

PROES

R+D+i PROJECTS

Ocean Lider

Integrated management system for safety and security of ports

Reliability of port structures

Integrated management of risks in the transport chain

Optimization of port's operation by simulation techniques.

AREDIS (Adjustments to increase the stability of breakwaters in muddy soils)

OCEAN LIDER

OCEAN LIDER seeks for the acquisition of the necessary knowledge to implement integrated facilities taking advantage of the existing oceanic **renewable energies** all along the Spanish coasts.

Ocean Lider projet is structured in **six activities** of research:

- I. Technologies research to identify and characterize optimal and suitable **locations**, to assess marine energy resources, and design integrated units of oceanic energy generation.
- II. Technologies to take **advantage** of renewable oceanic energies.
- III. Technologies for the **distribution**, transport, transformation and quality of renewable oceanic energies.
- IV. **Management**, maintenance and intelligent communication systems for renewable oceanic farms.
- V. Technologies and systems research for the marine **operations** and safety of the oceanic energy integrated units.
- VI. Technologies research to preserve natural resources, to manage **climate changes** and marine environment.

30 M€ budget y 15 M€ funding, **iii1st Worldwide!!!**

PARTNERS

Leader:

Iberdrola Ingeniería y Construcción.



In collaboration with:

PROES (The third major enterprise providing 2M€ funds) and 19 other companies.

More than 45 Universities and research centres.

OBJECTIVES

PROES leads the ACTIVITY V and has a significant role as responsible of the ACTIVITY I and ACTIVITY VI tasks. Therefore, Ocean Lider **main goals** are based on seven fields as follows:

1. Generation of an oceanographic, socioeconomic, physical and environmental **geodatabase** in GIS (Geographic information system) software has been developed. This Geodatabase not only characterizes the marine

environment but also has allowed us select the most suitable locations to install each type of renewable oceanic energy device.



2. Numerical modelling evaluation, calibration and validation, has been carried out to obtain the energy of **currents, waves and wind** to assess the operating conditions of the renewable energy devices.

3. Systematization of the main marine operations has been required for the **installation**, operation, maintenance and dismantling the oceanic renewable energies operation system, according to the different foundation typologies.

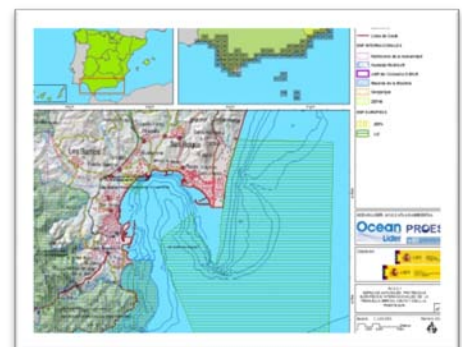


4. The acquisition of a unique methodology for the integrated management of **risks** regarding safety and security has been developed. This risk analysis has been also included on the management for answers in critical situations.
5. New methodologies, models and technologies for **environmental impact assessment** related to the renewable energy generation offshore infrastructures implementation have been developed.
6. Indicators of **marine environmental quality** and an impact monitoring methodology have been defined. A GIS marine environmental resources and sensitive "Atlas" zones has been printed.
7. The applicability of data mining techniques and Artificial intelligence, as well as the integration of results in GIS software for the monitoring and **environmental management systems**.

SCHEDULE

40 months, September 2009 to January 2013.

www.oceanlider.com



INTEGRATED MANAGEMENT SYSTEM FOR SAFETY AND SECURITY OF PORTS

This project seeks to elaborate a methodology to manage in an **integrated way the safety and security** of ports, according to current regulations by means of software that allows monitoring alerts once the Plan of Security and Safety of the Port is activated.

PARTNERS

Support entity:

Ports of the state

Leader:

Proes Consultores, S.A.

In collaboration with:

Port authority of Santa Cruz de Tenerife

University of Granada

University Carlos III, Madrid

OBJECTIVES



The identification of **port activities and facilities**.
The identification of the port **risks**.

The collection of existing **regulations and legislation in force**, related to risks analysis and evaluation of risks in ports, with the aim of establishing a unique methodology of analysis that includes all those individual regulations.

The generation of a **matrix system showing events/elements**, and developing sub matrixes to make difference between the different analyses, according to the user needs.

The establishment of **criteria to evaluate the risk**, based on the probability of presence of the element that constitutes the risk, the vulnerability of element/s susceptible/s of being attacked and the consequences derived from that situation.

The establishment of the criteria of acceptance of the **tolerable risk level**, in order to act in a homogenous way face to evaluated risks and independently to their origin.

The establishment of the **action measures according to the level of risk detected**, split in two main blocks: corrective actions and procedures of action. These measures may be agreed between the entities involved in the measures to be implemented.

The identification of the phases of **crisis management** and the elaboration of a pro-evaluative frame of the crisis management.

The establishment of a **procedure to communicate actions** (corrective actions, etc.) to the agents or entities involved.

The establishment of the structure of an integrated **plan for Safety and Security of ports** that allows the harmonization and unification of actions, increasing the effectiveness of the available technical and human resources.

The establishment of a **system for the inspection, revision, monitoring and continuous update** of the Integrated Management System of Risks that ensures the proper effectiveness of the future actions:

- Antisocial
- Navigational
- Industrial
- Dangerous goods
- Natural
- Transport
- Construction
- Port operation
- General activities

SCHEDULE

Months: January 2009 to December 2011.

RELIABILITY OF PORT STRUCTURES

The Project focuses on the evaluation of **the reliability** of maritime infra-structures during its working life.

PARTNERS

Leader:

Proes Consultores

In collaboration with:

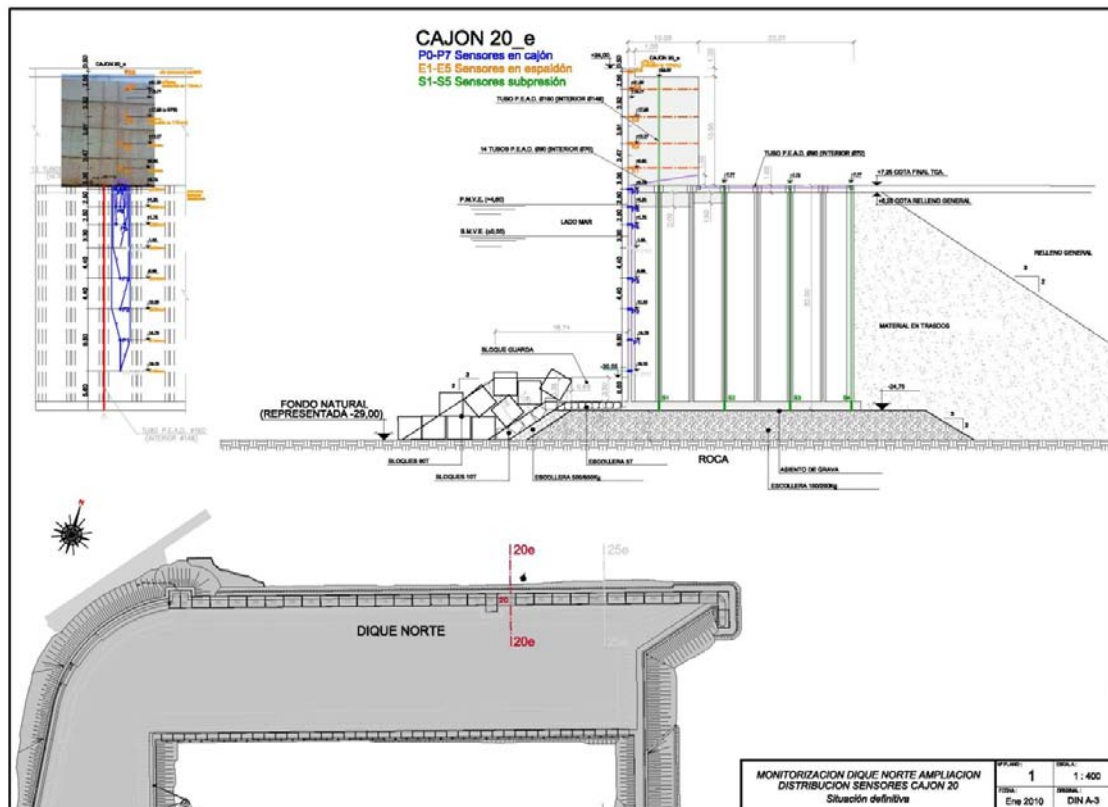
Port authority of Gijón

University of Granada

University of Santiago de Compostela

Tino Stone Group, S.A.

OBJECTIVES



The **tests** are carried out by studying the breakwater section (2D tests in wave flume), breakwater cross-section and the plan view (3D tests in wave basin). The 3D tests analyze specific breakwater sections: alignment changes, start-up and head section.



Behaviour of structures *in situ*

We study the behaviour of the structures *in situ* in order to be compared with the experimental and analytical data. The aim of the study is to evaluate the risk associated to the construction of the structure. During the working life phase, the evolution of the structure is monitored by means of the measurement of changes of the section type, failures, evolution of the damage, etc.

Failure modes

The failure modes are those failures suffered by each of them, or operative stop of works.

Calculation

The main formulas are oriented to the optimization of the section, so that a design of the breakwater is realised according to the behaviour of the site.

Evolution of the failure

It is very important to know the evolution of the failure of structures, if it can be stopped and balanced or lead to the destruction of the breakwater, for the phases of conservation and maintenance during the working life.

New typologies of seawalls

It is important that seawalls provide an optimal reliability face to the Project requirements, the whole or specific parts of the structure.

Implementation

The implementation is based on the analyses made so far, the methods of calculation of Level II and Level III against ULS and SLS.

Formulation

The formulation is carried out considering the characteristics of the load, the direction and intensity of the wind as well as the typology of the crane to evaluate the actions of this one.

Scattering of solid particles

It includes both situations, when the limits are surpassed and force to stop works and when they constitute an environmental impact risk, based on the geometry of the hopper, the characteristics of the material, the equipments used and the direction and intensity of the wind.

SCHEDULE

42 Months from January 2009 to June 2012.

INTEGRATED MANAGEMENT OF RISKS IN THE TRANSPORT CHAIN

The purpose of the project is to elaborate a **methodology** to manage in a unique and integrated way the **security and protection** of the transport chain, regarding illicit or unlawful acts (terrorism, delinquency, etc.).

The system integrates in a sole tool all the plans of safety/protection, required by different Public Administrations, codes, regulations or recommendations, applicable to the port as a whole or to any specific facilities, activities or systems developed in it.

PARTNERS

Leader:

Proes Consultores

In collaboration with:

University Rey Juan Carlos, Madrid

BB&J Consult, S.A.

OBJECTIVES



The main objective of the project consists of developing a methodology of **unique management** of the security in the transport chain, by means of a process of analysis and evaluation of any risks arising in the in port environments, to establish measures, procedures and actions directed to obtain the required minimum levels of security; to incorporate the methodology in a software of easy handling and to establish a telematic system to communicate to the organizations involved when and how to act in the procedures and activities.

The proposal is aligned with previous experiences of R+D+i promoted by Ports of the State as well as activities foreseen with this regard.

The project is framed within the industrial research, being collaboration between companies with the participation, at least of one SME.

In order to fulfil the global objective it is necessary to develop the following **individual objectives**:

- To develop to a general methodology of analysis and evaluation of **risks** to deal in a harmonic and homogenous way any risks arising in the transport chain.
- To develop a **homogeneous system** to evaluate any elements constitutive of risk, essentially its probability of presentation, the vulnerability and its consequences.
- The **current systems** use so far different criteria and elements of evaluation.
- To develop an **integrated management model** for security and safety of ports in order to transform the evaluations obtained into specific results of application with the conventional format of Security Plans, about which the existing legislation is not homogeneous and is not integrated and makes difficult to take preventive or response measures against specific emergency situations.

In order to achieve these partial goals we expose the following **specific objectives**:

- Compilation of the legislation and the **regulations in force** to analyze and evaluate individually the risks in the transport chain and to establish a unique methodology of analysis that includes the different individual regulations.
- To establish systems to identify risks by means of a general material system that takes into consideration events/elements developing a system of sub-matrix that allows making difference amongst the analyses according to the **user needs**.
- To establish criteria for **risk evaluation**, based on the probability of presentation of the element that constitutes the risk, the vulnerability of element/s susceptible/s of being affected and the consequences derived from the arising situation.
- To establish criteria of **acceptable risk** level, to act in a homogenous way face to evaluated risks, independently to its origin. This type of evaluation is established according to the perception of the existing risk in the Spanish society and to the influence of the different agents affected.
- To set up a methodology of **global action** applicable to any type of risks, in which the actions will depend basically on the level of the risk detected and not on their origin causes.
- To establish **measures to be taken** based on the detected risk level, split in two parts: corrective measures and procedures to act. These measures must be agreed between the organizations taking part of the measures to be adopted.
- To establish a procedure of communication of the **actions to be taken** (corrective measures, etc) for the agents and organizations using it.

- To set up the structure of an **integrated risk management plan** for the transport chain to harmonize the activities and increase the effectiveness of the technical and human available resources.
- To establish a system of monitoring, inspection, revision and continuous update of the **Integrated Management System of Risks** that ensures the proper effectiveness of the future actions.

SCHEDULE

33 months from October 2009 to June 2012.

OPTIMIZATION OF PORT OPERATION BY MEANS OF SIMULATION TECHNIQUES

The project develops a decision making **tool** to aid port managers and concession enterprises regarding land planning, management of traffic, planning and decision of investments, etc. The tool is based on the optimization of the port operation by means of numerical simulation techniques.

PARTNERS

Leader:

Proes Consultores

In collaboration with:

Port authority of Algeciras Bay
University Granada

OBJECTIVES

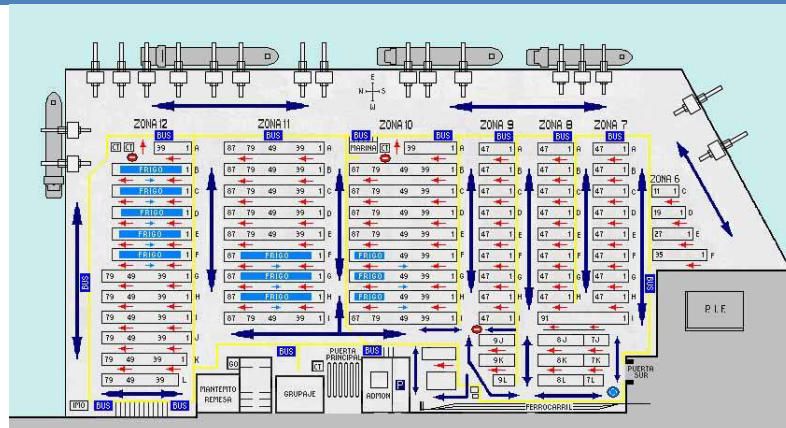


Figure 1: Simulation tool being developed

The **purpose of the project** is to develop a tool based on the optimization of the operation to be used as support to the port managers in the decision making regarding land planning, management and control of traffic, planning and decision of investments, etc.

In order to fulfil this final objective, we have settled the following **individual objectives**:



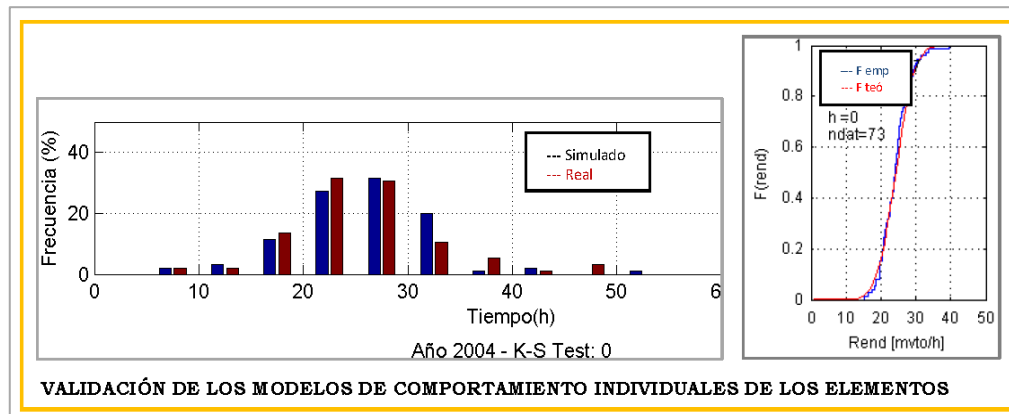
ELEMENTOS QUE INFLUYEN EN LA OPERATIVA PORTUARIA

Modelling individual elements

The interest of this objective is to identify every element that is affecting the port operation, obtaining their factors of characterisation and the models that allow simulating their behaviour.

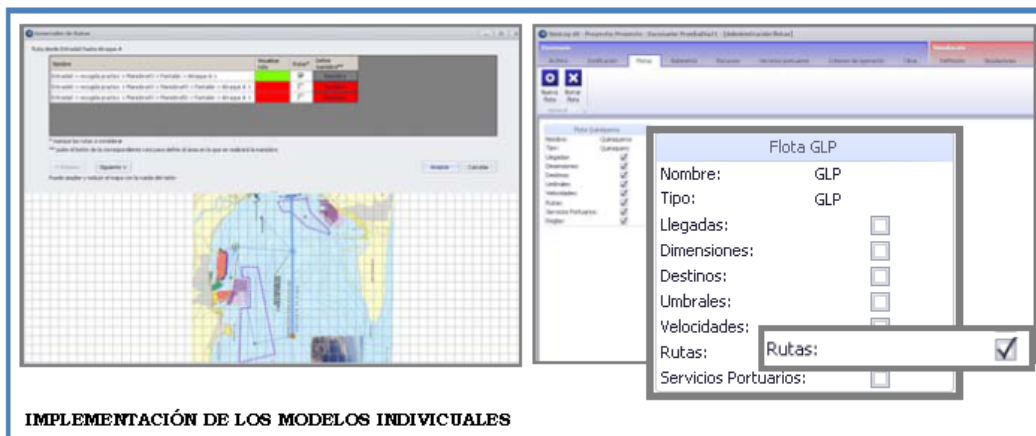
Integrated methodology of simulation of port operation

On the basis of the individual knowledge of the elements characterizing and determining the port operation, we have established a procedure to reproduce this operation in an integrated way.



Software development

It is focused on the creation of an easy handling simulation tool with a wide applicability that, considering the interaction between the individual elements affecting the port operation, can optimize it.



Diffusion of the tool

The diffusion of this tool consist of the distribution of the developed tool and the use of the feedback to generalize it, so that it can be implemented in the rest of the Port Authorities which entails an improvement of the global operation of the Spanish ports system.

SCHEDULE

36 months, from July 2009 to June 2012.

AREDIS: ADJUSTMENTS TO STRENGTHEN THE STABILITY OF BREAKWATERS IN MUDDY SOILS

The **aim** of the project is to develop techniques to face problems related to the design of breakwaters with slope in regions with soils catalogued as low quality or resistance due to their composition of fine materials (clays and slimes).

In this sense we propose **physical model tests**, and study with these results, the possible practical solutions to the current problems of design of breakwaters on muddy or cohesive soils, raising solutions focused on foundations and the way to settle structures. Furthermore, we have drawn up several recommendations for their use in the engineering sector.

PARTNERS

Leader:



ALEPH Ingenieros Consultores, S.A de C.V.

In collaboration with:

PROES

Proes Consultores



University of Granada



National Autonomous University of México (UNAM)

OBJETIVES

The **main objective** of AREDIS is to develop the necessary techniques to face the problematic arising when designing sloping jetties in low quality soils composed by fine materials (clay and slime).

In that sense, we have established the following **specific objectives**:

Waves flume.

To design, construct and implement a 2D wave's flume of 20 ms length, 30 cm width and 60 cm high, with lateral sides and bottom made of glass. This installation is necessary to complete the test program.

Waves-jetty-land.

The tests carried out in the laboratory characterize the interaction between the waves and the slope-dock on muddy soils: deformation of the profile of the structure, reflection and tidal surge on the slope. They also allow studying the temporary evolution of the scouring at the bottom of the dock and even indicate possible failures of the structure.

Liquefaction of the soil.

The aim is to generate so many stresses in the soil, as to raise the liquefaction of the cohesive material and to evaluate the impact of that in the stability of the structure. It also investigates the possibility of reproducing the conditions in which the settlement of a breakwater has a feasible magnitude to be considered as a failure.

Analysis and results.

It includes the analysis of the data collected from the tests and the recommendations proposed to design breakwaters in cohesive beds. It also includes the revision of the conditions of failure of the bed and how it affects the hydrodynamic and morphologic parameters, with the purpose of designing adjustments or new pieces, constructive procedures and technical specifications to guarantee the stability of the breakwaters.

SCHEDULE

26 months, from November 2011 to December 2013.