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The European Emerging Risk Radar Initiative – a Future Possibility for Latin America?

Iniciativa europea del radar para riesgos emergentes - ¿una posibilidad a futuro para América Latina?

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Key words
Emerging risk, risk radar, new technologies.

Abstract
The EU project: Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related, Risks – iNTeg-Risk, has developed a pragmatic and unusual approach for an integrated emerging risk management framework. The main objective was to develop a series of specific innovative solutions by applying good risk management principles and elaborate more generic and integrated solutions which all together enable us to "better understand how to manage emerging risk in a very uncertain and complex world".
The paper provides an overview of the different results and tools achieved in iNTeg-Risk project, highlighting some very important achievements regarding emerging risks in the area of process safety such as LNG regasification, remote operations, NaTech events, among others. In order to ensure sustainability of the iNTeg-Risk results, the European Emerging Risk Radar (E2R2) is an initiative envisaged as one of the potential ways by focusing on early recognition, monitoring and management of emerging risks.

Palabras claves
Riesgo emergente, radar de riesgo, nuevas tecnologías.

Resumen
El proyecto de la Unión Europea (UE): Reconocimiento temprano, monitoreo y gestión integral de riesgos emergentes relacionados con las nuevas tecnologías -iNTeg-Risk ha desarrollado un pragmático e inusual enfoque para un marco integral en la gestión de riesgos emergentes. El principal objetivo de este trabajo fue desarrollar una serie de soluciones específicas e innovadoras aplicando buenos principios de gestión de riesgos y elaborar soluciones más genéricas e integradas, que todas juntas, nos permitan "entender mejor cómo gestionar los riesgos emergentes en un mundo incierto y complejo".
El presente artículo presenta una visión general de los diferentes resultados y herramientas desarrolladas a través del proyecto iNTeg-Risk, resaltando algunos logros muy importantes en relación con riesgos emergentes en el área de seguridad de los procesos tales como la regasificación de LNG, operaciones remotas, eventos NaTech, entre otros. Con el fin de asegurar sostenibilidad de los resultados de iNTeg-Risk, el radar europeo de riesgos emergente (E2R2) es una iniciativa prevista como uno de los caminos potenciales para el reconocimiento temprano, monitoreo y gestión de riesgos emergentes.

Introduction – iNTeg-Risk project as the origin of the E2R2 initiative

In order to ensure the main EU goal to be the world leading knowledge-based society, the EU has to ensure that technologies and products developed are accepted by stakeholders in industry and society. Acceptance can be reached only if stakeholders are convinced that possible or perceived emerging risks related to these technologies can be managed in safe, sustainable and transparent way. The term emerging risks refers to new and /or increasing risks, by which there is lack of confidence in the ability of industry and authorities to identify and manage [1].

By 'new' is meant that:
a) the risk did not previously exist and is caused by new processes, new technologies, new types of workplace, or social or organizational change; or,
b) a long-standing issue is newly con-

sidered as a risk due to change in social or public perception; or,

c) new scientific knowledge allows a long-standing issue to be identified as a risk.

The risk is 'increasing' if the:

i. number of hazards leading to the risk is growing; or the,

ii. likelihood of exposure to the hazard leading to the risk is increasing; or the,

iii. effect of the hazard is getting worse (severity of consequences and/or the extent of human values affected).

Transparency of the work and of the solutions delivered in the projects is required both by the public bodies behind the research and the general public. The transparency is a precondition for having the research and innovation perceived as balanced, fair and beneficial for the society. What is "beneficial for the society" is, however, not a term precisely defined and it can be a topic of profound differences in opinions among different stakeholders groups in a society. Especially the question "is a particular innovation (e.g. a new technology – e.g. nanotechnology, new materials or new energy production technologies) beneficial for the society" often cannot be answered in a simple and straightforward way, most often because the question is posed in the reversed way: "how can one be sure that the innovation will not involve risks which one does not want to accept", the question leading to the so called precautionary principle, "better safe than sorry". This principle is well rooted in Europe and in the EU policies on the highest level and in a formal way. But the practical implementation of the general principles poses a lot of challenges and leads to different solutions.

The main goal of the iNTeg-Risk project [2], is to improve the ability of the EU industry, society and authorities to identify, monitor and manage emerging risks. The project improves chances of market success of European innovation and new technologies developed in the EU. The project has proposed a new management paradigm for emerging risks as a set of principles supported by agreed tools and methods all integrated into a single framework. The main aim is to reduce time-to-market for the new technologies "made in EU" and promote safety, security, environmental friendliness and social responsibility as a competitive advantage and a trademark of the EU technologies within the next 15 years.

The "EU response" proposed by the project is based on 17 individual applications of new technologies like nano, H_2 technologies, underground storage of CO_2, new materials, etc, which all are named as: ERRAs - Emerging Risk Representative Applications in EU Industry. The solutions are being generalized and used for the framework, which is validated in a second application cycle. Overall solutions are made available to the users in the form of the iNTeg-Risk "1StopShop" for EU solutions addressing emerging risks. The solution includes issues of early recognition and monitoring of emerging risks, communication, governance, prestandardization, education & training, dissemination, as well as new tools such as Safetypedia, RiskAtlas of Emerging Risks, Reference Library, etc.

The main purpose of the present paper is to highlight the most important results and tools developed in the project in order to be able to identify the possible future collaboration with stakeholders in Latin America, especially for those emerging risks having the more "globalization" character.

Emerging risks representative applications (ERRAs)

Emerging Risks Representative (industrial) Applications (ERRAs) are significant examples of applications related to industrial safety (emerging risks). Solutions for the these single, specific problems related to emerging risks should allow to capitalize upon and, by generalizing the solutions, build the common European approach to emerging risk. ERRAs are grouped around emerging risks related to categories shown in Table 1.

Table 1. ERRAs from iNTeg-Risk project

Group A	Group B	Group C	Group D
Intensification and development of new and advanced technologies	New materials and products	Complex industrial systems and networks	New global / EU / local emerging risk policies
A1 - Carbon Capture Storage	B1 - Nano-materials	C1 - Outsourcing	D1 - Key Performance Indicators for Emerging Risks
A2 - Insurance	B2 - Storage of materials	C2 - Remote operations	D2 - Distributed Energy Resources
A3 - Autom. surveillance	B3 - Advanced Materials	C3 - On-line monitoring	D3 – NaTech - Natural-technological accidents
A4 - Liquefied Natural Gas		C4 - Atypical Scenarios	D4 - Public Health
A5 - Underground hubs		C5 - Energy supply	

ERRAs, such as Liquefied Natural Gas, Remote Operations in Sensitive Areas, Outsourcing and NaTech, are important for process safety with very high global impact. Due to the specified audience of the present paper, we will mention some of the results achieved in iNTeg-Risk project accordingly to the above mentioned ERRAs [3-6].

Liquid Natural Gas (LGN) regasification in sensitive areas on-shore and offshore

- Technologies related to the floating and off-shore LNG terminals are now tackling the market of the new regasification plants in Europe and in the US. Within the iNTeg-Risk Project, the emerging risks related to safety and security of new and alternative technologies for LNG regasification were explored and solutions based on very complete catalogue of LNG risk models and methods were developed [3].

Remote Operations in Environmentally Sensitive Areas

- The purpose of this ERRA consists in describing early warning indicators of emerging risks focused on avoiding accidents (with potential oil spills). The main focus is placed in production of oil and gas with the use of integrated operations in environmentally sensitive areas. The challenge of managing risk at an acceptable level is amplified by the harsh climate, strict environmental requirements and sensitive environment areas. Within iNTeg-Risk project, it has used two approaches for the development of early warnings, a safety performance based approach developed by HSE (2006) – the so-called "dual assurance" approach, and a resilience based approach denoted REWI – Resilience based Early Warning indicators method [4].

Outsourcing

- When large industries run their operations on specialized subcontractors performing activities independently, safety must be managed and coordinated across organizational boundaries. Outsourcing and subcontracting have been considered as emerging risk issues due to the fragmentation and coordination of work appears to pose challenges to safety management. The main task of this ERRA is to identify, generalize and describe recommendations and good practices concerning parts of safety management which addresses outsourcing and subcontracting. The ERRA proposes an analysis of risk related to subcontracting and a model for safe outsourcing and subcontracting (guideline for establishing good practice in safety management addressing subcontracting of safety-criticatasks) [5],[6].

NaTech

- NaTech accident is defined by a chemical emergency caused by a natural hazard or a natural disaster. The main results of this ERRA within the project are:
- Handbook of Good Practices for the Mitigation of NaTech risk,
- New NaTech Risk Analysis Method, resulting of the combination between QRA CONPRICI method and INERIS Bow Tie Method,
- Development of specified Key Performance Indicators for NaTech. The Key performance indicators cover different safety measures and emergency response in the fields of earthquake, flooding, lightning and forest fires [7].

Main results of integ-risk project available so far

The project has successfully finished the bulk of its work and achieved significant results. The following are the main results of the project until May 2012 [8, 11].

RiskAtlas:

- It is a system for mapping of emerging and other risks with over 200 layers of data related to hazards and vulnerabilities, such as earthquakes, hazardous materials, industrial plants and similar; the emerging risks can be "recognized" by screening the list of calculated "risk distances" for the hazard-vulnerability pairs of points in the respective layers (See Figure 1). Benefits of using RiskAtlas are the following:
- Data quality enhancement
- Data sharing
- Extensive and up to date
- Trigger for control and enforcement
- Setting priorities according to risk grade
- Communication on risks
- Administrative responsibilities
- Reinforcement of the safety chain
- Providing transparent government information

RiskEars:

- It is a database system for acquisition and monitoring of early warnings. From the first "notions" indicating that something can become a threat, RiskEars enables to manage and follow the further development or maturation of the notion towards a full-scale risk. The approx. 900 "notions" collected so far are analyzed in the project.

RiskRadar:

- Is a monitoring tool to identify/locate/assess the risk according to the criticality and includes the following groups:
- Risk Radar Environmental
- Socio-political
- Economic/Financial
- Regulatory/Legal
- Technological

Risks are categorized in five clusters (See Figure 2), with the distance from the center of the radar indicating the criticality of the issue. A sample of notions (via the browser) can be selected and the selection for comparison can be displayed, or the most critical RiskTweet entries can be automatically retrieved. RiskRadar provides the way to visualize and analyze the notions in RiskEars. In addition, it feeds RiskEars

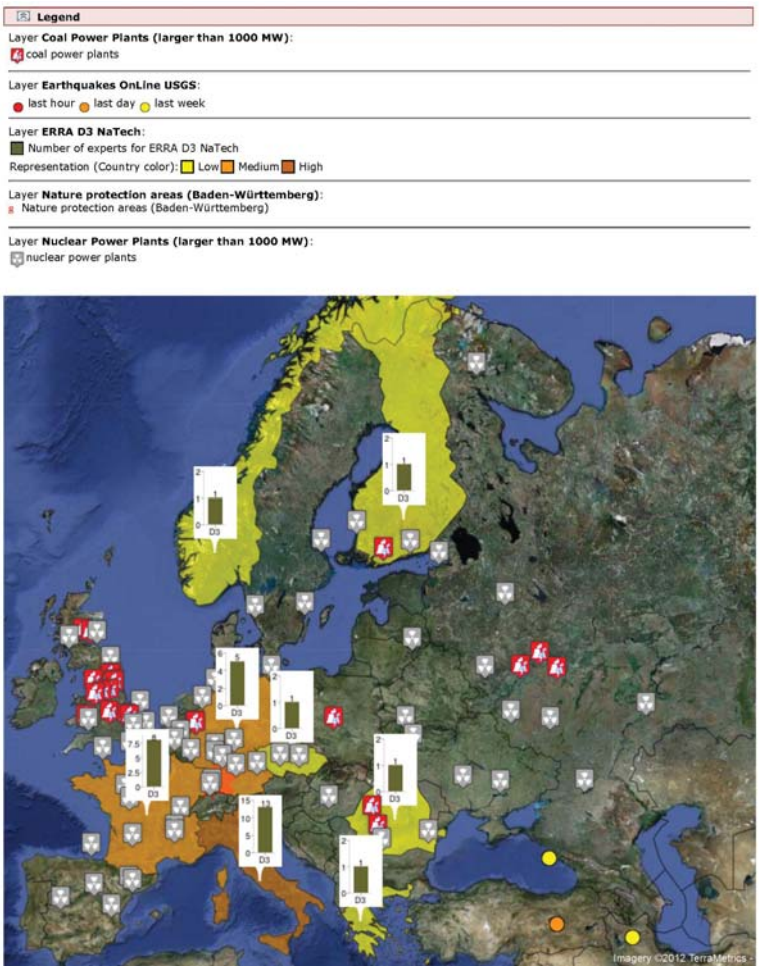
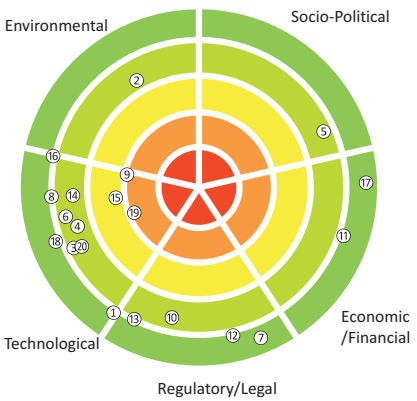


Figure 1. iNTeg-Risk – RiskAtlas



1. Geomagnetic storms - Impacts
2. Misuse of / resistance to antibiotics
3. Cyber vulnerability
4. Malicious effects - nano-technology
5. Gene therapy
6. Space debris
7. Terahertz technology
8. LNG re-gasification in sensitive areas
9. Fracking
10. Unmanned aircraft accuracy - Drones
11. Risk of unsustainable market rise
12. London Riots
13. Occupy Wall Street
14. Increasing losses on wind turbines
15. Genetically modified organisms
16. Critical infrastructures
17. Outsourcing
18. Biogas as a booming business
19. Fracking linked to energy storage
20. Fracking

Figure 2. iNTeg-Risk - RiskRadar

with the inputs from web-analysis such as, on-line analysis of web contents, social networks monitoring, Twitter monitoring, scientific abstracts monitoring, etc.

CEN Workshop Agreement (CWA):

- iNTeg-Risk Consortium has started the work on a CEN Workshop Agreement aimed to the standardization of approaches to analysis of emerging risks. A liaison between this activity and ISO PC262 (ISO 31000) has been established.
- About 20 other new applications/ tools, including, for instance, the "Intelligent Agent Based New Technology Acceptance Analyzer" are all part of "iNTeg-Risk 1StopShop", the project web and delivery platform [12]. Based on these results, the E2R2 initiative has come up with one of the potential ways to ensure sustainability of iNTeg-Risk results [1-3], focusing on early recognition, monitoring and management of emerging risks.

The solution for emerging risks offered by 1StopShop

Solution from the Emerging Risk Representative Applications (ERRAs) have been generalized and have been used in the definition for the Emerging Risk Management Framework (ERMF) implemented in the iNTeg-Risk 1StopShop and its main elements [13]. According to the definition of emerging risk proposed by the EU-OSHA[1], the 1StopShop offers a "solution" for a number of issues related to emerging risks, including early recognition of emerging risks, identification the most critical emerging risks, monitoring and optimized follow-up for the recognized emerging risks, systematic interlinking among hazards, vulnerabilities and stakeholders, etc, as shown in Table 2.

The goal and realization of E2R2 initiative

The goal of the E2R2 initiative

E2R2 initiative envisaged as a platform will enable the users to recognize, mo-

Table 2. The issues vs. solutions in iNTeg-Risk 1StopShop

The issue	The iNTeg-Risk ERMF and iNTeg-Risk tools help to:
How to recognize emerging risks?	Listen to the experts, look at what the people write, say or tweet, analyze the web and the data available there register them as "emerging risks notions" in iNTeg-Risk RiskEars
How to follow & monitor of emerging risks?	Understand better the process of emerging risk maturation in space (worldwide) and time with the support of iNTeg-Risk RiskEars and iNTeg-Risk RiskAtlas
How to analyze emerging risks?	Find data various needed in iNTeg-Risk Safetypedia and make the analysis using the iNTeg-Risk MethodsMart
How to know if the emerging risks are acceptable?	Make the assessment by using the highly innovative intelligent agent and semantic analysis based iNTeg-Risk tools
How to communicate emerging risks and educate professionals needed?	"Tell it visually"! Use iNTeg-Risk Emerging Risks Radar for easy intuitive communication and educate the specialist within the iNTeg-Risk European Master of Risk Engineering and Management
How to manage the risks?	Apart from the fully developed iNTeg-Risk Emerging Risk Framework, more than 30 general and specialized Risk Management frameworks might be evaluated and recommended for the application.

nitor and manage emerging risk at the European level. Understanding, avoiding and mitigation of risks constitute a strategic global advantage for the EU.

Multiple input channels for the E2R2 platform are planned to come from multiple sources such as experts opinions, scientific publications, web-publications, social/professional networks (e.g. Twitter) and general public.

The outputs of the E2R2 are in the same way multiple-channel, and enabling monitoring risks in time, delivering alarms and alerts (see Figure 3), providing timely and on-the-fly short information about emerging risks, statistics, scientific opinions, priority lists (e.g. the "Top 10") lists, e.g. largest risks in an application area, fastest growing risks, largest risks for the region). The Radar should also feed the on-line dynamic newsletters looking at issues like "Risks of the month", "Just appeared" and similar. The Web 2.0 and 3.0 solutions are envisaged for supporting the participative character of E2R2 and an open set of dedicated tools will be included or linked to it. Information on RiskRadar must ensure privacy and strict control/protection of data.

The characteristics and benefits of E2R2

Different types of risk radar have been developed since 1996, however they face problems related to the lack of public component and supporting tools, the areas of application are usually narrow and focused on specific area, and they are not based on agreed or accepted principles (frameworks, policies, etc.). In addition, the current Risk monitoring radars tend to be fragmented and cannot communicate to each other.

Some of the distinctive characteristics of the E2R2 are the following:

- It is a "radar" that can screen the horizon of the future, including identification and tracking of newly spotted risks
- Partly public and partly private
- Involvement of different stakeholders, governmental, EU organizations (e.g. OSHA, STOA, EU Scientific Committees like those dealing with i.e. health risks..), Professional Groups, national and international organizations, single industries or companies, R&D and academia
- Include, as support, the tools developed within iNTeg-Risk project such as: Safetypedia, RiskAtlas, RiskClock
- Multiple views, customized for different users, fields of application, and types of risks

Possible Action plant of the E2R2 initiative and future involvements

The first prototype of the E2R2 platform will be created and will be show at the final iNTeg-Risk project conference (May 22-23, 2013). One of the prospects of the E2R2 initiative is the EU framework programme Horizon 2020 (Running from 2014 to 2020 with an 80 billion budget). The support for research and innovation under Horizon 2020 will be an excellent opportunity to promote the future development of the E2R2 initiative and extend it from the EU level to a more global application.

The E2R2 is open to the outside world, and it is envisage to explore the interest of non-European countries including Latin-American countries, China, Japan, USA and some other countries. The stakeholders from La-

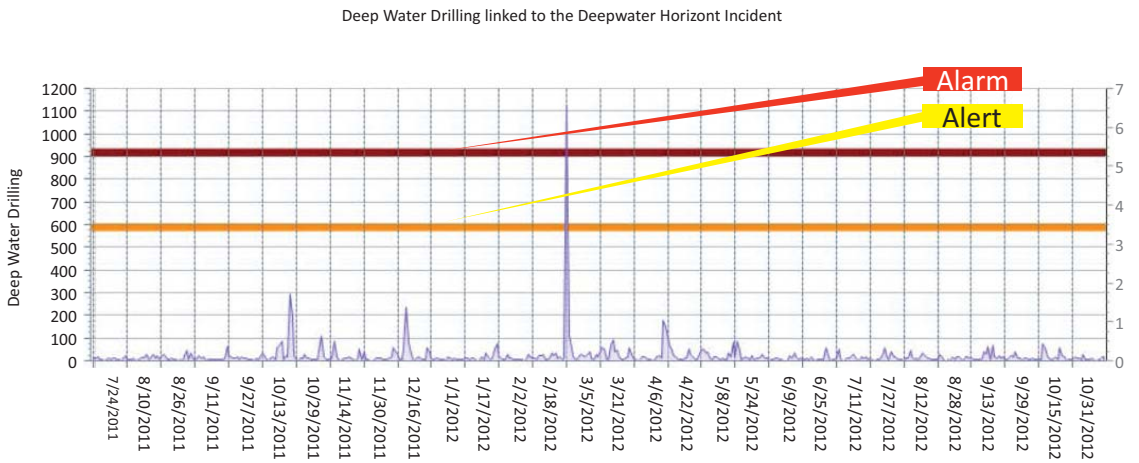


Figure 3. Illustration of delivering alarms and alerts

tin American academia, industry and governmental institutions will be approached, in order to learn about their interests and priorities. Future forms of cooperation will be proposed.

Conclusion

Following the EU-wide systematic effort to identify, monitor and manage new and emerging risks, iNTeg-Risk results give innovative and integrated solutions based on different tools, methodologies and frameworks to find better management options to deal with multiple and interconnected emerging risks.

Tools developed within the project enable to identify emerging risks (RiskRadar), monitor them (RiskEars), map them (RiskAtlas), among others.

With the new risks becoming more and more global, the general public will certainly require more information about issues of global concern (natural hazards, industrial technology, spreading diseases…) to be able to take a more active role in establishing and implementing safety related policies. As detailed in this paper, E2R2 initiative is expected to provide a source of credible and reliable information for the community, industry, SMEs, decision-makers and general public, involving not only European stakeholders but future Latin American stakeholders.

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