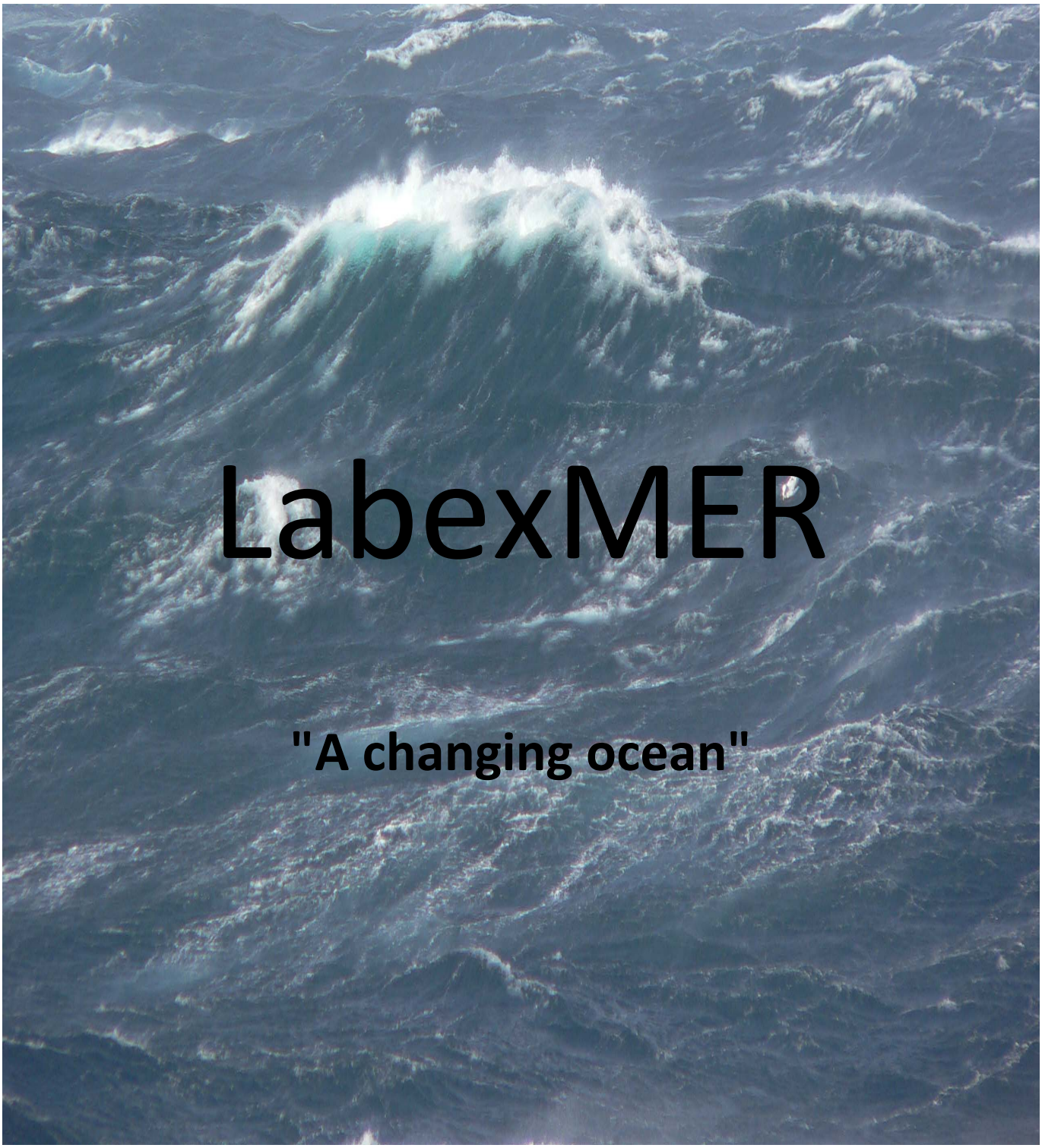

LabexMER

"A changing ocean"

LabexMER - Axe 5	**Research project 2012-2014**	**16/02/2012**

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1. AXIS 5 : DYNAMICS & VULNERABILITY OF COASTAL ZONES: OBSERVATION, MODELLING AND SCENARIOS AT THE NATURE / SOCIETY INTERFACE

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List of participating laboratories:

- LETG– UMR 6554 CNRS
- LDO – UMR 6538 CNRS

Associated laboratory:

- AMURE (Ifremer - UBO)

1.1. SCIENTIFIC CONTEXT, SCIENTIFIC QUESTIONS, 10-YEARS VISION

Coastal hazards resulting from the combination of natural and complex social dynamics. The development of coherent and long-term strategies concerning coastal management issue is one of the major challenges facing the coastal development in the coming decades. In a context of global environmental change (sediment shortage and eustatic rise of about 50 cm (IPCC, 2007), variability of climate-ocean conditions and continental hydrology at various scales of time and space and extreme societal pressures of recent decades (growing residential attractiveness echoing the "coastal development" of human activities on a global scale, ever-increasing population pressures, artificial increase in land degradation and natural areas), vulnerability to various hazards (erosion, flooding, pollution) is an essential parameter to be included in the prospective for integrated coastal zone.

The study of the vulnerability of the coast, and through it, the coastal risk management mobilizes a large number of actors from different fields. In all countries where the question arises, the state has a major role in coastal risk management, since it retains the normative point of view and the legitimate authority. Its role is to ensure a coordinated policy in the long term combining protection of inhabited places (work of defense against the sea) and prevention. In the U.S., the coastal risk management in terms of coastal erosion is based on a national monitoring of the coastline has helped provide the information necessary for the development of coastal defense operations by FEMA (Federal Emergency Management Administration). This monitoring was also used to identify and map areas subject to the risk of flooding, and to implement policies to protect the National Flood Insurance Program (NFIP). In Holland, the coastal risk management relies on developing a morphodynamic database "JARKUS" by the Dutch Department of Public Works (Rijkswaterstaat). With over 30 years of beach profile measurements along the Dutch coast, it helped to understand the spatial and temporal evolution, and define a national policy to preserve the shoreline, using when necessary large beach replenishment.

In France, in addition to coastal protection, the State has a policy of prevention based on the implementation of the Risk Prevention Plans (PPR - Plan de Prévention des Risques) (Barnier law of 1995). The achievement of the PPR is the responsibility of government services (Regional equipment, Departmental Directorates Territory and the Sea, Marine Services ...), which can also make use of consultants or private experts. In addition, municipalities play an important role in that the PPR is linked to planning documents - Local Town Planning (PLU – Plan Local d'Urbanisme). Governor of municipalities must deal with their citizens who belong to social groups with very different uses and different representations. Their role is then to assess the opposition, to give them meaning and promote the ownership of knowledge about the vulnerability of a site. Finally, other local authorities as areas for example, can play an important role in coastal risk management. The Water Act of 1992 (la Loi sur l'Eau de 1992) gives them such extensive possibilities to intervene in defense against the sea.

Therefore, studying the dynamics and vulnerably of the coastal zone assumes a good knowledge and a deep understanding of the natural and social risks. It is a major challenge to a sustainable development of these areas being faced by multiple environmental issues (weather events, pollution, overfishing, touristic pressure, etc) and societal ones (preservation, wealth, urbanization, agriculture, tourism, fisheries, transport, etc.). A deep knowledge of the socio-economic systems and the services provided by the resources is required to evaluate the acceptable pressure threshold and estimate the pressure contribution in a more general level through synthetic indicators (examples : the ecological footprint, the carrying capacity, etc.).

The axis 5 is following both scientific and operational objectives. On one hand, it concerns enhancing the understanding and comprehension of the induced risks on the coastal territories. This is achieved through taking into account the variability of both natural and anthropogenic forcing acting on different spatio-temporal scales. On the other hand, and based on this in-depth knowledge, it concerns bringing out elements to support public policy of the coastal risk management, such as erosion or coastal flooding, coastal environment pollution (hydrocarbons, heavy metals, etc.), taking into consideration the rapid effects of climate changes. In this context, society can, in fact, be seen as a variable "forcing" the coastal system, and, in a retroactive manner, as a component of the coastal system.

The methodological approach implemented will help answering the coastal vulnerability problematic trough contingency analyses, issues, representations, and environmental management. The approach is based on a construction work realized by multidisciplinary teams involving different specialties namely; humanities and social sciences, natural sciences, geosciences, economics and law. It aims at producing results that can benefit operational instances and governance.

To achieve this, the research realized in this axis needs to develop our knowledge of the extreme forcing damaging the coastal territories:

- The work is based on observing and measuring the mechanisms leading to critical situations in areas with high pressure. The complexity of the research's subject imposes using, in synergy, different observation tools (field measurements, sociological investigations, economic evaluations, satellites images, airborne, naval, and terrestrial)
- As such, the vulnerability issue of the coastal territories is spatially and economically quantified though dynamic analyses of the ground use and occupation, and socio-economic issues.
- It also concerns identifying and analyzing coastal risks representations by different social groups present in these territories, and to study the modalities and the role of different actors in the governance and decision-making.
- Based on this knowledge, the final aim is to model these dynamics and their impacts. This will allow us predict different scenarios and reliable prospective that may be used in a managerial context.

1.2. OBJECTIVES FOR THE NEXT THREE YEARS AND SPECIFIC ACTIONS

However, whether such anthropogenic forcing related to increasing urbanization of coastal areas, or natural forcing related in particular to the rise of contemporary sea level estimated at 3 mm / year on average with local variations from which projections can be made, or the likely increase in weather-marine paroxysmal events whose return periods are still poorly identified, it becomes necessary to:

- Understand the implications of climate change and / or climatic conditions on the urban spaces in the coastal zone in order to anticipate and implement appropriate management policies (eg. the National Plan of Adaptation to Climate Change for France), to reflect the societal implications of current environmental changes in terms of loss of life, damage property and socio-economic issues, possible compensation of victims and possible displacement of residents that will result;

- Preparing the future adaptation of coastal defenses, polder dikes and port infrastructure, which will in some cases be raised and strengthened to continue to play their role in relation to marine weather- for which they had not been provided;
- The provision of new anti-flood defenses, or fight against erosion, or strategies of decline.

Also, in this context, the priority is to strengthen knowledge on coastal hazards and risks and to support knowledge-based management decisions. This work is all the more necessary that scientific uncertainties still exist on many changing trends of natural forcing affecting the coastal zone and the acquisition of new knowledge on hazards remains an imperative. Our work plan should also reflect on the sharing of knowledge between scientists and with different social groups involved in coastal risk management.

The study of the vulnerability of the coast, its dynamics and its management requires an integrated, systemic and multidisciplinary approach. We therefore propose to cross, through transdisciplinary approaches to the humanities and social sciences of nature, geology, economics and law, expert climate, geomorphology, geography, sociology, psychology, economics and law to improve understanding of coastal processes of the vulnerability of territories that are submitted and representations of social groups that live there. As such, some multidisciplinary projects are already underway, including ANR COCORISCO (COmpréhension et COnnaissance des RISques CÔtiers) which implies in particular the members of the LETG, the LDO and AMURE). The work to be conducted during this first year will be to develop new federating projects along the same direction, expanding the international dimension of this research.

Initially, the study areas will be located on the coast of mainland France which offers a wide variety of natural and social situations. National workshops on these sites where data have been acquired for several years as part of previous projects will be the laboratories for the studies to be undertaken during the first year of the project. The workshops will allow us to articulate our disciplinary methodologies to create a transdisciplinary comprehensive approach, which can then be applied and / or compared to the methodologies implemented on other coastlines in the world: how can better developed international approaches be applied to our national sites? International approaches can thus help us to separate the respective human impacts on the dynamics of coastal impacts of climate change that appear very often blurred in the observations that can be made on the metropolitan coast.

The synergy between the teams of human and social sciences, natural sciences, geosciences, economists and lawyers, organized around the axis of LabexMER will benefit from the international partnerships developed independently by each team. The invitation of international experts will foster links with laboratories of international renown, with the aim of developing international collaborative projects. The effort will be concentrated during the first three years on building links with Queen's University of Belfast, University Politècnica de Catalunya and the University of Rimouski with whom discussions were already underway, and with the University of Hawaii with which LETG has worked for many years.

Besides strengthening links with the above universities, the creation of new synergies with other international research laboratories will enable the partners of axis 5 to position themselves for international calls, like INTERREG cross-Channel and the future horizon 2020 research program of the E.U. Furthermore, axis 5 will contribute in the major European / international programs such as LOICZ (Land-Ocean Interactions in the Coastal Zone).

In the short term, the axis 5 will focus its efforts to boost financial ties between the national teams SHS working on themes rather within human geography, sociology, economics, or law, and teams having a tougher approach such as physical geography, geosciences, and geomatics.