European Safety and Reliability Association

Newsletter

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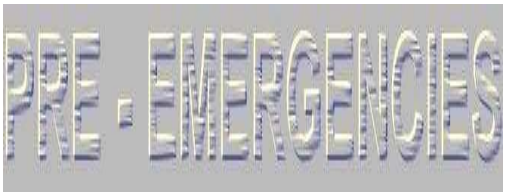
2007

Contributions from ESRA Technical Committees



Zoe Nivolianitou, Demokritos National Research Centre, Greece

PRE-EMERGENCIES is a new EE funded project, which is aimed at developing an emergency response model with the goals of:

- enhancing integration among the various entities involved in planning and managing response to an emergency;
- enhancing communication and information exchange and quality between response teams and civilians, in crisis situations

Specifically, the project focus on two particular areas: progressively mounting risk disaster (e.g., floods) and sudden disaster (e.g., highway or railroad tunnel accidents or other major technological accidents). Concerning the latter, particular attention will be placed on cross-border disasters, because they serve to exemplify highly complex, unpredictable, and difficult-to-manage emergency situations. The project will therefore enable us to pinpoint the critical elements occurring in cross-border disasters, with the aim of developing a "common and shared language".

The main applicant and main user of the project results is Italian Red Cross (CRI).

Among the Key partners are: Polytechnic of Milan, University of Torino, (Italy) NSCR "DEMOKRITOS"(Greece) and CRAIM (Romania), together with end users' organisations which greatly support this activity, as the two international Road Tunnels (Mont Blanc and Frejus on the French-Italian boarder)

The Italian Red Cross (CRI, Croce Rossa Italiana), is member of the International Red Cross, acting as a self standing entity with extended central and localized structure in Italy, offering also services internationally.

In the **Pre Emergencies project**, of which the latter is the main proposer and beneficiary in front of the European Commission, CRI is mainly interested in catastrophic scenarios dealing with mounting risk, such as the Floodings and the Tunnel Fires. Its main interest stays with the efficient co-ordination of the actions of state and voluntary intervention organisations.

Among the main goals of this project remains the creation of a simulator to validate the intervention protocols and, moreover, to issue guidelines for the more efficient acting.

These guidelines/indices will be mainly focused on human behaviour than on scientific and technical aspects of the intervention.

The official project site has been already created at the CRI server, namely

http://www.cri.piemonte.it/progetti/pre-emergencies/,

Where the various phases of the project are presented and analysed together with further information to the public regarding the findings of the project. A Greek web site has been also created to mainly support the Greek voluntary organisations which enthusiastically embraced the project, namely:

http://www.ipta.demokritos.gr/pre_emergencies/,

This project is co-financed by the European Commission, DG Environment, Civil Protection Unit, but its content does not necessarily reflect the position of the Commission, nor does it involve any responsibility on its part.

Contributions from ESRA Chapters

Ph.D.-Thesis ”Decision Framework for Well Delivery Processes - Application of Analytical Methods to Decision Making”

Lars Bodsberg, SINTEF Technology

M.Sc. Eivind H. Okstad defended his thesis on ”Decision Framework for Well Delivery Processes - Application of Analytical Methods to Decision Making” at the Norwegian University of Science and Technology (NTNU) in 2007-03-07.

The PhD project was dealing with a decision framework, including a decision methodology, for deep-water well engineering. Big-bore well concepts are here preferred, especially for gas field developments.

A major portion of the unproduced oil and gas resources is located in deep-water areas, often at sea level depths between 1500 and 3000 metres. Development of these fields with conventional technology necessitates increasing costs mainly due to the higher rig- and equipment specification needed. Thus, new solutions for cost-effective drilling and completion of deep-water wells have emerged during the recent years like the big-bore well concepts. Big-bore wells are typically associated with well concepts that utilize a 7”, or larger production tubing. However, uncertainty is connected to the application of these concepts that needs to be considered carefully. Uncertainty relates both to the operational aspects, as well as to the availability of finalized wells. Field development by use of big-bore well concepts requires that the expected production rate relies on fewer wells compared to more “traditional” well concepts. Decision makers are thus seeking appropriate methods and tools to ensure “decision quality” during the well engineering projects. Another aim is also to speed up the utilization of new technology within the offshore well-drilling and completion business.

The body of the proposed decision methodology contains the following basic steps:

1) To define the technical decision scope and structure of the well delivery process

2) To select the basic well concept

3) To conduct the detailed design

By this methodology the properties and characteristics of technological solutions are linked to the important requirements and decision criteria of the development projects. This is obtained by combining methods within the area of risk analysis and decision analysis. This kind of approach is new to the well engineering business. Instead of independent risk assessments, the current framework links such assessments directly to the decision processes of well engineering. It deals with the information of relevance, how assessments should be planned and accomplished, and how the results best should be implemented. Thus, proactive support to engineering organizations is obtained by the improved quality and efficiency of decision processes. Special attention is made to decision-making in project teams. In addition to the methodology itself, a two-step procedure to guide an industry implementation has been developed.

Feature Articles

Adapting hierarchical and risk-based approaches to safety rule modifications in the Norwegian railway system

Dr. Helene Cecilie Blakstad,
Senior Research Scientist
SINTEF

Experiences on safety rule revision with hierarchical and risk-based approaches in the Norwegian railway system have been presented in a Doctoral Thesis at NTNU, Trondheim, in February 2006[1]. The two approaches represent a change in the rule modification tradition of this system. The overall research question is:

> *How did the Norwegian railway system respond to new requirements*
> *for safety rule modifications?*

The study gives special attention to the influence of modification processes upon railway knowledge.
There are three objectives for the study. One objective is to provide descriptions of modification processes that can contribute to increased understanding of these. This includes revealing how problems and roles are framed and to contribute to the building of repertoires of how such processes can be run (Schön, 1991). Another objective is to compare the descriptions with theory. A third objective is to discuss implications of the study.

For these purposes four rule modification processes of the Norwegian railway system have been studied. The study has applied an explorative and qualitative approach. The main sources for information have been interviews with participants of the modification processes and documents developed by the projects. The study was performed in the last phase of the processes. Accordingly, the study looks at the

[1] The thesis can be downloaded from:
http://www.sintef.no/content/page1____3094.aspx

modification processes from the perspective of the participants of the studied processes as experienced in their last period of their work.

The main conclusion of the study is that the four modification processes abandoned the intentions of hierarchical and risk-based approaches. First, they did not develop outcome-oriented rules on the background of risk analyses. Second, they did not derive prescriptive rules from outcome oriented rules. Third, they did not choose rule solutions where the hierarchy of rule solutions was linked to the positions of rule-imposers in the organizational hierarchy such as had been suggested.

The main reason was that the new approaches did not take existing railway knowledge, that had been found to be important for safe performance, sufficiently into account. Instead, the modification work of all cases turned into processes that are given the name "reverse invention" in the study. Here existing railway knowledge and prescriptive rules were used as a fundament for the work. Accordingly, existing knowledge was brought forth.

The risk analyses supplemented railway knowledge. The four cases integrated the risk analyses in the modification processes in four different ways. This gave the analyses different functions in the rule development. The evolving work was evaluated with railway knowledge as a reference and brought in accordance with this knowledge.

The cases favored solutions that took advantage of different perspectives upon rationality and knowledge. However, existing railway knowledge, including existing prescriptive rules, appeared remarkably persistent compared to the expectations for the work. Furthermore, the modification processes contained mechanisms that validated this knowledge.
The new approaches and the processes of reverse invention raised questions that initiated inquiries into railway knowledge. These inquiries revived this knowledge. It remained uncertain whether the potential of inquires for organizational learning resulted in actual new knowledge.

However, the rationalistic ideals of new approaches stimulated a reduction of the revived railway knowledge into more rationalistic theoretical forms, i.e. relational and contextual elements were removed. Theory argues that the latter knowledge is important for the ability to decode theoretical knowledge for future use and to judge its relevance (Stein, 1995; Baumard, 1999; Nonaka & Takeuchi, 1995). The benefit of revived knowledge might therefore be lost in the future. The study outlines some solutions for counteracting such a negative development.

At the end of the study the implications of this conclusion are discussed. Also, links to theory and needs for further research are elaborated upon.

Severe accident database for comprehensive risk assessment in the energy sector

Peter Burgherr[*] & Stefan Hirschberg

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Severe accident database ENSAD

Among man-made accidents, severe accidents in the energy sector are a very controversial topic in public perception and energy politics. However, they were not adequately covered and their completeness was unsatisfactory in the past. Additionally, the consequences of severe accidents have become increasingly important with the steadily growing industrialization, urbanization and interdependencies of complex infrastructures. For this purpose the Paul Scherrer Institut (PSI) has built up the database ENSAD (Energy-Related Severe Accident Database), which is the world's largest database on severe accidents in the energy sector, providing a well-founded basis for technical comparisons of severe accident risks associated with the different energy chains (Burgherr et al. 2004, Hirschberg et al. 1998). Continuous updates of ENSAD ensure that the growing historical experience is taken into account to enable accurate and timely analyses of accident risks. At the same time, the analysis scope has been extended to provide solutions to upcoming problems and to meet the specific needs of new users (e.g., Hirschberg et al. 2003, Burgherr et al. 2004, Burgherr & Hirschberg 2005, Burgherr 2007). Comparisons based on custom-tailored ENSAD data can contribute to the decision process on energy policies and to achieving safety goals. This potential can lead to the further development of cooperation between PSI and a variety of stakeholders including energy companies, insurers, political bodies, and national or international organizations and authorities. A concise overview of severe accident risk and the ENSAD database are given in the PSI newsletter "Mirror on Energy" (Energie-Spiegel 2005).

Severe accident definition

In the literature there is no commonly accepted definition of the term severe accident. Differences include the actual damage types considered (e.g. fatalities, injured persons, evacuees or economic costs), the use of imprecise categories such as "people affected", and differences in damage thresholds to distinguish severe from smaller accidents.
In the ENSAD database an accident is considered to be severe if at least one of the following criteria is fulfilled (Burgherr et al., 2004, Hirschberg et al., 1998):

1. at least 5 fatalities
2. at least 10 injured
3. at least 200 evacuees

4. extensive ban on consumption of food
5. release of hydrocarbons exceeding 10000 metric tonnes (t)
6. enforced clean-up of land and water over an area of at least 25 km^2
7. economic loss of at least 5 million USD (price level year 2000)

Methodological approach

In the initial phase of the ENSAD development it was decided that such a database should build upon existing information sources. It combines data from a large variety of primary data sources in a unique way, i.e. information is verified, harmonized and integrated. The database concentrates on comprehensively covering severe, energy-related accidents and their technical aspects. The analytical approach includes fossil, hydro and nuclear energy chains because all of them entail some significant forms of health, environmental or socio-political risks. The scope of the analyses encompasses the complete energy chains because accidents can take place in every chain stage, and not only at the power plant stage. Other man-made accidents and natural catastrophes are also addressed in a less detailed manner. Considerable differences in the magnitude, timing, and nature of associated risks can be expected among the various energy chains, which allow a degree of choice in the decision-making process, and makes ENSAD a very useful tool beyond purely scientific purposes.

Current status and properties of ENSAD

The ENSAD database currently contains 18706 accident records, of which 88.4% occurred in the years 1969-2000, i.e. the evaluation period chosen in this study. Within this period, 6995 accidents resulted in five or more fatalities, of which 39.5% were natural disasters and the other 4233 were man-made accidents. The latter can be further divided into energy-related accidents (1870, or 44.2%) and other man-made accidents (2363, or 55.8%).

Overall, fatalities in all categories of severe ($\geq$ 5 fatalities) man-made accidents and natural disasters from 1969 to 2000 amount to about 3.4 million fatalities. Of these victims, more than 90% were due to natural catastrophes and about 10 % due to severe man-made accidents; 37 % of the latter were killed in energy-related accidents. The most deadly man-made catastrophes claim one to two orders of magnitude fewer victims than the largest natural catastrophes.

Overview of energy-related severe accidents

For the period 1969-2000 results are provided separately for OECD (Organisation for Economic Co-operation and Development) and non-OECD countries because they largely differ in their levels of technological development and safety performance.

The ENSAD database includes 1870 severe accidents for the various energy chains in the period 1969-2000, amounting to 81258 fatalities. The coal chain accounted for 65.3% of all accidents, followed distantly by oil with 21.2%. Contributions by the natural gas (7.2%) and LPG (5.6%) chains were much smaller, while both hydro and nuclear account for less than 1% each. This dominance of coal-chain accidents is fully attributable to the release of detailed accident statistics by China's coal industry, data that were not previously publicly available (Burgherr & Hirschberg 2007). Altogether, 819 of the 1044 accidents collected for the Chinese coal chain occurred in the years 1994-1999, implying substantial under-reporting prior to the release of the annual editions of the China Coal Industry Yearbook. Fatalities were clearly dominated by the Banqiao/Shimantan dam failures, which together resulted in 26000 deaths. As a consequence, the hydro chain accounts for 36.8% of all fatalities. Among the fossil chains, coal accounted for most fatalities, followed by oil, LPG and natural gas.

Aggregated indicators and frequency-consequence curves

Fatality rates can be expressed as the number of immediate fatalities from energy chains normalized per unit of electricity produced (e.g., $GW_e yr$), allowing a direct comparison between energy chains and country groups. Figure 1 shows that OECD countries have significantly lower fatality rates than non-OECD countries. Among the fossil chains LPG is most accident-prone, but oil and coal are also clearly worse than natural gas. Western style nuclear and hydropower plants have the lowest fatality rates. The recent experience with hydro in OECD countries points to very low fatality rates, comparable to the representative PSA-based results obtained for nuclear power plants in Switzerland and in the USA, whereas in non-OECD countries dam failures can claim large numbers of victims. At the same time the extent of consequences of hypothetical extreme accidents is largest in the case of hydro and nuclear. The associated risk valuation is subject to stakeholder value judgments and can be pursued in multi-criteria decision analysis.

Frequency-consequence (F-N) curves show risks, and also allow comparison of chain-specific maximum damages and the probability of an accident with a specified number of victims. For OECD countries, fossil energy chains clearly exhibited higher frequencies of severe accidents than hydro and nuclear (Figure 2a). Among fossil chains, LPG exhibits the worst performance and natural gas the best, whereas coal and oil chains are ranked in between. For non-OECD countries (Figure 2b) the ranking of F-N curves was comparable to the OECD, except for the Chinese coal chain that showed a significantly worse performance than other non-OECD countries. Additionally, frequencies at corresponding numbers of fatalities were generally higher for non-OECD compared to OECD, and for LPG and Coal China (1994-99) chain frequencies at lower death tolls were even greater than 10^{-1}.

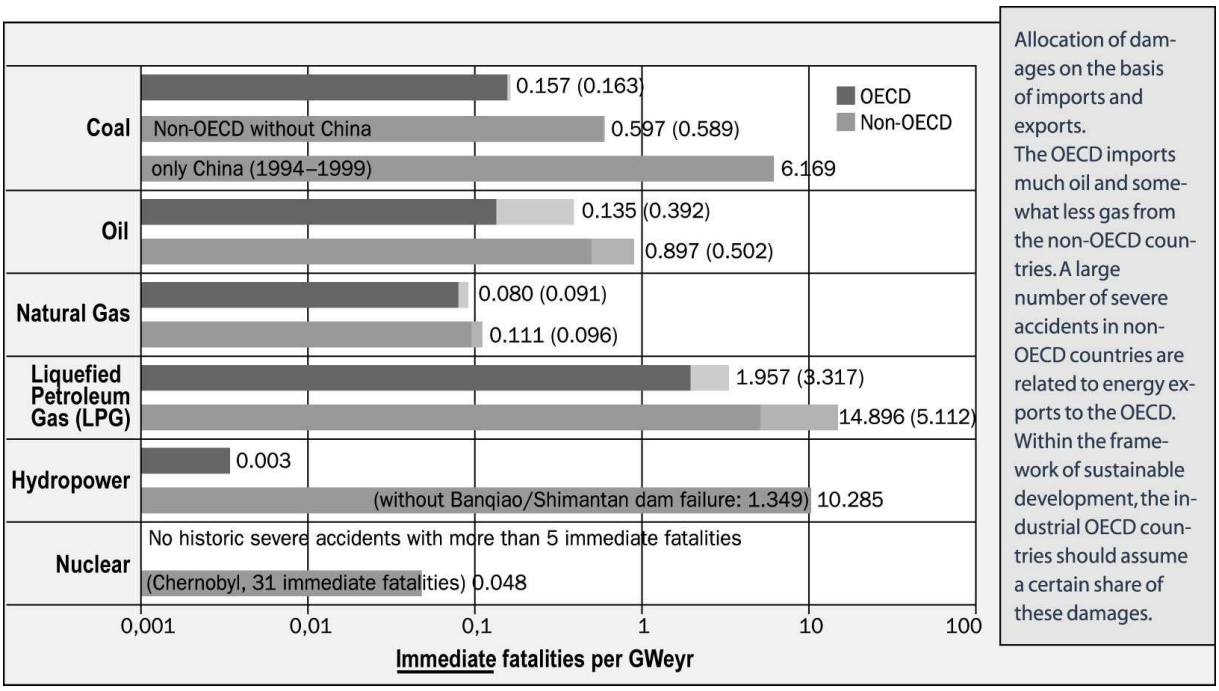

Figure 1: Immediate fatalities per $GW_e yr$ for the various energy chains in OECD and non-OECD countries. The bars in dark grey show domestic fatalities, and the light grey bars show the "imported" or "exported" fatalities. For the OECD the light and dark bars should be added, and for the non-OECD the light bar should be subtracted from the dark bar. The exact values for each bar are shown in the figure, with the allocated values in brackets.

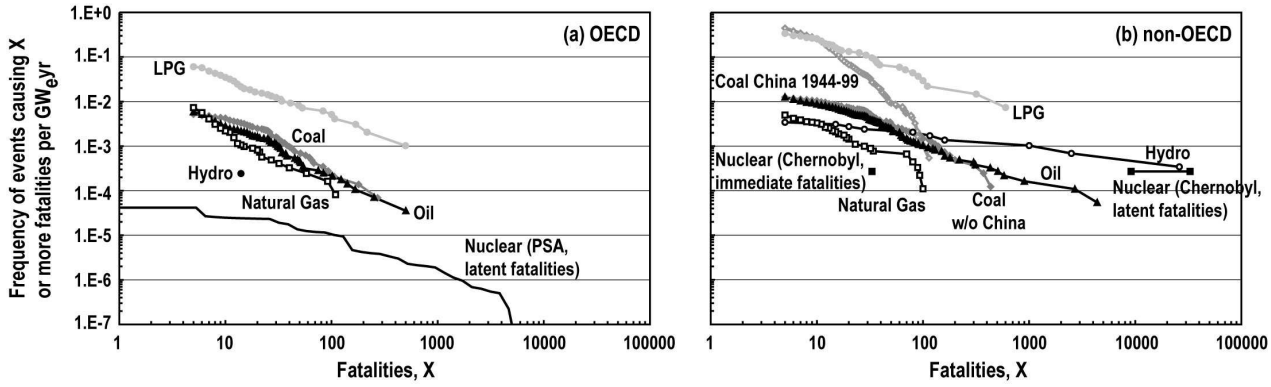

Figure 2: Comparison of frequency-consequence curves for full energy chains, based on historical experience of severe accidents in (a) OECD and (c) non-OECD countries for the period 1969-2000, except for China 1994-99 (data from China Coal Industry Yearbook available).

For nuclear energy in addition to immediate fatalities, latent fatalities[2] are also significant. In the case of Chernobyl, estimated latent fatalities due to delayed cancers range from 9000 (based on a dose cut-off) to 33000 (entire northern hemisphere) over the next 70 years (Hirschberg et al. 1998), indicating that the upper range is conservative (as intended) because it was not limited to the most contaminated areas. In a recent report, the Chernobyl Forum (2005) concluded that in the most contaminated areas up to 4000 people could eventually die due to radiation doses from the Chernobyl accident, including so called "liquidators". This is significantly lower compared to the previously mentioned PSI values because of the more limited area considered.

No dependable statistics can be determined from this single, severe accident. The accident data cannot be transferred to Western plants, because they use a very different technology. For calculations one is therefore forced to work with Probabilistic Safety Assessment (PSA) (see Figure 2a).

Concluding remarks

The ENSAD database provides the most comprehensive and detailed compilation of severe energy-related accidents. Its superiority is based on a much broader coverage of severe accidents than any

[2] „Latent" fatalities denote affected persons who die of delayed consequences from years to decades after a particular accident.

single database as well as its applicability to a multitude of accident- and risk-related issues in the energy sector. Potential future developments that are planned or already ongoing include: (1) the extension of the analysis beyond currently operating systems; (2) broader application of probabilistic analysis; (3) extended analysis of economic consequences of severe accidents; (4) more in-depth consideration of sociological and psychological aspects of risk, and (5) the coupling of ENSAD with Geographic Information Systems (GIS) to analyze and visualize spatially discontinuous distributions, based on predictive geo-statistical methods.

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Safety and Reliability Events

Looking back at ESREL 2007

Terje Aven, Chairman of ESREL 2007

The 18th European Safety and Reliability Conference, ESREL 2007, was held in Stavanger, Norway June 25-27, 2007. It was a successful conference, indeed. The participants took part in an extensive program with excellent keynote speakers and presentations in eight parallel sessions. The boat trip and conference dinner on Monday 25th we will never forget. The weather was fantastic, and we could all enjoy the Norwegian fjords and mountains.

The ESREL conference has become well established in the international community, attracting a good mix of academics and industry participants that present and discuss subjects of interest and application across various industries. This year the theme of the Conference was "Safety, Reliability and Societal Safety". The Conference covered a number of topics within safety, risk and reliability, including risk and reliability analysis methods, maintenance optimisation, and risk management. Special focus was placed on societal safety issues, such as vulnerability analysis of critical infrastructures, risk perception, communication and governance. The application areas ranged from oil and gas, nuclear engineering and civil engineering to information technology and communication, security, transportation, health and medicine.

The Conference was attended by more than 400 participants, from 38 countries. The country distribution is shown in the figure below. Norway was represented by 106 participants, Germany 44, France 42 and Italy 32. All five continents were represented. ESREL has become a true international event. About 25% of the participants were students, which shows that there is a new generation of researchers coming up.

About 500 abstracts were received. After the review by the Technical Programme Committee of the full papers, 354 were accepted and included in the Conference Proceedings. The work and effort of the peers involved in the Technical Program Committee in helping the authors to improve their papers are greatly appreciated. Special thanks go to the organisers of the Special Sessions of the Conference, for their initiative and planning which resulted in a number of interesting sessions covering a broad spectre of topics. The paper preparation and review was quick and efficient this year, due to short time available from the ESREL 2006 conference. Thanks to authors as well as reviewers for their contributions in this process.

The keynote speakers presented interesting overviews and reflections on various topics within risk and reliability:

- Professor Ali Mosleh, University of Maryland, US, *Next Generation Risk Methods*
- Professor Rhona Flin, University of Aberdeen, UK, *Managerial Decisions: Counterbalancing Risks between Production and Safety*
- Professor Uwe Jensen, University of Hohenheim, Germany, *Reliability Analysis via Cox-type Regression Models*
- Professor Enrico Zio, Politecnico di Milano, Italy, *Reliability Engineering: Old Problems and New Challenges*

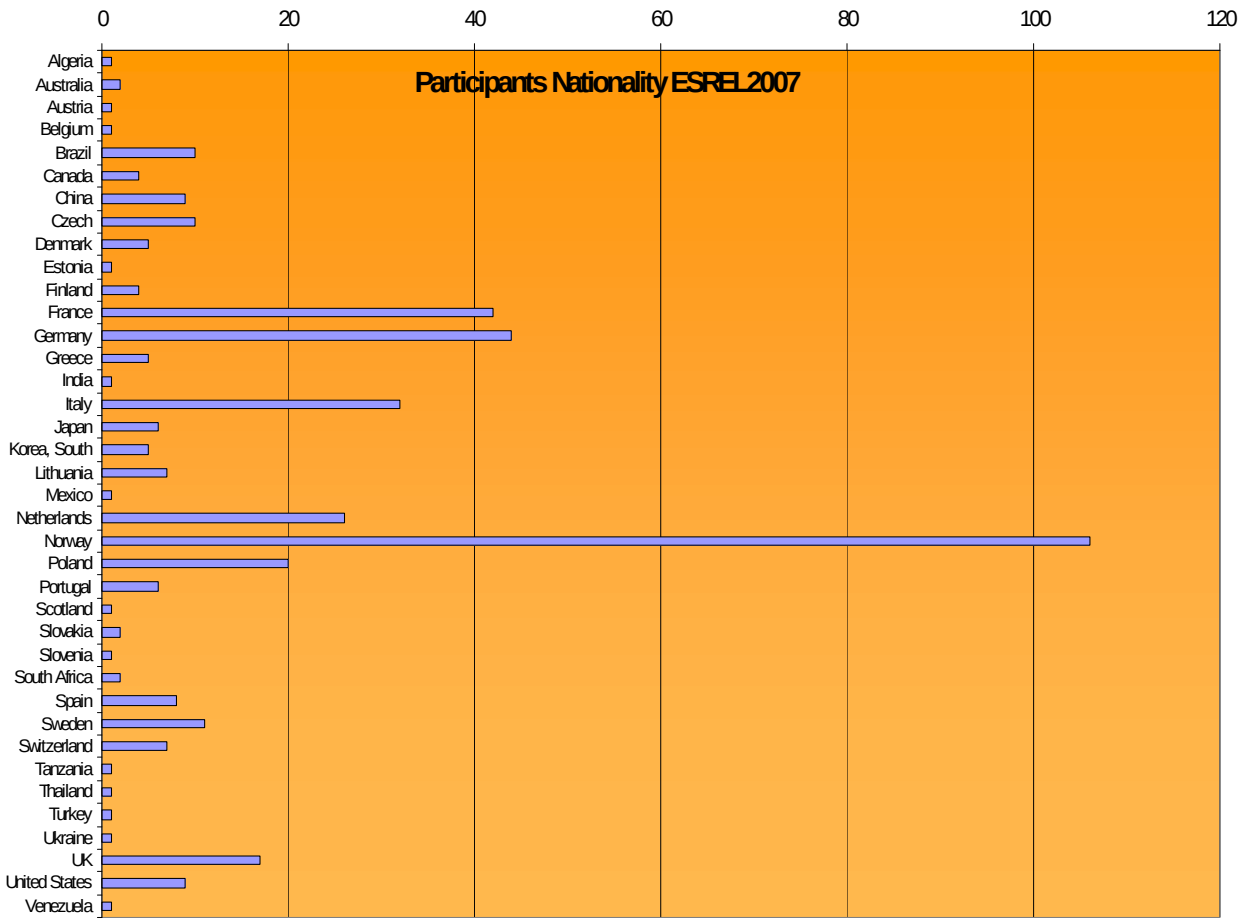
Thanks to Ali, Rhona, Uwe and Enrico and all the other speakers, as well as all the session chairs, for your contributions. Your efforts made the conference successful.

The review process was conducted electronically through the Conference webpage and we acknowledge the use of the system developed for the ESREL 2006 conference in Estoril, Portugal. Thanks to Alexandre Janeiro at the Instituto Superior Técnico, for his continuous support during the paper submission and reviewing process.

The host of the ESREL 2007 conference was the University of Stavanger, and the associated Centre of Risk Management and Societal Safety. The Conference was sponsored by the University, the International Research Institute of Stavanger (IRIS), ESRA Norway, Statoil, Proactima/HSE Academy, Safetec, ConocoPhillips and DNV. The support is greatly appreciated.

I would also like to acknowledge the local organising committee, and in particular the FLEKS organisation and their many helpers (including our Ph.D students) at the University for taking care of the practical arrangements. They did a superb job. Special thanks go to my colleague and co-chairman professor Jan Erik Vinnem. He supervised the paper reviewing process and ensured that the Proceedings resulted in three high-quality volumes. Many thanks also to post.doc. Eirik B. Abrahamsen for his administrative help during the paper reviewing process. He worked day and night in a certain period in January-March.

It was an honour and a great pleasure to have the opportunity to co-operate with you all during the ESREL 2007 conference, both at the planning stage and during the Conference in June.



Portuguese National Conference on Risk, Safety and Reliability (II ENRSF)

Ângelo P. Teixeira, Instituto Superior Técnico

The Portuguese ESRA Chapter has organized in Lisbon, 13-15 November, 2007, the second edition of the National Conference on Risk, Safety and Reliability (II ENSRF 2007). This biennial event that has become well established in the Portuguese community, has gathered 170 participants from which about 40% were from academia and 50% from industry.

This year the theme of the Conference was "Public and Industrial Risks". About 160 abstracts were received and after the review process 86 papers were accepted and included in the conference proceedings.

The conference covered several topics within risk, safety and reliability, organized in technical sessions on: Public Risks; Transportation Safety, Safety at Work, Industrial Risks and Safety, Risk Management, Human Factors and Safety Culture, Accident Analysis, Reliability and Maintenance and Natural Risks.

Compared with the first conference of 2005, this year special focus was placed on how the various types of risks are managed in society, which requires decisions that account for public interest. In this context, the issues related to public risks, acceptable levels of public risk, risks of critical infrastructures, emergency planning and crisis management have been addressed.

Risk, Uncertainty and Decision Analysis for Environmental Security and Non-chemical Stressors

Summary of the NATO Workshop

By Igor Linkov, Susan Cormier, Elizabeth Ferguson, Abou Ramadan, Richard Wenning, Jeff Steevens, Jose Figueira, Greg Kiker

Population growth, needed economic growth, and social pressures for improved infrastructure coupled to the need for human and ecological health protection and environmental security make environmental decision-making a difficult task when balancing human health and ecological impacts with societal benefits. Environmental security has emerged as an increasingly important concern of governments and their defense establishments because of these trends that have the potential to threaten stability. Risk Assessment has emerged as a useful tool to address environmental security issues. Nevertheless, the question of harmonization of risk-based approaches and decision tradeoffs has not been addressed, especially as it is applied to non-chemical stressors.

The 3-day NATO (North Atlantic Treaty Organization) Advanced Research Workshop (ARW) titled "Risk, Uncertainty and Decision Analysis for Environmental Security and Non-chemical Stressors" attracted more than 60 participants representing 14 countries. The workshop was held 26-29 April 2007 in Cascais, Portugal. The workshop was chaired by Drs. and Igor Linkov and Elizabeth Ferguson and hosted jointly by the SRA (Decision Analysis and Risk Specialty Group), Instituto Superior Technico, Lisbon and ENVIRON. The meeting was an event supported by the NATO Programme for Security through Science.

This was the seventh meeting in a series of workshops that began in Lisbon, Portugal, in 2000 on the use of advanced risk assessment and decision analysis tools to understand environmental security. The 2007 NATO workshop in Portugal started with building foundation to apply chemical risk assessment approaches and tools to a broad collection of non-chemical stressors including physical (unexploded ordnance, noise, temperature, pH), novel technologies and emerging materials (nanomaterials, pharmaceuticals and pathogens), biological (invasive species, microbial agents). The principles of risk assessment are unchanged regardless of the type of problems encountered by assessors. However, in practice, they are influenced by temporal and spatial scales frame in which the decisions must be made. Some decisions, such as those made within a rapidly evolving crisis require extensive pre-planning and training in gaming scenarios to prepare decision makers so that they may react instinctively in a timely fashion. Other decisions in which the timing of the decision is less critical can occur in a more deliberative, consensus manner. Clearly, a continuum exists across a range of situations. Indeed, in the structuring, execution, and debriefing of management scenarios, one goal is to achieve consensus regarding the proper course of decision-making under the scenarios. The workshop reviewed methods and tools developed in the field of multi-criteria decision analysis that apply to these two conditions encountered in environmental management, namely the rapid versus more deliberative process.

The differences between rapid and deliberate decision analysis are apparent from the onset of risk assessment through the final decision analysis and implementation. The differences begin with initial recognition of the nature of the problem to be addressed and continue through the risk assessment, actions taken, and post-decision analysis of the process, including evaluation of the effectiveness of the decisions. The measures of success provide data to analyze approaches used and promote continual improvement of the process.

Assuredly, the NATO workshop was only the first step in a deeper exploration of the topic. It drew distinctions between rapid versus deliberative approaches in risk assessment and related it to specific tools. It give us an opportunity to consider what we might learn and how we might improve risk, uncertainty, and decision analysis by customizing methods and processes intended to deal with crisis and chronic situations. The workshop concluded that a framework that combines risk assessment and multi-criteria decision analysis would be appropriate to address multiple challenges in managing a whole spectrum of emerging stressors.

5th International Probabilistic Workshop in Ghent

Dirk Proske, University of Natural Resources and Applied Life Sciences, Austria

On 28-29 November 2007 the 5th International Probabilistic Workshop took place in Ghent, Belgium. The workshop dealt with the issue of safety and risk mainly in structural engineering but also in ship navigation.

Former workshops were organised in Dresden in 2003 and 2004, in Vienna in 2005 and in Berlin in 2006. Whereas during the first workshop in 2003 about 35 participants followed roughly ten presentations, in 2007 nearly 25 presentations were given to approximately 50 participants during the two days. The content of the presentations reached from the topic of safety of tunnels, the robustness of structures, the monitoring of existing structures, the global resistance safety factors for non-linear computation of reinforced concrete structures, the evaluation of concrete properties and finally to the topic of quality of life parameters for safety evaluation of structures. Since there have been no parallel sessions and the presentation and discussion time was scheduled with 25 minutes for most presentations, there were good opportunities for discussions, which were indeed widely used.

The 5th International Probabilistic Workshop was jointly organised by Magnel Laboratory for Concrete Research at the Ghent University, Belgium and the University of Natural Resources and Applied Life Sciences, Vienna, Austria. Furthermore the conference was supported by the European Safety and Reliability Association, which is kindly acknowledged. The conference was chaired by Prof. Luc Taerwe, a well known expert in the field concrete material. Also the support by Mr. R. Caspeele should be mentioned here.

Additionally to the excellent spirit during the conference also the nice location of the conference venue and the city should be brought up. The conference was continued by a meeting of the ESREDA working group SRA in SRA under the management of Mr. Emmanuel Ardillon.

The 6th International Probabilistic Workshop will be hold in Darmstadt on the 26-27 November 2008 by the Institute of Concrete and Masonry Structures of the University of Technology Darmstadt, Germany and the University of Natural Resources and Applied Life Sciences, Vienna, Austria. In case of interest either for the former proceedings or for the next probabilistic workshop please contact the author of this article.

Calendar of Safety and Reliability Events

PSAM 9 – International Probabilistic Safety Assessment and Management Conference

Hong Kong, China, 18-23 May 2008

PSAM 9 will focus on the 'Improvement of the economic and safety performance in complex technological systems.

The main objective is to provide a platform for engineers and safety practitioners from different industries and technical disciplines to share their view and experience in the applications of risk management.

Important Dates: 10th April 2008

Please note that authors who are not registered by 10th April 2008 may see their papers excluded from the Conference Proceedings.

The 7th International Conference on Reliability of Materials and Structures

St.Petersburg, Russia, 17-20 June, 2008

Organizers: St.Petersburg State Polytechnic University, Centre des Materiaux, Mines Paris-Paristech–CNRS, France, St.Petersburg State University and Institute for Problems of Mechanical Engineering of Russian Academy of Sciences (IPME RAS.

Important Dates:

Abstract Submission	October 30, 2007
Manuscript for Review	December 15, 2007
Final Manuscript due	March 10, 2008

Prospective authors are invited to submit (by email strength@mtr.hop.stu.neva.ru, *kafedra@ksm.spbstu.ru* or by Fax 7 (812) 297-20-88) your abstract in 300-400 words to the Secretariat of the Conference, see backside. Abstract written in English should emphasize the significance of the results and/or the originality of a completed work. Abstract has to include the paper title, all authors' and co-authors' names, affiliations, full addresses, telephone, fax numbers and email addresses of the corresponding author.

The technical and industry sessions will emphasize the following tentative topics:

- Mechanics of Solids and Structures
- Plasticity and Creep
- Computational Mechanics
- Fatigue and Fracture of Materials and Structures
- Numerical Simulation of Deformation and
- Fracture of Materials
- Strength and Reliability of Structures
- Building Materials and Habitat

ESREL2008 – International Conference on Safety and Reliability and 17th SRA-Europe Conference

Valencia, Spain, 22-25 September 2008

Learning from the past, building the future

Important Dates

Submission of Abstracts	-	26 November 2007
Session Plan Submissions	-	26 October 2007
Notification of Abstracts	-	15 December 2007
Submission of full-length paper	-	15 March 2008

This event stems from a European initiative merging the European Safety and Reliability Association (ESRA) and Society for Risk Analysis Europe (SRA-E) annual conferences into the major risk analysis, safety and reliability conference in Europe during 2008.

The conference will provide a forum for presentation and discussion of scientific papers covering theory, methods and applications in the fields of risk, safety and reliability to a wide range of sectors and problem areas.

Valencia is the Spain's 3rd largest city situated in the East coast close to the Mediterranean Sea and represents a meeting point of many cultures. It has an excellent temperature for most of the year. It can be reached directly by air from many European airports and indirectly through Madrid or Barcelona. The airport is located just 8 km away from the city centre. Valencia is undergoing a continuing transformation combining traditions and progress. Valencia has a large hotel capacity and a wide range of hotels. There is a complete network of public transport connecting the city, the airport and the University. The city and its surroundings offer a broad variety of cultural, entertainment and leisure activities.

Abstracts and papers are invited for submission through this conference web page. Manuscripts will be reviewed by the Technical Programme Committee in accordance with standard practice and the criteria for the conference. Final acceptance of the papers is based on review of the full papers. The congress official language will be English.

ESRA Information

1 Membership

1.1 National Chapters

- French Chapter
- German Chapter
- Italian Chapter
- Polish Chapter
- Portuguese Chapter
- Spanish Chapter
- UK Chapter

1.2 Professional Associations

- The Safety and Reliability Society, UK
- The Danish Society of Risk Assessment, Denmark
- ESReDA
- French Institute for Mastering Risk, France (IMdR-SdF)
- ESRA Germany
- The Norwegian Risk and Reliability Association (ESRA Norway)
- SRE Scandinavia
- The Netherlands Society for Risk Analysis and Reliability (NVRB)
- Polish Safety & Reliability Association, Poland
- Asociación Española para la Calidad, Spain

1.3 Companies

- TAMROCK Voest Alpine, Austria
- ARC Seibersdorf Research GmbH, Austria
- VTT Industrial Systems, Finland
- Bureau Veritas, France
- INRS, France
- Total, France
- Commissariat á l'Energie Atomique, France
- GRS, Germany
- VEIKI Inst. for Electric Power Res Co, Hungary
- Autostrade, S.p.A, Italy
- D'Appolonia, S.p.A, Italy
- IB Informatica, Italy
- TECSA, SpA, Italy
- SINTEF Industrial Management, Norway
- Adubos de Portugal, Portugal
- Central Mining Institute, Poland
- Transgás - Gás Natural, Portugal
- Cia. Portuguesa de Producção Electrica, Portugal
- Siemens SA Power, Portugal
- Caminhos de Ferro Portugueses, Portugal
- ESM Res. Inst. Safety & Human Factors, Spain
- IDEKO Technology Centre, Spain
- TNO Defence Research, The Netherlands
- HSE - Health & Safety Executive, UK
- Railway Safety, UK
- W.S. Atkins, UK

1.4 Educational and Research Institutions

- University of Innsbruck, Austria
- Université Libre de Bruxelles, Belgium
- University of Mining and Geology, Bulgaria
- Technical University of Ostrava, Czech Republic
- Technical University of Liberec, Czech Republic
- Tallin Technical University, Estonia
- École de Mines de Nantes, France
- Faculté de Polytechnique de Mons, France
- Henri Poincaré University, France
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- LAAS, France
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- Technische Universität Wuppertal, Germany
- Nat. Centre Scientific Res. 'Demokritos', Greece
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- Politecnico di Milano, Italy
- University of Rome "La Sapiensa", Italy
- Universita Degli Studi di Pavia, Italy
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- Nuclear Consultants International, South Africa
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3 Management Board

The Management Board is composed of the ESRA Officers plus one member from each country, elected by the direct members that constitute the National Chapters.

4 Standing Committees

4.1 Conference Standing Committee

Chairman: K. Kolowrocki, Gdynia Maritime University, Poland

The aim of this committee is to establish the general policy and format for the ESREL Conferences, building on the experience of past conferences, and to support the preparation of ongoing conferences. The members are one leading organiser in each of the ESREL Conferences.

4.2 Publications Standing Committee

Chairman: C. Guedes Soares, Instituto Superior Técnico, Portugal

This committee has the responsibility of interfacing with Publishers for the publication of Conference and Workshop proceedings, of interfacing with Reliability Engineering and System Safety, the ESRA Technical Journal, and of producing the ESRA Newsletter.

5 Technical Committees

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ESRA is a non-profit international organization for the advance and application of safety and reliability technology in all areas of human endeavour. It is an "umbrella" organization with a membership consisting of national societies, industrial organizations and higher education institutions. The common interest is safety and reliability.
For more information about ESRA, visit our web page at http://www.esrahomepage.org.
For application for membership of ESRA, please contact the general secretary **Pieter van Gelder**, E-mail: P.van.Gelder@ct.tudelft.nl.
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