

WORKSHOP

# RISK GOVERNANCE FOR SOUTH ATLANTIC

Includes the presentation and discussion of IST's Master Student Projects

(Course on "Technological and Natural Risks", of the IST's Master in Environmental Engineering and the Master in Engineering and Energy Management)

Venue: IST Congress Center

2 June 2014, 9h30-13h30

Scientific Coordination: Manuel Heitor  
Center for Innovation, Technology and Policy Research (IN+/IST-UTL)

In collaboration with:

**International Observatory for Oil&Gas Policies - South Atlantic, Latin America and Sub-Saharan Africa**

<http://www.oipg.org/>

Organization:

Center for Innovation, Technology and Policy Research, IN+  
Instituto Superior Técnico, Lisboa  
<http://in3.dem.ist.utl.pt/>

International Risk Governance Council – Portugal, IRGC-Portugal  
<http://www.irgc-portugal.org/>



## Goals of the workshop

This workshop is oriented towards the analysis of emerging systemic risks in South Atlantic, in association with technological, economic and environmental challenges of the exploration of oil and gas. It is based on the presentation and discussion of IST's Master Student Projects, which have been performed during the last months in the context of the Course on Technological and Natural Risks, of the Master in Environmental Engineering and the Master in Engineering and Energy Management.

Each group of students has identified and analysed a specific issue in energy security, risk governance and/or socioeconomic resilience across the Atlantic. The projects consider a risk communication strategy.

The ultimate goal is that all projects contribute for the development of a web-based Observatory for risk governance in South Atlantic, stimulating a process of public participation in the discussion of emerging opportunities and challenges in South Atlantic (see at [www.oipg.org](http://www.oipg.org) ).

## Rationale

Analysis of emerging and systemic risks, facilitating societies to benefit from technical change, while minimising the negative consequences of associated risks. The focus is on technological and natural risks, as analysed together with major societal risks, including unemployment and related deindustrialization risks. The ultimate goal is to help design engineering practices to deal with uncertainty, including industrialization strategies that consider major opportunities associated with the need to mitigate energy and environment related risks. This includes the discussion of stakeholder engagement processes to help communicate emerging risks and to foster their mitigation.

The IST course on Technological and Natural Risks is project-based and problem-oriented, including the analysis of specific cases and fieldwork by groups of students. It involves the identification and formulation of a specific issue in risk governance, to be followed by research work by group of students. A comprehensive framework for risk analysis and governance will be used following best international practices, as by the OECD and the International Risk Governance Council, IRGC (<http://www.irgc.org/risk-governance/irgc-risk-governance-framework/> ).

## Background note:

The identification of vast hydrocarbons resources in the Brazilian pre-salt and, eventually, in the African pre-salt, as well as the technological innovations that led to the rapid increase of unconventional hydrocarbons resources in the USA both are reshaping the energy geopolitics. The recent gas discoveries in Mozambique sustain this process.

The increase supply of hydrocarbons in the North Atlantic (USA, Canada and potentially Mexico) and in the South Atlantic (Brazil, West Africa and potentially Venezuela) diminishes the economic risks of the disruptions in the Middle East oil supply for the Atlantic nations. In addition, the expansion of the Panama Canal (as expected in 2015) in times of increased uncertainty in the energy markets and potential production of unconventional gas worldwide, may foster new systemic risks to emerge in the Atlantic, particularly in the South Atlantic. This will probably occur together with traffic and major commercial sea routes, which will be significantly enhanced with the emergence of new industries in several parts of the Atlantic coast, including East and West Africa and Northern Brazil.

These changes may impact the overall scenarios for energy security at a global level, which require to be addressed and discussed in detail. In addition, many port zones in Latin America (e.g., Rio de Janeiro and Santos in Southeastern Brazil; Suape, Bahia and Pecém in Northeastern Brazil) and Southern and Atlantic Europe (including Sines, Lisbon and Leixões in Portugal, Valencia in Southeastern Spain, Las Palmas in Canarias, Algeciras), as well as in northern Europe (e.g., Rotterdam, in the Netherlands), will compete for promoting entry/exit gates of merchandise, thus leaden to opportunities to develop, and adding new

risks to those regions. This initiative should focus on those changes in terms of technological and systemic risks.

The effects of this new context are not fully understood and, certainly, poorly measured as yet. Recent data suggests that a process of reindustrialization is emerging in North America and that the industrialization process in the South Atlantic is gaining momentum. If so happens, trade among Atlantic nations is likely to take off with obvious impact on trade between Pacific and Atlantic nations.

In any circumstance, the hydrocarbons resources of the Portuguese speaking countries (in particular, Brazil, Mozambique and Angola) will play a significant role in the reshaping of the geopolitics of energy. This initiative intends to explore this role and to help deepening our understanding of emerging risks and opportunities. It aims to identify the current perception of academics, regulators, government officials and oil operators of Angola, Brazil, Portugal and Mozambique on this issue and to set a new research agenda.

The overall issue was discussed in a workshop organized in Porto, Portugal, by the time of the XV Conference on Latin Ibero-American Management of Technology - ALTEC 2013, <http://www.altec2013.org/>. It brought together different experts and stakeholders to discuss emerging challenges and opportunities for South Atlantic.

### **Specific Goals: Student Learning Outcomes**

To develop students' competence and self-confidence as engineers able to deal with uncertainty and address complex issues associated with emerging and systemic risks. Emphasis is on the analysis of emerging systemic risks in South Atlantic, in association with technological, economic and environmental challenges of the exploration of oil and gas and related industrialization processes. The ultimate goal is to understand the need to mitigate energy and environment related risks and the secure operation of off-shore and industrial and/or port sites in the South Atlantic.

## PROGRAM

Monday, June 2, 2014, 9:30 am – 1:30pm

### **Introductory Notes**, by invited discussants:

Manuel Heitor, IN+/IST-UTL  
Carlos Andrade, Galp Energia (tbc)  
Ruben Eiras, Galp Energy  
Fernanda Povoleri, Technip  
António Sarmiento, WAVEC (tbc)  
Artur Costa, CEIIA (tbc)  
Fernanda Carvalho, IST

### **Project presentation and discussion**

- **Project 1: Perspectives for south Atlantic after the enlargement of Panama Canal: a risk governance analysis**
  - Guilherme Correia, Julius Müller, Vanessa Tomás
- **Project 2: Risks of explosions: application of scenario analysis to the Port of Sines**
  - Patrícia Ribeiro, Sara Justino
- **Project 3: Scenarios for high impact events in industrial Ports: a risk governance analysis**
  - Martyna Grzegorzolka, Iselin Wabakken
- **Project 4: Managing environmental related risks in FPSOs**
  - Dominika Lesniaková, Mariana Marçal
- **Project 5: Inspection of risers at deep sea with submarine robotic**
  - Kristian Mollestad, Mikko Riuttamäki, Jarmo Hirvonen
- **Project 6: Submarine Robotics - opportunities and challenges under a risk governance perspective**
  - Bernardo Fazenda, Veronika Lambertová
- **Project 7: Skills and Labour force Dynamics: a comparative analysis of Norway and Angola**
  - Marion Jakobsen, Admir Rosa, Pedro Fonseca
- **Project 8: Supply Risks and Opportunities for gas – Comparative analysis of UK and Mozambique**
  - Inês Simões, Thomas Hiorns, Joana Sousa
- **Project 9: Risks associated to blowout in oil and gas facilities**
  - Tiago Morais, Marco Pereira

**Closure and Lunch:** 1:30pm

## **Project Abstracts**

### **Project 1: Perspectives for south Atlantic after the enlargement of Panama Canal: a risk governance analysis**

- Guilherme Correia, Julius Müller, Vanessa Tomás

This project approaches potential changes in South Atlantic in association with the upcoming expansion of Panama Canal (for bigger shipping vessels). It considers potential impacts in the vicinity of Panama Canal and in three ports far away from the canal: two in South America (Suape and Cartagena ports) and one in Southern Europe (Sines port). The analysis is driven by international markets competition and demand for goods, still leading to the improvement of their transportation. It is known that this type of changes and markets development have impacts in economy, environment and in safety due to the possibility of worse hazard situations. The IRGC framework is used for the analysis.

The report emphasizes environmental impacts and major risks which are important to predict the future of the canal. Different trade routes and industrial opportunities in the various ports analyzed in South Atlantic were developed through different scenarios. As result of our work, we strongly believe that this expansion of Panama canal will definitely lead to an increase of maritime traffic in South Atlantic, mainly larger vessels. Ports will be a key element and there are many possibilities laying on them, depending on their relative positioning. Yet, considering emerging new scenarios of energy resources in South Atlantic, there is a good possibility to a relative boom of industrialization in countries nearby that area.

### **Project 2: Risks of explosions: application of scenario analysis to the Port of Sines**

- Patrícia Ribeiro, Sara Justino

This project consists in analyzing the risk of explosions and related applications to the Port of Sines, making use of the IRGC report about Malacca / Singapore as a basis of reference. The focuses is on the refinery and petrochemical sites located in Sines.

The report considers five parts, as follows: i) Analysis of the Malacca / Singapore report, considering related explosion scenarios; ii) Risks: the explosion scenario, listing the hazards and risks, describing a general approach to risk an explosion scenarios. Characterization of the Port of Sines; iii) Analysis of the Port of Sines infrastructure and interviews collected; iv) application of the explosion scenario to the Port of Sines; and v) Conclusions, including a comparison of the infrastructures analyzed in Sines with the Malacca / Singapore report and final recommendations to prevent/minimize risk associated with explosions.

### **Project 3: Scenarios for high impact events in industrial Ports: a risk governance analysis**

- Martyna Grzegorzolka, Iselin Wabakken

The project consists of establishing scenarios for high impact events in industrial ports. The risk picture existing at ports and the challenges the different port operators is used to foresee possible impact scenarios and mitigating actions. The main goal is to reduce risk level in the ports of South Atlantic.

The ports of Lobito and Santos are the ports that will be in focus and two other European ports will be used in comparison. The risk analysis method that will be used in this paper is a preliminary hazard

analysis, often referred to as PHA. Several relevant stakeholders are considered and a comparative analysis is established against the IRGC Report of the Malacca and Singapore ports, as well as other available reports and hazardous/impact data. The report highlights impact scenarios that may occur caused by ship traffic at ports and provides expert opinions regarding risk challenges in ports. The potential scenarios are based on actual scenarios that might have happened in other ports of the world.

#### **Project 4: Managing environmental related risks in FPSOs**

- Dominika Lesniaková, Mariana Marçal

This project focus on the floating production, storage and offloading (FPSO) units used in offshore oil and gas exploration. It considers two major issues with critical implications for risk governante in the South Atlantic: i) morins system; and ii) alarm procederes. It makes use of case studies along with information obtained from professionals, aiming at two main goals, namely: i) identify the effectiveness of morins systems; and ii) identify hazard scenarios/events and potential associated human errors.

#### **Project 5: Inspection of risers at deep sea with submarine robotic**

- Kristian Mollestad, Mikko Riuttamäki, Jarmo Hirvonen

In this project we are studying the use of submarine robotics for riser inspection in context with South Atlantic oil drilling. We are using a case study and scientific papers as source material. We also contact professionals to have the newest knowledge to add to our work. We are studying the advantages of using robotics with risers and also the new risks involved with them. We are also interested in regulatory frame works for submarine robotics.

The goal of this study is to recognize the biggest advantages and risks of using robots and make recommendations for future regulations of using submarine robotics. This study is a basic study to help the oil industry to develop the oil drilling operations in South Atlantic with using robotics to make the drilling safer and more efficient.

This study contains an introduction to oil risers and underwater robotic technologies such as Remote Operated Vehicle (ROV) and Autonomous Underwater Vehicle (AUV). We are using a case study from Deepwater Horizon to present real data of using robotics and understanding the real risk involving riser failure. We assess the possible risk of collision between robots and riser and in the end of the study the recommended regulations are presented. We are also assessing the economical aspect of using robots with risers.

#### **Project 6: Submarine Robotics - opportunities and challenges under a risk governance perspective**

- Bernardo Fazenda, Veronika Lambertová

This project is focused on discussing the skills and responsibilities necessary to build, maintain and operate submarine robotics for oil and gas exploration. It considers education and training programs used by typical Oil Field Services (OFSs), looking at examples in the firms Subsea 7 and Technip to prepare robotic specialists for real exploitation purposes.

The analysis considers evolving market situations and how to open up future markets under increasing uncertainty, with emphasis on unmanned robotic vehicles (AUVs), intervention robots or hybrid underwater vehicles. The potential use of multiple AUVs is discussed in terms of underwater network systems that can communicate among each other. The emphasis is on applications for deep water, including the need to meet emerging requirements in relation to positional accuracy, speed and cost.

### **Project 7: Skills and Labour force Dynamics: a comparative analysis of Norway and Angola**

- Marion Jakobsen, Admir Rosa, Pedro Fonseca

This project considers the importance of training in the offshore industry, making use of a comparative study in Norway and in Angola. We have looked into what can happen, what consequences there are, and what the risk is of an accident happening due to lack of adequate training. To evaluate this specific issue, we have used our own training experience in Norway and Angola respectively, through accident reports from the Petroleum Safety Authority Norway and we have made an interview with an employee in Total EP.

The analysis shows that the process of implementing safety must consider “behavior” and cultural components of good safety practices, which are very important along with safety management systems and go far beyond formal training procedures. In other words, our analysis shows that an adequate safety practice requires skills and practices that are not adequately transmitted exclusively in formal training programs. They require systematic learning procedures through “Hands-on” and “on the job” practice, which make “safety learning” a long timely and complex process. For example, when studying the different training schemes in Norway and Angola, we found similar formal training schemes, but a rather different safety attitude and practice. The related implications for regulatory safety systems are discussed.

### **Project 8: Supply Risks and Opportunities for gas – Comparative analysis of UK and Mozambique**

- Inês Simões, Thomas Hiorns, Joana Sousa

In the report “Are We Entering a Golden Age of Gas?” published in June 2011, the International Energy Agency (IEA) described a positive outlook for the global future of natural gas, with natural gas being the only fossil fuel whose share of the global energy mix is expected to grow.

Africa is currently a small but growing part of the global gas picture (with prospects even brighter), whose gas resources have long attracted a large spectrum of investors. Although North Africa has historically led the continent’s gas sector, recent growth has come from the huge discoveries in offshore East Africa (in particular, Mozambique and Tanzania). The development of this sector holds tremendous opportunity for Africa and it will certainly boost the economic and social development.

On the opposite side is UK, which is a developed country with the world's sixth-largest economy (by nominal GDP). Moreover, UK was, from the late 1970s to the early 20s, a major exporter of gas, followed by a decline in production, reason why it is now a net importer. Thus, and because opportunities always come with risks and challenges, Mozambique can learn from the UK, from the way it developed his solid gas infrastructure and market, but also from the mistakes that caused a volatile market and a decline of production. Those risks and opportunities assessment and comparison between the two countries, are the main goals for our project.



## **Project 9: Risks associated to blowout in oil and gas facilities**

- Tiago Morais, Marco Pereira

This project focuses on blowout's risks in offshore gas explorations, as they are frequently related with oil exploration. It is aimed to better understand the characterization of blowout's risks and to identify their principal's causes, blowout's types and possible consequences. It includes the identification of a few measures to prevent these events, with emphasis on the South Atlantic region, more specifically in Brazil, due to the growing perspectives for the development of offshore hydrocarbon exploration.

The analysis considers the Macondo's well blowout, in the Gulf of Mexico in 2010, as a reference case study, which had devastating consequences in the region. The ultimate goal is to guide the development of risk regulatory frameworks for South Atlantic and a comparative analysis between USA and Brazilian legislation is established. It shows that the North American legislation is more specific and restrictive compared with that of Brazil, leading us to suggest measures that can be adopted in Brazil to help minimizing the probability of blowout's occurrence in oil and gas explorations.