Contract n°: NMP2-CT-2003-505555

# S H A P E – R I S K

SHARING EXPERIENCE ON RISK MANAGEMENT (HEALTH, SAFETY AND ENVIRONMENT) TO DESIGN FUTURE INDUSTRIAL SYSTEMS

Co-ordination Action

Priority 3 : **Nano-technologies and nano-sciences, knowledge-based multifunctional materials, and new production processes and devices – 'NMP'**

## Deliverable D 34 (D.10.D)

# Publishable Final Summary Report

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| **Dissemination Level** | | |
| PU | Public | X |
| PP | Restricted to other programme participants (including the Commission Services) | |
| RE | Restricted to a group specified by the consortium (including the Commission Services) | |
| CO | Confidential, only for members of the consortium (including the Commission services) | |

## Reference Workpackage(s)

| | |
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## Abstract

This Publishable Final Summary Report of the SHAPE-RISK co-ordination action reminds the objectives of the project, contractors involved, work performed and end results.

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The European Commission agreed to grant a financial contribution for the implementation of SHAPE-RISK within the 6th Framework programme. "SHAPE-RISK" is the acronym for SHAring exPErience for RISK management to design future industrial systems.
SHAPE-RISK is a three years co-ordination action, gathering 19 partners, and the co-ordinator is INERIS (France), Institut National de l'Environnement Industriel et des Risques.
SHAPE-RISK aims at optimising the efficiency of integrated risk management in the context of the sustainable development of the European process industry. The proposal addresses sustainable waste management and hazard reduction in production, storage and manufacturing In this initiative, risk management is related to Environment, Major accident hazards, and occupational health and safety.
This co-ordination action began on the 1st March 2004 and ran to February 2007.

SHAPE-RISK aims at optimising the efficiency of integrated risk management in the context of the sustainable development of the European process industry. The main goal is to support safety and the minimisation of accidents, pollution and emissions at industrial installations. In operational terms, SHAPE-RISK aims at structuring a network with the organisations providing technical support to the Public Authorities in charge of the application of the SEVESO II, IPPC, ATEX and occupational Directives. The SHAPE-RISK network interacts strongly with industry and other stakeholders at European (international) level, but also at national and local level.

## SHAPE-RISK: an action toward integrated risk management

SHAPE-RISK Co-ordination Action enhances the current situation in risk management, regarding the state of the art. SHAPE-RISK used a 2-steps approach :
- 1st step: the sharing of knowledge gained thanks to the 4th and 5th Framework Programme, national RTD activities funded by the Member States and other third countries, ending with the definition of future needs.
- 2nd step: the innovative dynamics coming along with the definition of news concepts that serve the main objective of the SHAPE-RISK action.

**The first step** :
The 1st step is carried out through 6 Focal Topics considered in 6 Work Packages (WP) during the 2 first years (WP 1 to 3 from March 2004 to February 2005, and WP 4 to 6 from March 2005 to February 2006):
- WP 1: The integrated implementation of IPPC and SEVESO directives in order to find the optimum between "cleaner" and "safer" for the protection of the environment and the workers.
- WP 2: The continuity of risk management from the accidents at the working place to the major accidents with off-site consequences.
- WP 3: The survey and comparison of tools and service platforms used in the Member States and at the international level to improve risk management (prevention, response, crisis management).

- WP 4: The improvement of the efficiency of the organisational management with regard to safety, health and environment.
- WP 5: The management of environmental accidents, addressing land-use planning and trans-boundary effects.
- WP 6: The Public perception and communication on risk and its influence as a driving force to change the current concepts in industrial production.

**The second step :**
The **2nd step** was implemented during the 3rd year (from March 2006 to February 2007) with a special creative process favouring radical changes and breakthrough in terms of integrated risk management to reduce hazards in production, storage and manufacturing. This work was performed in the WP 7.
The SHAPE-RISK process is presented in the figure 1.

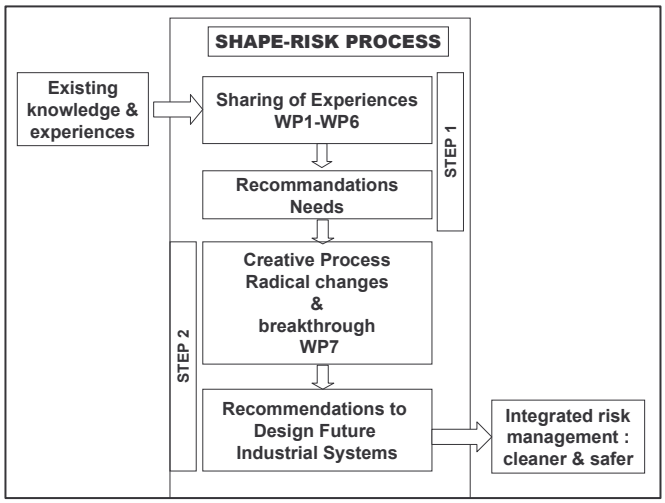


**Fig. 1: The SHAPE-RISK process**

The aim of the WP7 deliverable document was to propose a global solution articulated in recommendations for each topic, and the integration of risk assessment and management for Health, Safety and Environment, on the basis of the results of the first six workpackages and the results of the conferences. The problematic areas and the research and development needs are integrated according to a list of topics, which cover regulations, organisational and human issues, technical aspects and risk communication. Subsequently, per topic, the main outcomes of the WP7 integration document and recommendations to design future cleaner and safer industrial systems, will be outlined.

## Regulations

The integration of SEVESO and IPPC Directives will allow the improvement of risk assessment and management for industrial processes. Foreseen benefits of the integration of safety and pollution prevention are an efficient use of the resources in designing and

managing industrial systems, improvement of the synergies and avoidance of conflicts between reduction of pollution and safety.

Beyond the regulation issue, including as well the ATEX and occupational health directives, it comes in evidence that an "integrated approach" of regulations, would strongly reinforce all other issues: the technique (methods to assess risk in global), the organisation (organisation of the inspections in common), and the human factor (training).

Main recommendations:

- There is a need to define a **policy framework** (IPPC, SEVESO, ATEX) for integrated risk management. The proposal for one directive covering all safety and environmental aspects is the first and the strongest recommendation of the regulatory topic, which will define and guide all the following recommendations and actions.
- The development of new BREF documents and the application of the Deming cycle of continuous improvement for the development of regulations. This would also contribute to increase the compatibility of management standards with the regulation.

## Organisational and human issues

Industry considers HSE management systems to become complex and bureaucratic. There is a strong wish to make systems simple and to avoid unnecessary complexity, especially from medium-sized companies. Focus should be on performance in practice rather than on the amount of documentation. The challenge will be to implement management routines that are simple while still adequate for the tasks to be solved.

Attitudes towards integration depend on the size of the company. Large companies naturally run integrated HSE management systems. Medium-sized companies tend to object to the administrative complexity of introducing these systems, while responsibilities in the different fields are more directly linked to personal competences. In small companies, integration naturally takes place as responsibilities are covered by a single person. A general concern of integration is the problem of the auditors' competence. Industry often complains about too many (external) audits and inspections. In order to benefit of integration, the integrated management system should preferably be audited by a one-step audit (i.e. integrated in the one-stop-shop concept). In practice, the auditors' competence does not cover all areas.

Regarding human issues, it can be noted that the transfer of knowledge gained from research in risk management and environmental protection and dissemination towards industry, is too long and scattered. The efficiency and effectiveness of information exchange can be strongly improved by means of appropriate training programmes, integrating both concepts of "cleaner" and "safer" technologies.

Despite some national differences, it can be concluded that modern European industries consider progressive goal-based management of HSE issues to be the way forward. That is, in every management period, new goals for HSE are set and the status is evaluated at the end of the period. Goals can be related to legal requirements or industry can be pro-active and

identify goals itself (benchmarking). It is essential that goals are chosen in agreement with verifiable indicators and supported by appropriate training programmes.

Main recommendations:

- Information exchange of HSE risk management procedures between countries, industries, and organizations, through the collection and sharing of best practices and experiences in HSE management, making also visible benefits of a good HSE management even for SMEs;
- Harmonization and simplification of management tools and procedures, for instance following the approach already developed in the UK with the Management Health and Safety (MHS) regulatory framework, which applies to all workplaces;
- Promotion of life cycle management, as a conceptual model to adress risk issues;
- Promotion of industrial parks, where shared ownership and responsibility are present, in order to avoid to divide a plant in smaller under SEVESO limits parts;
- Development of HSE integrated training courses in industry in the short term, and developing best practices guidelines for training and communication for multi language workforces in the mid term;
- Development of human centred design of industrial environments and processes, to provide safer, cleaner, and easy-to-use workplaces. Experiences in human design should be collected and shared (short term), developing guidelines and tools for their evaluation (mid term).

**Technical aspects**

Technical issues in the HSE risk assessment and management within IPPC, SEVESO and ATEX directives, deal with: the evaluation and selection of technical measures; risk assessment methodologies and approaches; and the need for an integration of internal (safety) and external (man, environment) risk assessment.

For the evaluation and selection of technical measures, the assessment of the impact on pollution prevention and safety as a whole is important, using both expert judgement and supporting approaches like life cycle assessment. Other supporting tools for the assessment of alternative technologies are cost-effectiveness and cost-benefit analysis.

Regarding Risk assessment methodologies and approaches, a common approach to evaluate both external and occupational risks would represent a step forward to simplify the procedures. In addition, an integrated assessment can allow the evaluation of the occupational (minor) accidents potential to cause major accidents in a given scenario.

Another tool which is used to assess the effects on environment of potential accidental releases is the Environmental Impact Assessment. Environmental and human health impact assessment procedures includes also risk assessment methods and results, such as: dangerous properties of substance, estimation of quantity involved in accident, mobility of substance in environment, accident probability, local environment vulnerability. Currently, an exact method to assess the accident impacts on the environment, is lacking.

The needs to integrate occupational and external risk can be highlighted in the Safety Management System (SMS) requirements of the SEVESO guideline. In particular, the identification and evaluation of hazards to be achieved in the framework of the SMS cannot be limited to external risks. Moreover, it should be considered that it is not proven that a high level of occupational safety is a guarantee that no major accidents will happen. This links between safety and external risk (e.g. identification and evaluation of hazards in the Safety Management System of SEVESO II) calls for an integrated assessment of safety and external risks.

Conflicts between safety and external risk assessment tools and approaches concerns basically the methodology (e.g. clear method is lacking) and regulatory requirements (e.g. no clear difference between SEVESO major accident and environmental accidents).
Main recommendations:

- Promotion of cleaner and safer production systems by means of sharing of best practices and a common platform (short term); development of new - simple and effective - tools or the improvement of existing ones and inclusion of safety and clean concepts in the BAT process (mid term); research on concepts and approaches to deal with new and emerging risks, such as nanoparticle production, risks caused by new chemicals, cumulative risks, etc.
- Extension of the scope of Health, Safety and Environment (i.e. HSE) assessment, in order to include the assessment of major accident, occupational safety and environmental risks, both across the production chain, and in the design of production systems. The development of new assessment tools (e.g. life cycle assessment) and procedures standardization are considered.
- Development of a commercial one-stop-shop platform, in order to find validated information (e.g. accident occurrence), tools (e.g. risk management procedures, indicators), guidelines. The platform should reassure a continuous development and maintenance. Furthermore, the embedment of authorities, is essential to stimulate the development of a simpler auditing and inspection process.
- Development of cost-effective monitoring instruments for the environment and for safety, such as early-warning safety indicators (short action), and the promotion of secure mechanisms to collect and share data on failure frequencies (mid term).

## Risk communication

The involvement of the public in the decision-making process in environmental management is a major objective in the EU environmental policy. Specifically it is broadly recognised that the public potentially affected by certain activities has the right to information and the right to participate in the policy-making process which entails those activities. In this direction, several EU initiatives have already been launched, based on the principle that policies and projects should involve the communities and individuals affected by these policies, throughout the whole decision process. The regulatory promotion of public involvement in decision processes is based on the principles of subsidiary and shared responsibility, dialogue and partnership, as expressed in several Action Programmes of the European Communities on the environment.

Despite of the several initiatives at EU and UN levels, which were particularly important to structure the risk communication process (e.g., Aarhus Convention, Seveso Directive, EC Impact Assessment policy, APPEL programme), there is still a lack of commonly accepted policy on risk communication together with a series of accepted guidance documents, which incorporate all taxonomies of risks by including newly emerging risks (e.g., intentional acts, terrorism).

Main recommendations:

- Sharing of best practice in the field of risk communication, taking into account the communication of ambiguities on current and emerging risks. This sharing could be done by means of the one-stop-shop platform promoting a harmonisation of Risk communication procedures;
- Involvement of the public (including workforce) as soon as possible in the decision process, aiming at a common "emergency culture" among the population at the long term. The expected outcome is a better industrial process design, and an increased efficiency of the emergencies management, concerning especially major accidents, but also workplace safety.
- Transparency and efficiency of risk communication should be enhanced, in order to build the trust of the public in the communication sender, by encouraging the national authorities to share information about chemical risks and pollution (short term action), and by tailoring communication messages to the different audiences (mid term action).

## SHAPE-RISK Advice

Based on the integration of the various topics (regulations, organisational and human issues, technical aspects and risk communication) and the outcome of the blueprint scenarios, the SHAPE-RISK project can be summarised in 4 key recommendations, which form together the final SHAPE-RISK advice:

There is a strong need for a EU policy framework for HSE management in order to harmonise EU regulation, support integrated HSE management and optimise the efficiency of integrated risk management in the context of the sustainable development of the European process industry. Key elements of such a policy framework are the extension of the BAT discussion with safety aspects and life-cycle considerations, and the further adoption of the New approach and performance-based regulation in HSE management;

There is a need for eco-design tools for industrial processes, adopting the life-cycle approach and the concept of industrial parks in a industrial ecology perspective, in order to reduce significantly the overall impact of industrial activities on HSE;

There is a need for adequate tools to support integrated HSE assessment and management. Adequate tools mean available, user-friendly, up-to-date and respond to the needs of the end-users. Ideally, HSE tools will be provided by the one-stop-shop platform;

There is a need to promote risk communication and improve the risk perception by correctly informing the public and all involved actors (e.g. industry, authorities, public, stakeholders). Transparency and efficiency of risk communication should be enhanced, in order to build the

trust of the public and to involve them as soon as possible in the decision process, aiming at the promotion and diffusion of risk awareness in the society as a whole.

These recommendations were the result of a large debate among SHAPE-RISK partners and received a strong support from industry representatives, consultants and Competent Authorities.

The start point for the implementation of the SHAPE-RISK advice is the consolidated collection of knowledge, data, methods and tools build during the project WP and which is available on SHAPE-RISK website.

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# 1. PROJECT EXECUTION

## 1.1 Reminder of the project objectives

SHAPE-RISK aimed at optimising the efficiency of integrated risk management in the context of the sustainable development of the European process industry.

The goal was to support safety and the minimisation of accidents, pollution and emissions at industrial installations. In operational terms, SHAPE-RISK was structured as a network with the organisations providing technical support to the Authorities in charge of the SEVESO II, IPPC and ATEX directives.

"SHAPE-RISK" responded to the objectives in research sub-areas 3.4.3.2 Systems research and hazard control, and the paragraph dealing with Sustainable waste management and hazard reduction in production, storage and manufacturing.

Before proposing alternatives or changes, SHAPE-RISK dealt with six work-packages, during the 2 first years. In the final step (2006 – 2007), "SHAPE-RISK" consisted in organising a creative process encouraging radical changes and breakthrough in terms of integrated risk management (see figure 2).

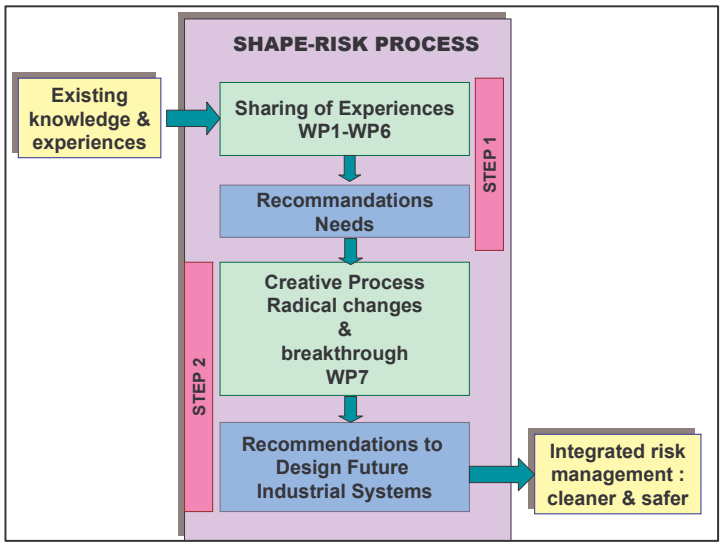



**Fig. 2: SHAPE-RISK Process**

## 1.2 The partners of the project

The consortium of SHAPE-RISK was composed of 19 partners and 12 European countries were represented, as presented in the table below.

| Partic. Role* | Partic. No. | Participant name | Participant short name | Country |
|---|---|---|---|---|
| CO | 1 | Institut National de l'Environnement Industriel et des Risques | INERIS | France |

| Partic. Role* | Partic. No. | Participant name | Participant short name | Country |
|---|---|---|---|---|
| CR | 2 | European Commission – Joint Research Ispra Establishment<br>Institute for the Protection and Security of the Citizen, Technological and Economic Risk Management Unit, Major Accident Hazard Bureau – MAHB | IPSC – TREM – MAHB | Italy |
| CR | 3 | Rijks Instituut voor Volksgezondheid en Milieu, Centre for External Safety | RIVM | Netherlands |
| CR | 4 | The technical Research Centre of Finland | V T T | Finland |
| CR | 5 | Risø National Laboratory, Systems Analysis Department, Programme Safety, Reliability and Human Factors | RISOE | Denmark |
| CR | 6 | Technical University of Ostrava | VSB - TUO | Czech Republic |
| CR | 7 | Jožef Stefan Institute | JSI | Slovenia |
| CR | 8 | Istituto Superiore per la Prevenzione e la Sicurezza sul Lavoro | ISPESL | Italy |
| CR | 9 | The Netherlands Organisation for Applied Scientific Research | TNO | Netherlands |
| CR | 10 | Health and Safety Labarotory | HSE.HSL | United Kingdom |
| CR | 11 | National Centre For Scientific Research | DEMOKRITOS | Greece |
| CR | 12 | Central Mining Institute | GIG – CMI | Poland |
| CR | 13 | Otto-von-Guericke-Universität Magdeburg (IAUT-AS) | (IAUT – AS) – OvGU | Germany |
| CR | 14 | Centre of Excellence for Sustainable Development in the Mediterranean Coastal Areas | IDEAS / CESD | Italy |
| CR | 15 | Major Risk Research Centre (MRRC) and Eco-square (Faculté Polytechnique de Mons) | FPMs | Belgium |
| CR | 16 | Environment Agency of England and Wales – Environment Agency | UKEA | United Kingdom |
| CR | 17 | Bundesanstalt für Materialforschung und –prüfung - | BAM | Germany |
| CR | 19 | The Flemish Institute for technological research | VITO | Belgium |
| CR | 20 | University of Manchester | University of Manchester | United Kingdom |

*CO = Coordinator
CR = Contractor

In operational terms, “SHAPE-RISK” Coordination Action was structured as a network which interacted strongly with industries and the other stakeholders at European level, but also at national and local level.

Each partner behaved in his country as an “ambassador” or a “SHAPE-RISK relay” to collect needs and concerns from the industry and other stakeholders, and also disseminated the production of the network.
SHAPE-RISK activities resulted in the dissemination of knowledge and in the specification of research activities to address innovative breakthrough that serve the construction of safer and cleaner industrial systems.

## 1.3 WP 1 – Integration of IPPC and SEVESO directives

### 1.3.1 Objectives

The main members of WP 1 are: INERIS (WP leader), TNO (deputy leader), VSB – TUO, Demokritos, CMI and IDEAS.
The objective was to tighten the links between safety and pollution prevention and control.

### 1.3.2 Results

The general requirements of IPPC and SEVESO directives were evaluated, assessing similarities and differences, evaluating the state-of-the-art of their integration in the EU, and finally suggesting appropriate improvements.

There would be several benefits involved in the integration of IPPC and SEVESO directives. The main motivation supporting the integration are the following:

1. Improve synergies between pollution and accidents prevention and further reduce their occurrence;
2. Better informed decisions on the design and management of industrial systems taking into account pollution and accidents as a whole, leading to higher efficiency of environmental safety investments;
3. To save time in procedural aspects and reduce time devoted to assessment work for both industry and administration, and to improve the enforcement of both Directives;
4. Better handling of situations that are not at the core of IPPC or SEVESO II, like near accident, operation problems, process or equipment start up, washing, etc.;
5. To integrate waste directives and IPPC;
6. To improve synergies, to avoid or to solve the potential conflicts (or risk transfers) between reducing emissions and improving (not degrading) safety.

The slide hereunder presents some recommendations expressed in the WP 1 synthesis document.

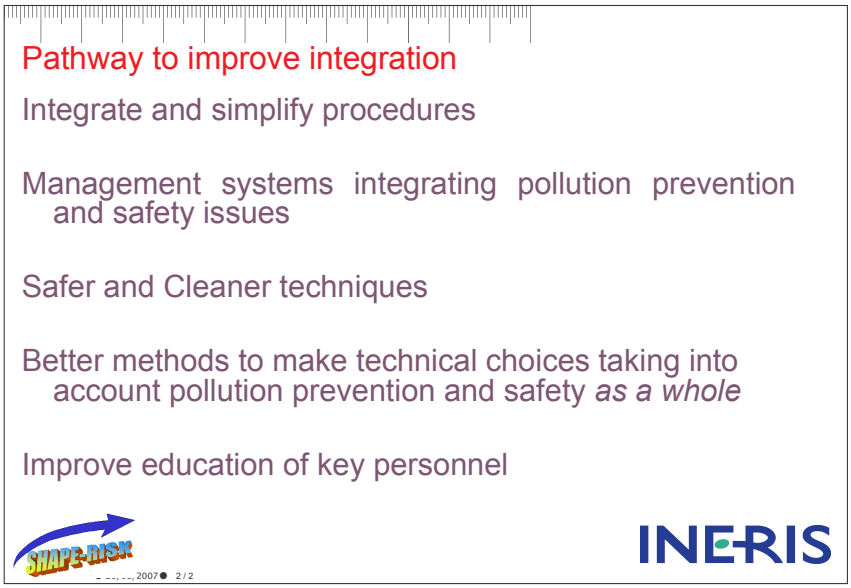



**Fig. 3: Slide presented during the final conference by Mr. Jean-Marc Brignon (INERIS)**

The two different strategies for integration are presented.
As a priority, integration efforts could be concentrated on those industrial sectors that are under the scope of both Directives: Energy production, Chemical industry, Refineries, Storage of Chemicals and Petrochemicals.
An alternative strategy could be to consider all IPPC and all SEVESO sites in the integration process. The integration of IPPC and SEVESO would therefore extend significantly the scope of accidents prevention and pollution prevention legislation in the EU.

Three main benefits could be expected for the assessment of the impact of technical measures on pollution prevention and safety as a whole:

1. Comparing technological and/or managerial alternatives from an integrated (environment + safety) point of view. When integrating pollution prevention and safety in decisions about technology choices, one needs to appreciate the overall "safety-and-cleanness" of different options. This goal which could be achieved by using expert judgement or weighting schemes integrating different indexes, and integrating them into LCA approach. Suggestions were made to adapt indexes as alternatives comparison tools.
2. Taking costs into account when making decisions on environment and safety issues to select reasonably cost-effective solutions, it is required to take into account simultaneously cost-effectiveness in the two fields of i) pollution prevention and ii) accidents prevention/impact minimisation.
3. Taking into account the value of environmental and safety benefits when evaluating alternatives at an industrial site beyond assessing the cost-effectiveness of technological options, the next step can be to evaluate their cost-benefit ratio. This implies to carry out an economic valuation of the impacts of the alternatives.

One goal of the integration of the IPPC and SEVESO Directives would be to create a better framework for the introduction of safer and cleaner processes in industries. However, it is

difficult to define and identify concretely what are or what should be "safer and cleaner" technologies. Introducing safer and cleaner processes could have one of the following meaning:

1. substituting and reducing the use and storage of hazardous chemicals
2. replacing batch by continuous processes
3. reducing the size of the production systems
4. reducing the size of storage of toxic and hazardous chemicals.

### 1.3.3 Method to achieve the objectives

To achieve the objectives of the WP 1, the efforts were mainly devoted to the dissemination and the discussion of the ideas of the discussion document.
The strategy was to have discussions of the integration of IPPC and SEVESO and related issues that the industry regards as important in this framework, by contacting the right organisations in each WP country. For instance, in France, both national organisations and local chambers of commerce were contacted in order to reach both large companies and SMEs.

At the beginning of this period, the work was structured by the elaboration of a discussion document for the WP1.

- A preliminary version of the discussion document has been written very early in the work, so that the WP1 members had from the beginning some basic material to help them in collecting input from industry.
- A first round of input was then sought by WP1 members, of course from their own expertise and their own institution, but also from industry, from competent authorities, and from other scientific and technical institutions in their country.

Many oral and written comments on the document, and more generally on the objectives of the WP1 and the Shape-Risk project were obtained, for instance from the electricity generating and the chemical industries in France, from the petroleum industry and the competent authorities in Greece.

The preparatory meeting of the WP 1 took place at Apeldoorn on the 10$^{th}$ September 2004. This work session gave the opportunity to complete the discussion document and to point out topics to be discussed during the work shops.

The workshop took place on 15.11.2004 in Paris during the Society for Risk Analysis Conference, where the topics were discussed.

**The results of the work is a good contact established between the WP members and the industry, and a synthesis document that reflects the main preoccupations of the industry and that gives proposals regarding the WP 1 objectives.**

An extract of the conclusion of the WP 1 synthesis document is given below :

- "*The IPPC BREF documents are seen as the best basis to start with for the integration. The existing BAT information exchange framework can be used to exchange experience on safety and pollution prevention, and to develop next generations of BREF documents that also cover safety issues. But the BAT process as it is now, maybe unable to drive the industry fast enough to new cleaner and safer processes. A more radical way could be to re-engineer the BAT process itself to make it become a real driver for radically cleaner and safer (and competitive, as said before in this document) new industrial plants in Europe.*
- *It seems necessary, as a research and development objective, to develop methodologies for the assessment of alternative technology options in the integrated framework of pollution prevention and safety.*
- *For this objective, it is also necessary, as a long-term project, to develop external costs for industrial sectors other than energy and integrate environmental and safety externalities. Cost-efficiency benchmark values representative for the EU, covering pollution prevention and safety, for enough air and water pollutants would also be useful.*
- *Finally, a last recommendation is to improve the education of key personnel in Competent authorities and companies involved in environmental regulation.*
  *Improving education will reduce the time needed for the permitting and the compliance checking activities, and improve the enforcement of the Directives, because bad or poor implementation of the Directives requirements will be more easily detected.*
  *Linked to the education of the personnel, there can be a problem of availability of highly skilled professionals because positions in companies and administrations on environmental matters are not sufficiently attractive. Increasing the attractiveness of environmental jobs related to the environmental legislation may therefore be as useful are working on the Directives themselves.*"

### 1.3.4 List of deliverables

The list of the WP 1 deliverables is given in the table below:

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.1.A | Discussion Document | WP 1 | 31.07.2004 | 15.04.2005 | INERIS – 1 |
| D.1.B | Proceedings of the workshop | WP 1 | 30.09.2004 | 15.04.2005 | INERIS – 1 |
| D.1.C | Synthesis document | WP 1 | 28.02.2005 | 15.04.2005 | INERIS – 1 |

**Tab. 1: List of deliverables for the WP 1**

### 1.3.5 List of milestones

The WP 1 milestones are presented in the table:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.1.A | Workshop | WP 1 | 31.08.2004 | 15.11.2004 | INERIS – 1 |
| M.1.B | Synthesis document on the website | WP 1 | 28.02.2005 | 15.04.2005 | INERIS – 1 |

**Tab. 2: List of milestones for the WP 1**

## 1.4 WP 2 – Continuity of risk management from work place accident to major accident

### 1.4.1 Objectives

The main partners of the WP 2 were: TNO (WP leader), HSL (deputy leader), INERIS, RIVM, DEMOKRITOS and BAM.

WP2 addressed the continuity/consistency of risk management from workplace accident to major accident, meaning: "is cross fertilisation between techniques for the characterisation of occupational and external safety possible / desirable ?".

### 1.4.2 Results

The work conducted within this WP has shown the large variety of methods, criteria, and involved institutions in the different countries, in which the analysis was conducted. The positive and negative aspects with a possible integration of those issues with regard to occupational and external risk management have also been highlighted.

Several stakeholders were interviewed to get a feedback on the state-of-the-art concerning the identification, prevention, preparation, mitigation, repression and after care of workplace hazards and external hazards due to accidents.

The main outcomes of this activity were:

- the inventory on the management of occupational risks and external risks (for France, Germany, Greece, the United Kingdom, Finland, Austria, Spain and The Netherlands),
- the comparison of management of occupational risk approaches,
- the comparison of methods for assessing external risks.

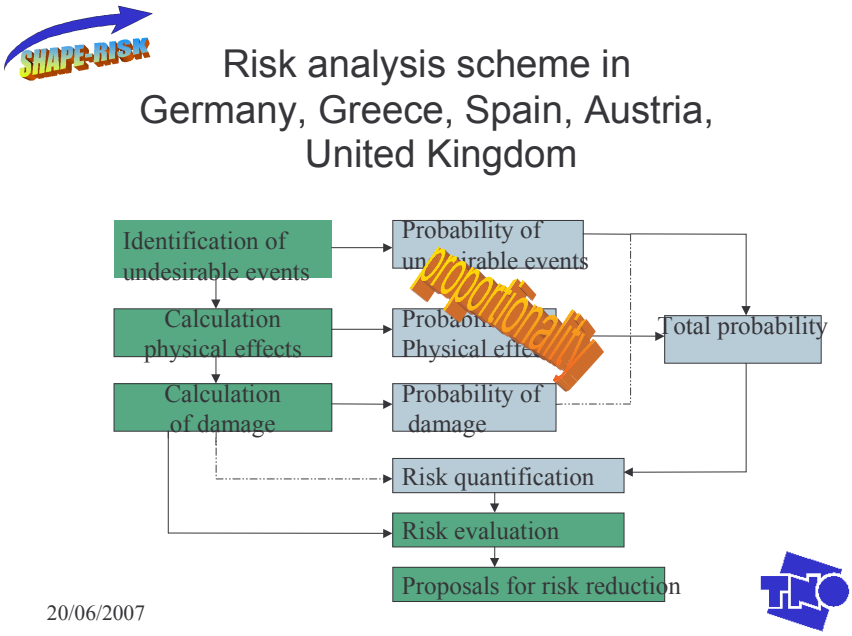



**Fig. 4: Slide presented during the final conference by Ms. Ingrid Heindebrink (TNO)**

The WP2 had first analysed how occupational safety is dealt with in the different selected countries, by specifically taking into account the different risk assessment methods in use, and subsequently has compared the different reporting systems concerning the occupational safety report, and the different obligations amongst the countries under investigation.

Subsequently, the WP2 addressed the comparison of methods for the assessment of external risks (i.e. major accidents), by identifying the main actors involved and the different approaches. For each country each step of a full-scale risk analysis was evaluated.

On the basis of the inventory regarding occupational and external risk assessment and management, the existence of a link between occupational and external risk was verified and then addressed, according to two main questions:

- How and where are both types of hazards tackled?
- Are occupational and external hazards related to each other?

As a follow-up of the analysis and discussions within WP2, it is clear that a possible link between occupational and external safety is given in the Safety Management System (SMS), recommended by SEVESO guideline. The identification and the evaluation of hazards as required in the SMS obligation should not be limited to external risks. It should consider all (loss of containment) scenarios that may "lead to serious danger to human health and/or the environment, inside or outside the establishment". Concerning the second question, it is not proven that a high level of occupational safety is a guarantee that no major accidents will happen. Major accidents often happen due to a combination of factors that have not been foreseen. This is usually not the case for occupational accidents, which are normally more trivial and more frequent. However, they can be the cause of a chain of events, which can eventually be at the basis of the release of chemicals with off-site effects.

### 1.4.3 Method to achieve the objectives

The WP 2 began with the three tasks below :

- An inventory of the names of the organisations (stakeholders) to be approached to participate in the project.
- Making a framework for the data gathering collection in the countries involved in WP2 that is to say France, Germany, Greece, United Kingdom and the Netherlands.
- Approaching the stakeholders.

Beginning of September the information of the six partners in the project to reflecting the state of the art regarding occupational safety (on site) and external safety (protection of the environment) appears in a discussion document.

The purpose of this discussion document was to focus on the methods/techniques to describe/calculate occupational and external risks and to see which synergies and conflicts exist. This inventory lead to the identification of RTD efforts to reduce occupational and external risk.

The occupational safety and the external safety were compared together and detailed in 5 European countries, regarding these parameters :

- External actors,
- Internal actors,
- Example of risk assessment,
- Occupational Safety Report,
- Methodology for risk analysis,
- Lost of Confinement events,
- Frequency calculation,
- End points
- and parameters for consequences calculations (risk calculation and risk acceptability criteria)

The preparatory meeting at Apeldoorn on 9th September 2004 was a good opportunity to exchange practises in European countries and to prepare the discussion document to be discussed during the further workshop.

This workshop took place on 15.11.2004 in Paris during the Society for Risk Analysis Conference.

The WP 2 synthesis document gives a description of the state of the art, and also an analysis of the difficulties encountered by the industry and other stakeholders. Six main difficulties are pointed out (see the synthesis document D 10 (D.2.C)). A lot of recommendations enhanced by the Industry and stakeholders have been proposed.

### 1.4.4 List of deliverables

The list of the WP 2 deliverables is given in the table below:

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.2.A | Discussion Document | WP 2 | 31.07.2004 | 15.04.2005 | TNO – 9 |
| D.2.B | Proceedings of the workshop | WP 2 | 30.09.2004 | 15.04.2005 | TNO – 9 |
| D.2.C | Synthesis document | WP 2 | 28.02.2005 | 15.04.2005 | TNO – 9 |

**Tab. 3: List of the WP 2 deliverables**

### 1.4.5 List of milestones

The WP 2 milestones are presented in the table below:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.2.A | Workshop | WP 2 | 31.08.2004 | 15.04.2005 | TNO – 9 |
| M.2.B | Synthesis document on the website | WP 2 | 28.02.2005 | 15.04.2005 | TNO – 9 |

**Tab. 4: List of the WP 2 milestones**

## 1.5 WP 3 – Survey and comparison of common tools and service platforms

### 1.5.1 Objectives

The main members of WP3 [VTT (WP Leader), JSI (WP deputy), MAHB, HSL, OvGU, IDEAS/CESD] were expected to complete the task of surveying and mapping the commonly used tools and service platforms in the first 12 months of the SHAPE-RISK project.

The main objective of WP3 was to conduct a survey of **To**ols, **S**ervice **P**latform, and **I**nformation **S**ystems (i.e. **ToSPIS**) supporting the compliance with the IPPC and SEVESO Directives (i.e. for prevention, response, crisis management, and mitigation). The objective was to compare the findings of the survey and describe the state-of-the-art in order to identify the needs for the future RTD activities with the intent of improving the ToSPIS for risk management. This has been achieved by identifying and mapping the ToSPIS that industry and competent authority currently uses in order to comply with the SEVESO II and IPPC Directives.

### 1.5.2 Results

The ToSPIS survey was conducted through dedicated interviews by involving several stakeholders of different member states. An interviews' aid was adopted, which was naturally structured around the main areas of interest with regard to SEVESO & IPPC Directives. It consisted of three main sections:

1. Organisation / Institution Profile
2. Seveso Directive compliance
3. IPPC Directive compliance

The sub-sections used to subdivide the checklist allowed the interviewers to target the relevant people in these diverse and multidisciplinary fields of risk management.

The diverse range of ToSPIS used is attributable to the diverse nature of the risk management field, and the corresponding legislative and regulatory demands placed on industry. As was highlighted by the SHAPE-RISK WP2 Synthesis Document, occupational and external safety are dealt with by different bodies (i.e. for policy making and legislation as well as for regulations and enforcement). And other bodies regulate environmental safety.
Many well-established ToSPIS are available, while newer methods and practices are also being developed to comply with upcoming legislative demands. There seems to exist a growing need for these in an "easy and user friendly form" in administration.
In the attempt to comply with all the relevant safety-related legislation, it is often the case that various risk assessments are carried out for slightly different purposes, and some degree of duplication is possible. Industry is consequently confronted with a larger administrative overhead in their compliance efforts – in choosing, learning, using and maintaining all the suitable and necessary ToSPIS, and as was often noted, also developing their own systems. In addition, excessive administrative work contributes to a number of ToSPIS being unwanted by industry (too comprehensive, costly, time consuming in application, etc.); therefore it looks for a system "one tool for all".

It is generally accepted that there is a lack of safety knowledge in SMEs and current information on the most suitable ToSPIS (and their limitations) seems to be limited. More guidance by authorities regarding the preferred ToSPIS would be beneficial for all stakeholders (although it has been raised that the authorities themselves often also require assistance).
The information and knowledge needed to support and use the ToSPIS must be available to all stakeholders. In the European framework, it would be advantageous to improve the availability and sharing of information and know-how.

Risk assessments in the chemical industry are obviously closely related to the chemicals used in the process and those in storage. The effects of any subsequent accidents may even be very widespread, and several stakeholders are typically involved in managing the associated risk. Common approaches between the various authorised bodies would enable more harmonised reporting and perhaps more standardised ToSPIS to be developed and applied.
Further harmonisation of ToSPIS will certainly be determined by the constraints placed on the organisations – a variety of factors including societal concerns, legislative demands, and available resources and time are typically influential.
Concurring with the other suggestions noted in the SHAPE-RISK WP2 Synthesis Document, semi-quantitative methods and ToSPIS may give directions for improvement. Semi-quantitative methods and supporting ToSPIS were often quoted as being preferred and used because they were less resource intensive. The risk would typically be presented in the form of a risk matrix, thus enabling ranking of the risk, comparison of the risk against (semi-) quantitative risk criteria, and prioritisation of the various risk reduction measures.

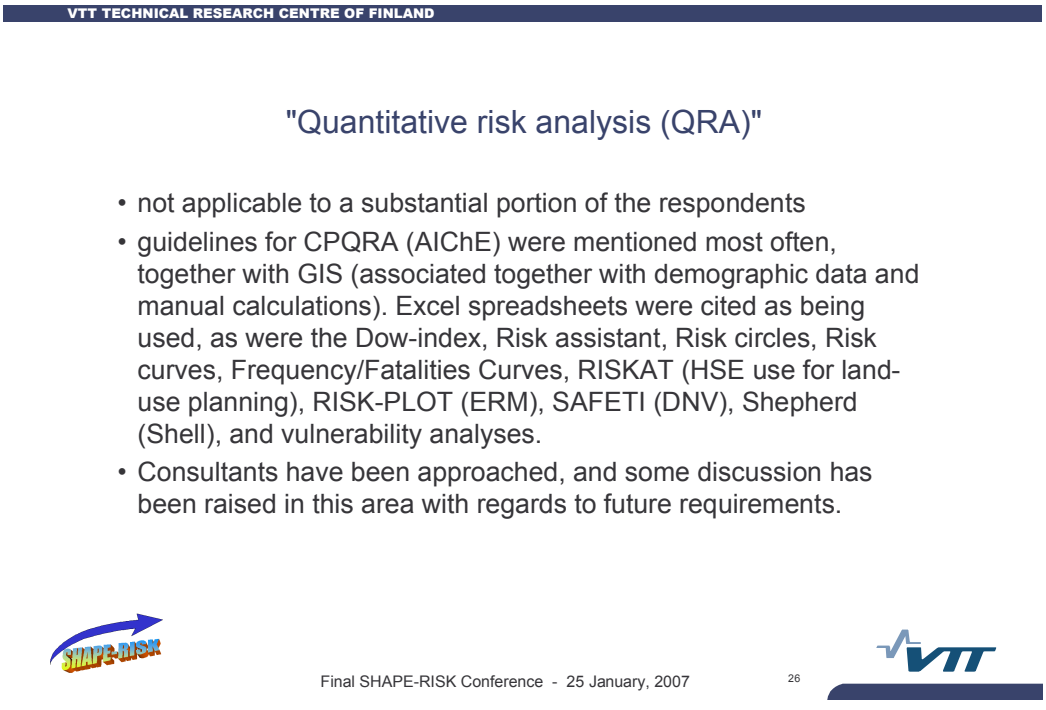



**Fig. 5: Slide presented during the final conference by Mr. Branko Kontic (JSI)**

As the process industry strives for increased competitiveness, the time needed for training, together with the associated costs, make it difficult to maintain and support the required levels of safety. In Europe, where one trend in the process industry is towards small multi-product plants and increasing complexity, the ever-present potential for chemical-related accidents remains an issue. Even the relatively simple tasks of raising and maintaining safety awareness are often neglected.

Safety practitioners need simple, quick, and effective tools to support safety and continuous improvement of chemical process systems now required by stringent legislation and customer demands.

The complexity of the risk determining methods and supporting ToSPIS must, however, be proportionate to the risk. The burden on all the stakeholders would be reduced, as would the need for extensive expertise and training resources. Typically, the nature and the amount of the chemical substances in process or storage gives a good indication of the associated risk, and hence common sense was often quoted when choosing and using the most suitable ToSPIS.
Quick and easy tools may degrade risk analysis and give false impression about safety of concrete installation. A well-trained consultant doing a risk analysis with appropriate tools would typically be preferred to people with adapted training in risk assessment. It would be a sad situation if authorities apply "quick and easy tools" as a basis for decision-making primarily because they are not competent to use comprehensive methods, data, etc.

Many ToSPIS exist for complying with the diverse aspects covered by the Seveso and IPPC Directives. New methods and ToSPIS to support and improve risk management practices are being developed, both within the companies themselves and also as part of ongoing research efforts. Better ways of sharing information and knowledge will be instrumental in the ongoing reduction of risk and improved prevention, response, crisis management, and mitigation issues in the chemical process industry.
Future ToSPIS will need to not only support the technical risk aspects, but also the safety management, and social and regulatory aspects. Although many obstacles exist, as suggested in the WP2 Synthesis Document, the development of an automated expert system for SMEs based on their specific needs may be beneficial. Recommendations for Research and development would include the development of ToSPIS to support the assessment of alternative technology options in the integrated framework of safety and pollution prevention.

### 1.5.3 Method to achieve the objectives

A summary of the work carried out for WP3 this period follows:

- Preparation of the project and attendance the Kick-off Meeting – clarified & presented overview and objectives of WP3, established working relationship with partners, and prepared & finalised the Minutes.
- Development of the WP3 Interview Aid (Questionnaire 1).
- Development of national SHAPE-RISK Networks – via various channels.
- WP3 Interviews.
- Analysis and comparison of the WP3 Interviews' material.

- Completion of the Discussion Document
  The Discussion Document gives an overview of the tools, services, and information systems used to comply with the Seveso and IPPC Directives. The "critical review" of the state-of-the-art should incorporate commentaries from the industry and map, e.g. the national perspectives, the industry uptake & implementation, etc.
- WP3 Workshop preparations – Workshop Agenda, Workshop Proceedings, etc.
- The Workshop: The workshop took place on 16.11.2004 in Paris during the Society for Risk Analysis Conference, where the topics (raised in the discussion document) were discussed.
- Develop WP3 Synthesis Document: The final deliverable, a Synthesis Document describing the state-of-the-art regarding the topic (available data and results from previous works) and an analysis of the barriers that can compromise the implementation of the foreseen solutions is compiled. It contains a list of possible RTD activities to fulfil the needs.

The SHAPE-RISK "national interactive group" networks have been developed – industry (and competent authority) representatives were identified and contacted. These were seen to be critical in achieving good representation of the relevant stakeholders (e.g. industry, consultants, etc.) for the WP3 Interviews & feedback to the Discussion Document.
It was also envisaged to extend the networks into other member countries that are not currently represented in the consortium, however, it has been a challenge to optimise the coverage of information with respect to the resources available.
At least VTT needed to translate (and abridge) the "Support Form" (developed by INERIS) into Finnish, before disseminating this via their contact networks. Both Finnish & English versions of the SHAPE-RISK website were set up in Finland to support this network (http://www.vtt.fi/tuo/44/projects/shape-risk/). A "Dissemination Log" documentation was developed to monitor both the development of the SHAPE-RISK network and the SHAPE-RISK dissemination.

It was initially decided to limit the interviews (mainly resources & quality of information issues) to solely the states represented within the WP3. It was nevertheless forwarded to all members of the consortium (in order to get EU-wide coverage of the state-of-the-art).

Both the SHAPE-RISK Network and the local website have been developed. The main SHAPE-RISK website has also been used to support the work of WP3 – uploading files and information.

### 1.5.4 List of deliverables

The list of the WP 3 deliverables is given in the table below :

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.3.A | Discussion Document | WP 3 | 31.07.2004 | 15.04.2005 | VTT – 4 |
| D.3.B | Proceedings of the workshop | WP 3 | 30.09.2004 | 15.04.2005 | VTT – 4 |
| D.3.C | Synthesis document | WP 3 | 28.02.2005 | 12.05.2005 | VTT – 4 |

**Tab. 5: List of the WP 3 deliverables**

### 1.5.5 List of milestones

The WP 3 milestones were:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.3.A | Workshop | WP 3 | 31.08.2004 | 15.04.2005 | VTT – 4 |
| M.3.B | Synthesis document on the website | WP 3 | 28.02.2005 | 15.04.2005 | VTT – 4 |

**Tab. 6: List of the WP 3 milestones**

**WP 4 – Improving the efficiency of the organisational management with regard to safety, health and environment**

### 1.5.6 Objectives

The WP4 addressed issues and trends related to management of Health, Safety and Environment (HSE) for industry and for regulatory authorities, with a special focus on the integration of the management of these three issues. The work is based on experience and collected information by the participating organisations in the Shape-Risk Coordinated Action.

The objective of WP4 was to contribute:

- to the establishment of a general framework for management tasks and objectives related to safety, health and environment;
- to the review of tools monitoring performance with respect to these management tasks and objectives;
- to the provision of guidance on methods to improve performance with respect to these management tasks and objectives.

The members of the WP 4 were : RISOE (WP leader), DEMOKRITOS (deputy leader), INERIS, JSI, GIG-CMI, FP Mons.

### 1.5.7 Results

The following conclusions are considered to be important in the (future) management of Health, Safety and Environment:

- effective management approaches should be *simple* and adequate. There are many approaches to management; industry likes to know what management systems, or what elements from these systems, perform best. Linked to simplicity is the need to harmonize management requirements with *legal requirements*. *Integration* of HSE management will be more effective if also the legal requirements and approaches towards Health, Safety and Environment are *harmonized*. Industry also requires to focus on practice rather than on documentation,
- there is a need for *indicators* that at an early stage can indicate the level of safety and risk which can be also useful to avoid the collection of data that are not of use. Activity indicators not necessarily address improvement, and accident/incident statistics are not attractive as indicators,
- there are considerable differences in the practical implementation of the EU-directives, and the integration of HSE management is most EU countries is not stimulated and rewarded,
- risk analysis is a necessary tool for safety management. Also risk analysis can be integrated and extended from the present use on major hazard risk to include occupational safety and environment,

- new challenges appear or will appear in the near future, including *shared responsibility of hazard sources* (outsourcing, industrial parks with shared infra structure, etc.); *multicultural workforces*, and *new* (computerised) *forms of communication.*

### 1.5.8 Method to achieve the objectives

The WP4 partners have collected information from industry, industry associations and competent authorities in their respective countries. Information collected was based on an agreed list of questions and items. Identifying the present level of and attitude towards integration of HSE management was an important item. Different approaches were used, i.e. joint meetings, individual interviews, existing networks and additional telephone interviews with industry. This method does not provide a basis for a statistical analysis, but it fulfilled very well the aim of collecting main viewpoints and issues across the EU, and the results, as discussed by the participating organisations, have clearly shown some trends and conclusions.

The work has been structured by the elaboration of three documents: i) the discussion document, ii) the proceedings of the workshop and iii) the synthesis document.

A successful preparatory meeting took place at RISOE on the 30th of September 2005. All WP4 partners (plus University of Magdeburg) attended the meeting.

The information included in the discussion document was presented and discussed at an international workshop that took place December 12th, 2005 at INERIS. Apart from the SHAPE-RISK partners, in this workshop participated representatives from industry (4), competent authorities (2) and other stakeholders (8, typically consultants). The outcomes of this workshop are included in the synthesis document.
The synthesis document contains:

- Background – management of HSE in relation to industry's objectives
- Presentation of the state of the art
- Problem areas
- Proposed recommendations, Research and Development needs

All documents are on the SHAPE-RISK website.

### 1.5.9 List of deliverables

The list of the WP 4 deliverables is given in the table below:

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.4.A | Discussion Document | WP 4 | 31.07.2005 | 15.04.2006 | RISOE - 5 |
| D.4.B | Proceedings of the workshop | WP 4 | 30.09.2005 | 15.04.2006 | RISOE - 5 |
| D.4.C | Synthesis document | WP 4 | 28.02.2006 | 15.04.2006 | RISOE - 5 |

**Tab. 7: List of deliverables for the WP 4**

### 1.5.10 List of milestones

The WP 4 milestones are presented in the table below:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.4.A | Workshop | WP 4 | 31.08.2005 | 12.12.2005 | RISOE - 5 |
| M.4.B | Synthesis document on the website | WP 4 | 28.02.2006 | 15.04.2006 | RISOE - 5 |

**Tab. 8: List of milestones for the WP 4**

**WP 5 – Policies for the management of environmental risks**

### 1.5.11 Objectives

The WP5 was intended to produce a survey in the area of environmental risk assessment, with specific reference to IPPC and SEVESO classified sources. This activity was focused on management of the environmental risks generated by accidents.

### 1.5.12 Results

The main deliverable of the WP5 was to provide the overview of environmental risk assessment at European level including description of founded difficulties in this area. The overview was aimed at the state of the art in different countries of EU, the course and specifies of accidents in the environment and existing methodologies and approaches used for environmental risk analysis.

For getting an overview in area of environmental risk assessment the *Questionnaire of environmental risks overview* translated to several different languages was produced. The aim of the *Questionnaire* was to bring out the information about the way and scope of implementation IPPC and SEVESO Directive in European Union countries (and also in others selected European countries), map the actual situation including the methodologies used for environmental risk assessment. The Questionnaire has these main parts:

- regulations: relations between IPPC and SEVESO II Directives,
- risk assessment of potential accidents in environment,
- risk analysis use.

The Questionnaire was structured around these three areas to include the main issues concerning chemical accidents in environment and troubles linked with implementation of the SEVESO II and IPPC Directives, which are almost not solved in European countries, even if they should be.

Through the Questionnaire several stakeholders on national and international level were addressed. Among these belonged representatives of the state administrations (i.e. national and regional level), professional bodies, industries and NGOs. The addressed stakeholders aimed at sharing experience, technical support and transfer of know-how including good practices in the field of accidents having origin or impact in environment. These European representatives came especially from Belgium, Italy, Finland, United Kingdom and Czech Republic and they were selected on the base of their participation in WP5 of Shape-Risk project. Among others addressed countries belonged Slovak Republic, Spain, Sweden and Switzerland, where contributors who replied were the members of SEVESO CCA.

The benefit of replied Questionnaires was especially in identification of different views on chemical accidents in environment caused by IPPC or SEVESO installations and in identification of the most used European methodologies for environmental risk assessment.

Methodologies used for environmental risk assessment

There is not too wide scale of methodologies for assessment of environmental risks in comparison with other methodologies like Purple Book, Dow's F&EI, which enable to assess the accident impacts on human health or property. Methodologies for assessment of long-lasting effects of dangerous substances in environment are not suitable for accidents because of dangerous substance effect in high concentrations and short-time. The present methodologies are still in stage of progress or are not developed in sufficient form.
The methodologies and tools currently used to assess risk of environmental accidents were reviewed, by identifying 4 main approaches which are used within the EU countries: Czech method *H&V index*, Spanish method *Guideline for the performance of environmental risk assessment*, Finnish method *Sara risk analysis for accidental releases* and *H1 Guidance* from UK. Each approach was described and evaluated, in order to identify difficulties and proposed recommendation, which will be discussed later in this document.

Some questions and issues were discussed, such as : i) the definition of an accident and of pollution; ii) the opportunity to evaluate not only dangerous classified substances; iii) the interactions between SEVESO, IPPC, and EIA; iv) the bilateral assessment of industry-environment interaction, such as environmental impacts caused by industrial accidents caused by natural phenomenon (e.g. flooding); v) land use planning implementation. All these issues will be discussed in the next chapter.

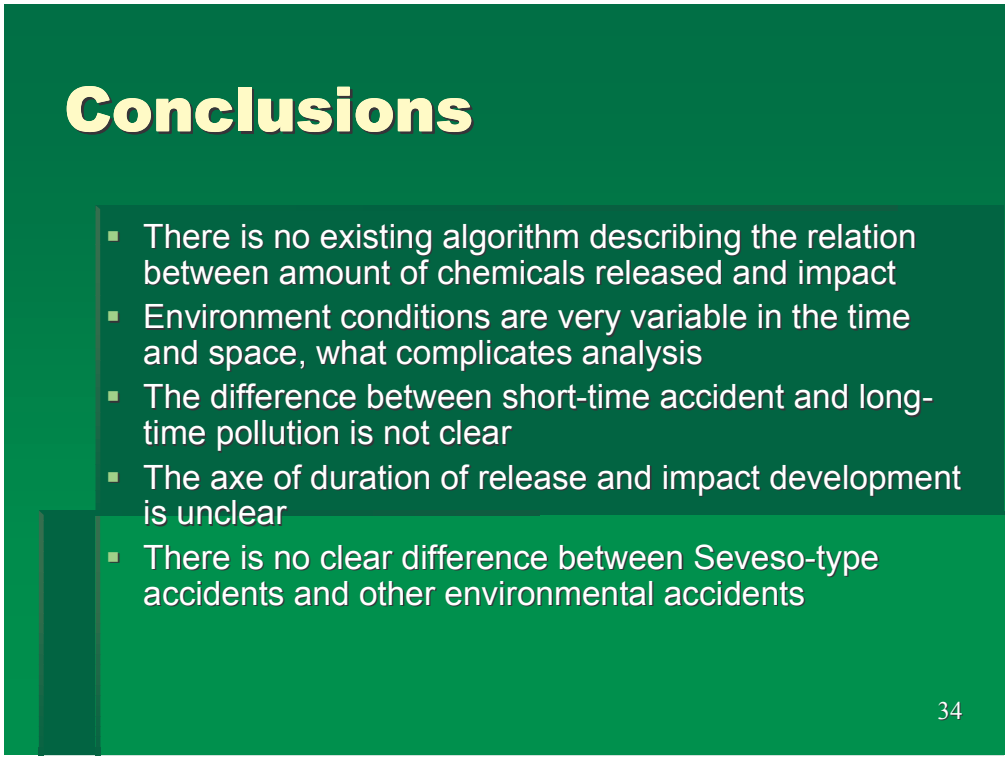



**Fig. 6: Conclusions presented during the final conference by Mr. Pavel Danihelka (VSB-TUO)**

### 1.5.13 Method to achieve the objectives

The first item is the Questionnaire of WP5. The aim of the *Questionnaire of WP5* was to collect the information about the way of implementing the IPPC and SEVESO Directives in certain countries of the EU (legislative requirements) and map the current situation including used methodologies on the field of accidents having origin or impact in environment.

The Questionnaire consisted of 3 main parts:

- Legislation: in compliance with IPPC and SEVESO Directives,
- Risk assessment of potential accidents in environment,
- Risk analysis use.

The *Questionnaire of WP5* was structured around these mentioned main areas concerning the issue of accidents in environment. Then the *Questionnaire of WP5* was structured around these mentioned main areas concerning the issue of accidents in environment involved a lot of difficulties connected with the implementation of the IPPC and SEVESO Directives in some countries of the EU, which are almost not solved (we don't know the answer), but should be.
The WP5 working team addressed with the *Questionnaire of WP5* these stakeholders at national or international level: state administration, competent authorities, industry and NGOs.

A successful preparatory meeting took place in Italy (October 2005). All partners involved in the WP 5 attended.

The second task was the discussion document.
The *Discussion document* aims to present the results gained from national approaches of individual partners of WP5 concerning "Management of environmental risks generated by accidents" in general for the scope of the WP5 Workshop taking place in the beginning of December in Paris.

The contents of the Discussion document is described hereunder:

- Note for the reader/Workshop invitation
- Introduction of Shape-Risk project
- Objectives of WP5
- Work description
- State of the art (European and national legislation, current situation in countries of EU-summary from *Questionnaires of WP5*, commentaries from the industry)
- Methodologies and approaches of environmental accident risk analysis (comparison of some methodologies)
- Proposal of general principle - "How to assess the accidental impacts in environment?"
- Difficulty/advantages
- Propositions to be discussed during the Workshop

A one-day workshop was organised by INERIS on 12$^{th}$ of December in Verneuil-en-Hallate, France. The goal of workshop was to obtain feedback on the WP5 *Discussion document* and

collect contributions from the main experts (including industry) in the field of risk analysis and management of environmental accidents.

### 1.5.14 List of deliverables

The list of the WP 5 deliverables is given in the table below:

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.5.A | Discussion Document | WP 5 | 31.07.2005 | 15.04.2006 | VSB-TUO - 6 |
| D.5.B | Proceedings of the workshop | WP 5 | 30.09.2005 | 15.04.2006 | VSB-TUO - 6 |
| D.5.C | Synthesis document | WP 5 | 28.02.2006 | 15.04.2006 | VSB-TUO - 6 |

**Tab. 9: List of deliverables for the WP 5**

### 1.5.15 List of milestones

The WP 5 milestones achieved are listed in the table below:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.5.A | Workshop | WP 5 | 31.08.2005 | 12.12.2005 | VSB-TUO - 6 |
| M.5.B | Synthesis document on the website | WP 5 | 28.02.2006 | 15.04.2006 | VSB-TUO - 6 |

**Tab. 10: List of milestones for the WP 5**

## 1.6 WP 6 – Public perception and communication on risk

### 1.6.1 Objectives

The Work Package 6 addressed the main mechanisms which are at the basis of the perception of risks, and the risk communication strategies and practices to establish public trust of certain industrial activities, and to promote public participation. The main intention was to gather the information necessary to devise a framework document on risk perception studies and risk communication practices in the EU. Specifically the main objectives of the WP were:

- To provide a state-of-the art document on risk perception and risk communication to the public
  - ✓ to identify the principles of risk perception;
  - ✓ to identify the principles, methods and tools for public communication;
  - ✓ to discuss the role of public participation in the decision-making process.
- To describe the general regulatory and policy framework in the EU and in the Member States on this topic;
- To provide information on existing empirical studies on risk communication;
- To identify future research needs in this area and provide general recommendations.

The contributing members were : EC JRC (leader), JSI (deputy), RIVM, RISOE, HSE/HSL and OvGU.

### 1.6.2 Results

Although risk communication principles are applicable to many situations, WP6 was specifically addressed to (i) environmental pollution (IPPC) and (ii) potential major accidents of Seveso type installations (SEVESO). However, most of the general results and conclusions from risk communication studies are often conceived as independent from specific risk or hazard sources, and therefore, many knowledge claims obtained in other sectors/applications can be related to our field of interest, though care needs to be taken regarding the extent that these knowledge claims are context-specific, and can be directly transferred to different situations. For this reason, sources outside these sectors have been consulted when appropriate.

**Public perception of risk**

A great deal of the research into risk perception seeks either explanation at the level of the individual, or at the wider social level. Less research is aimed at integrating these two levels, or understanding the interaction that takes place. Key research topics are:

- the mechanisms by which hazards are perceived along with the cognitive process through which they are interpreted and mentally represented by individuals,
- the mechanisms by which particular classes of hazards come to be viewed as risky or not,
- the factors that influence the perceived acceptability or tolerability of particular risks for experts and the public.

Different approaches to the **risk perception analysis** were presented and discussed, such as psychometric paradigm, cultural theory, social amplification of risk.

**Risk communication**

One of the objectives of risk communication is to inform and alert people about risk issues and to aid their understanding of the complex aspects of new technology and emerging risk. In addition it aims at promoting appropriate behaviour and responses (e.g. self-protective) towards hazards by, in part, enhancing the ethic of responsibility. This can be facilitated by the communication of information through social networks.

Some of the purposes of risk communication can be to:

- establish a trusting relationship between the 'sender' and the 'receiver' of risk communication ('**building trust**'),
- provide information about the potential risks of certain activities ('**raising awareness**'),
- increase understanding amongst all involved parties of the underlying principles of risk assessment, risk management and risk based decision-making. ('**education**'),
- gain acceptance of certain activities by the public ('**reaching agreement**'),
- establish attitude and behavioural change with respect to specific causes or classes of risk ('***motivating action'***).

Tools and methods for an effective risk communications were assessed. The efficacy of tools and methods for risk communication are dependent on the specific risk debate involved. The main risk debates can be classified under three general themes: factual evidence, experience and competence, and world views and value systems.

Finally, specific evaluation of risk communication to decision makers was afforded, taking into account their specific needs.

In the end of the WP6 activity, a review of the regulatory and policy framework in the EU was accomplished, focusing primarily on the EU legislation for the environment, health and safety in relation to the public involvement in decision-making processes. In particular, the gradual evolution from information supplied to the public ('right to be informed'), to public participation in environmental decision-making process ('right to participate') is discussed.
According to the general principle of democratic governance, the involvement of the public in the decision-making process in environmental management has been a major objective in the EU environmental policy arena.

Annexed to the Synthesis Document of WP6 there was a report on "Resource Documents and Information", which was intended to provide complementary information about relevant documentation on risk perception and risk communication related issues. It contained studies, guidelines, journals, and books, which can be found in the literature and other additional information available at the Community Documentation Centre on Industrial Risk (CDCIR) of the European Commission at the Joint Research Centre of Ispra.


**Fig. 7: Slide extracted from the presentation during the final conference (Mr. Luciano Fabbri - JRC)**

### 1.6.3 Method to achieve the objectives

The first task was to define the scope of the work. Although risk communication principles and practices are applicable to several sectors, it was decided to focus on the following aspects:

- Environmental Pollution (IPPC)
- Major Accidents of Industrial establishments (Seveso)

With regard to Occupational Safety, it was decided that the risk communication activity should be part of the training and education of the personnel and, therefore, it will be not specifically considered in the framework.

All the WP6 members gave overview of the general situation in their countries with regard to risk perception and communication. The method to collect data diverge from all organisations.
A preparatory meeting took place on the 14th of October 2005, and a work shop gave the opportunity to collect data from stakeholders.

During this first period, the work has been structured by the elaboration of a discussion document for the WP.
The final version of the discussion document contains:

- information collection to produce the state of the art,
- list of keys topics to be included in the framework
- a first list of reference documents.

The work shop took place on the 12th of December 2005 at INERIS.

The synthesis document contains the problems and recommendations discussed during the work shop.

### 1.6.4 List of deliverables

The list of the WP 6 deliverables is given in the table below:

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.6.A | Discussion Document | WP 6 | 31.07.2005 | 15.04.2006 | MAHB - 2 |
| D.6.B | Proceedings of the workshop | WP 6 | 30.09.2005 | 15.04.2006 | MAHB - 2 |
| D.6.C | Synthesis document | WP 6 | 28.02.2006 | 26.05.2006 | MAHB - 2 |

**Tab. 11: List of deliverables for the WP 6**

### 1.6.5 List of milestones

The WP 6 milestones achieved are listed below:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.6.A | Workshop | WP 6 | 31.08.2005 | 12.12.2005 | MAHB - 2 |
| M.6.B | Synthesis document on the website | WP 6 | 28.02.2006 | 15.04.2006 | MAHB - 2 |

**Tab. 12: List of milestones for the WP 6**

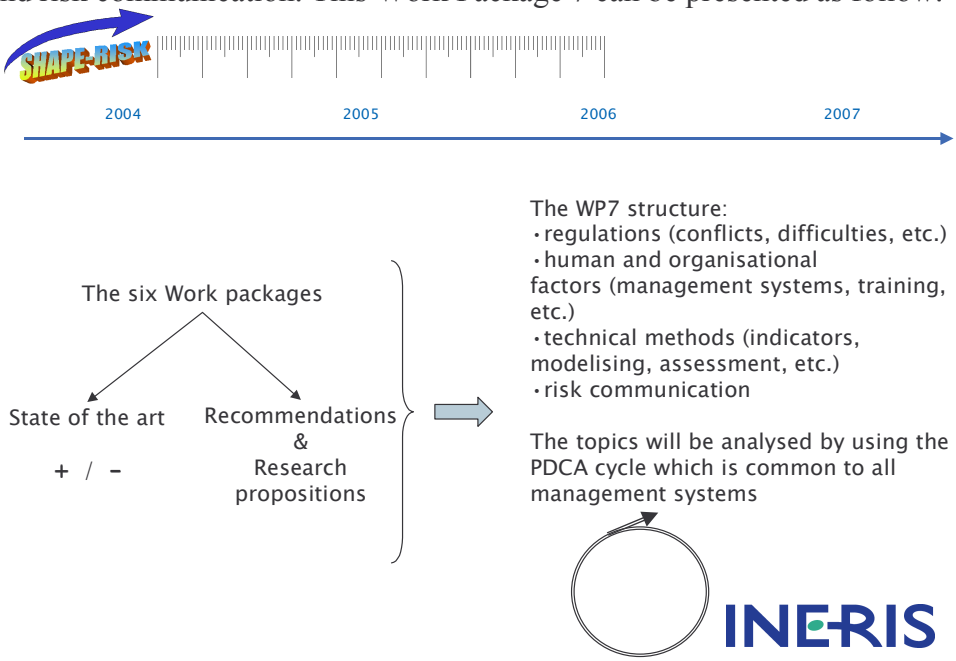
## 1.7 WP 7 – Radical changes – breakthrough and prospective

### 1.7.1 Objectives and results

The six WPs synthesis documents have the same framework:

- description of the state of the art (problems raised by industries, by the competent authorities, etc.),
- proposition of recommendations and research propositions.

The aim of the WP7 was to propose a global solution articulated in recommendations for each topic, and the integration of risk assessment and management for Health, Safety and Environment, on the basis of the results of the first six workpackages and the results of the first WP7 workshop. The problematic areas and the research and development needs were integrated according to a list of topics, which cover legislation, human issues, technical aspects and risk communication. This Work Package 7 can be presented as follow:



## Shape-Risk topics

- **Regulatory topic**: harmonization of European and national legislation concerning HSE (SEVESO, IPPC, ATEX, etc.)
- **Technical topic**: tools and approaches for HSE risk assessment and management, cleaner and safer technologies
- **Organizational and human topic**: workforce training, risk management, control and auditing procedures
- **Risk perception and communication**: involvement of public and workforce in decision making, transparency of risk communication, target-specific risk communication approaches

INERIS

IDEAS

**Fig. 8: Slides extracted from the presentations during the final conference (Mr. Christophe BOLVIN – INERIS ; Mr. Christian Micheletti and Leo Breedveld – IDEAS)**

All of the SHAPE-RISK members contributed to this WP. The leader was IDEAS and the deputy leader was INERIS.

The description of work describes the objectives of the WP 7 with this sequence:

- WP7.A: Preparation of the integration document WP1 to WP6;
- WP7.B: First WP7 workshop: integration and new concepts;
- WP7.C: Preparation of a framework document and a blueprint of risk scenarios;
- WP7.D: Second WP7 workshop: breakthrough and perspective;
- WP7.E: Synthesis document WP7.

The general conclusion of the WP 7 are give in the chapter 2.2.2.

### 1.7.2 Method to achieve the objectives

- WP7.A: Preparation of the integration document WP1 to WP6

A meeting was organised between IDEAS and INERIS at VEGA "Parco scientifico e tecnologico di Venezia" 15 March 2006. The objective was to organise the WP 7 work.

IDEAS prepared a draft of the integration document which was updated by INERIS. This version of the document was disseminated among the SHAPE-RISK consortium.

All the SHAPE-RISK partners made comments upon this version: the integration document had been updated by taking into account the comments.

- WP7.B: First WP7 workshop: integration and new concepts

To discuss the recommendations, a first workshop was organised. It took place on the 19th and 20th of June 2006 in Venice. The document D 28 (D.7.C) "Proceedings of the first WP7 work shop" gives a clear view of the good attendance and of the good exchanges of information during the work shop.

- WP7.C: Preparation of a framework document and a blueprint of risk scenarios

This first work shop gave the opportunity to propose a "recommendations table" composed by short-term, mid-term and long-term actions.

The recommendations were added to the integration document and formed the "Preparatory document on WP 7" (reference D 26 D.7.A).

This document was disseminated by the SHAPE-partners to all the stakeholders.

All comments coming from the stakeholders were taken into account and gave the opportunity to update the preparatory document.

Different approaches were used:

1. Meetings in the national networks created by the SHAPE-RISK partners.
2. Individual interviews by a SHAPE-RISK partner.
3. Presentation of two articles during the ESREL 2006 Managing Risks with Safety and Reliability - Safety and Reliability Conference 18-22 September 2006 - Estoril, Portugal. A very large audience attended to the presentation of the SHAPE-RISK recommendations (500 persons).
4. Presentation of the SHAPE-RISK recommendations to the Committee of Competent Authorities of the European Union dealing with the implementation of the Seveso Directive. The CCA 2006 meeting was held in Porvoo on 4-6 October 2006. INERIS made a presentation of the results. A good reception of the propositions was made by the audience. The slides of the presentation are annexed to this report.

5. Recommendations were disseminated during the meetings of the European Technology Platform on Industrial Safety. The recommendations were also well welcomed by the audience composed by industry representatives and consultants.

In parallel, blueprint scenarios were prepared and compled in a document (see the deliverable D 28 – D.7.C "Blueprint scenarios").

- WP7.D: Second WP7 workshop: breakthrough and perspective

A final conference / workshop held on the 25th of January at the Ecole des Mines de Paris. All the recommendations of the project were presented and discussed with the audience (see the deliverable D 28 – D.7.B "proceedings of the final conference"). During this conference, blueprint scenarios were presented and discussed (see the deliverable D 28 – D.7.C "Blueprint scenarios").

- WP7.E: Synthesis document WP7

All the comments arising from stakeholders and the meetings were compiled and added to the WP 7 report: that was the base for the construction of the WP 7 synthesis document (see the deliverable D 30 – D.7.C "Synthesis document WP 7).

### 1.7.3 List of deliverables

The list of the WP 7 deliverables is given in the table below:

| Deliverable No[1] | Deliverable title | Delivery date [2] | Nature [3] | Dissemination level [4] |
|---|---|---|---|---|
| D26 | D.7.A Preparatory document on WP 7 | Month 30 | R | RE |
| D28 | D.7.B Proceedings of the WP7 workshop | Month 32 | R | PU |
| D30 | D.7.C Synthesis document WP7 | Month 36 | R | PU |

**Tab. 13: List of deliverables for the WP 7**

[1] Deliverable numbers in order of delivery dates: D1 – Dn
[2] Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.
[3] Please indicate the nature of the deliverable using one of the following codes:
**R** = Report
**P** = Prototype (if appropriate)
**D** = Demonstrator (if appropriate)
**O** = Other
[4] Please indicate the dissemination level using one of the following codes:
**PU** = Public
**PP** = Restricted to other programme participants (including the Commission Services).
**RE** = Restricted to a group specified by the consortium (including the Commission Services).
**CO** = Confidential, only for members of the consortium (including the Commission Services).

### 1.7.4 List of milestones

The WP 4 milestones achieved are presented in the table below:

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.4.A | M.7.A Two workshops | WP 4 | 31.08.2006<br>28.02.2007 | 15.04.2007 | IDEAS - 14 |
| M.4.B | M.7.B Synthesis document on the website | WP 4 | 28.02.2007 | 15.04.2007 | IDEAS - 14 |

**Tab. 14: List of milestones for the WP 7**

## 1.8 WP 8 – Dissemination of knowledge

### 1.8.1 Objectives

WP8 was a transversal work package that is intended to provide the most efficient exploitation and dissemination of the main SHAPE-RISK achievements to the main EU stakeholders dealing with SEVESO II, IPPC and ATEX directives.

The JRC was the leader of this WP.

The main objective was to elaborate the SHAPE-RISK web site, which is used as the first dissemination platform for the project.

### 1.8.2 Results

The WP8 leader, according to the agreement taken during the kick-off meeting, constructed the web site, which was published in one of the JRC servers (http://shaperisk.jrc.it). Several links to this site have already been created in the web sites of the organisations belonging to the SHAPE-RISK Consortium.

All the synthesis documents can be downloaded from the web site.

Lots of meetings were organised during the project, inside the consortium and outside. In the annex of the "Plan for using and disseminating the knowledge", all the dissemination actions performed by the partners are presented.

**SHAPE-RISK had a large impact in Europe, in the field of risk management, prevention of accident and pollution.**

Articles were presented at different conferences: ESREL 2005, 2006, 2007, SRA meetings, etc.

### 1.8.3 Methods to achieve the objectives

The web site was constructed (during the first period) also in order to set up an efficient communication system amongst the SHAPE-RISK members (i.e., forum and file project sharing) and it is characterised by a special section open to the public, which is accessible after registration and that contains the final SHAPE-RISK achievements.

The SHAPE-RISK web site layout is described in the first periodic activity report.

The web site was periodically updated, as presented in the picture below.


### 1.8.4 Deviations from the project workprogramme

No deviation were observed for the completion of this Work Package.

### 1.8.5 Strategy to achieve the objectives

The current version of the web-site is still running and is updated by the WP 8 leader.

### 1.8.6 List of deliverables

The list of deliverables are presented in the table below :

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.8.A | SHAPE-RISK site on the web | WP 8 | 31.08.04 | 01.08.04 | MAHB – JRC |
| D.8.B | Complete draft Technological Implementation Plan | WP 8 | 28.02.2007 | 28.02.2007 | MAHB – JRC |

**Tab. 15: List of the WP 8 deliverables**

### 1.8.7 List of milestones

The table below gives the milestones for the three periods of the WP 8. The milestones M.8.A, M.8.B and M.8.C have been delayed because of the change in the time schedule.

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.8.A | Web site operational | WP 8 | 31.08.2004 | 01.08.2004 | MAHB – JRC |
| M.8.B | Workshop for WP 1, WP 2 and WP 3 | WP 8 | 31.08.2004 | 15.11.2004 and 16.11.2004 | MAHB – JRC |
| M.8.C | Workshop for WP 4, WP 5 and WP 6 | WP 8 | 31.08.2005 | 12.12.2005 | MAHB – JRC |
| M.8.D | Conference at the end of the project | WP 8 | 28.02.2007 | 25.01.2007 | MAHB – JRC |

**Tab. 16: List of the WP 8 milestones**

## 1.9 WP 9 – Management of the Advisory Group

### 1.9.1 Objectives

The main intention was to gather several experts from different organisations such as: Competent Authorities responsible for the implementation of the three Directives in the different Member States, Industrial representatives who have to demonstrate the conformity of their operation with the requirements of the aforementioned Directives, and experts in the area of integrated risk management.

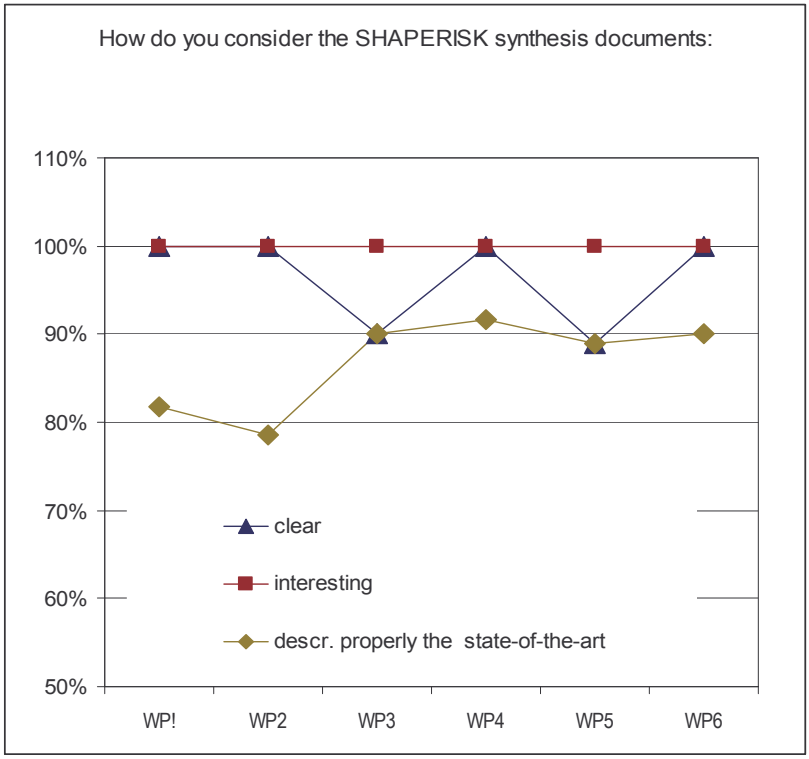
The JRC was the WP 9 leader.

### 1.9.2 Results

A survey was conducted amongst the advisory group members and an extended audience of experts belonging to different organisations. This survey aimed at complementing the WP 9 activity (presented in the following chapter) by collecting the general impression from specialists and practitioners in the area of risk management, with regard to the SHAPE-RISK achievements.

**The figure below presents the two main results:**

- **the SHAPE-RISK documents are considered "very interesting",**
- **and useful for the current and future activity.**



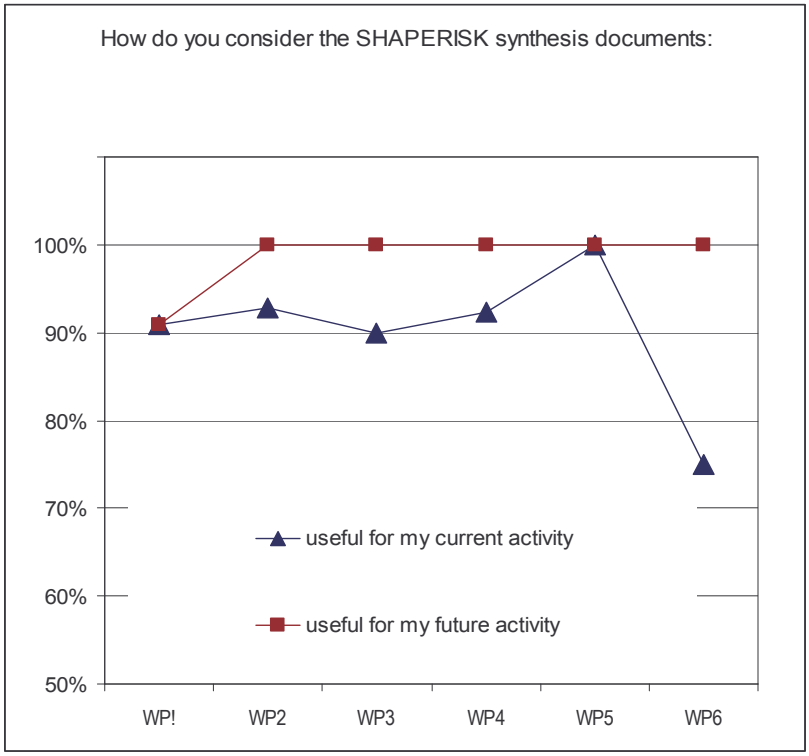



**Fig. 9: Results from the survey**

### 1.9.3 Method to achieve the objectives

WP9 was intended to get a feedback and a critical review from specialists and practitioners in the area of risk management concerning SEVESO and IPPC related issues.

After a first meeting with a limited number of experts who provided their opinion on the SHAPERISK achievements concerning WP1,WP2, and WP3 (**18.11.2004**), it was decided to extend this feedback activity to a larger audience by preparing a survey to test the consistency and feasibility of the SHAPE-RISK achievements. In particular a specific emphasis is given to the main needs and expectations of the industrial representatives, and other stakeholders concerning SEVESO, IPPC, and ATEX, the technical consistency of the SHAPE-RISK findings, and the potential impact of SHAPE-RISK at EU level.

The survey questionnaire was published on the SHAPERISK web site and was addressed to all registered members in order to get a broader feedback.

Amongst the different expert and practitioners who responded to the survey, there were representatives form the competent authorities responsible for the implementation of the relevant Directives in their Member States, industrial representatives who have to demonstrate the conformity of their operation with the requirements of the aforementioned Directives, and experts in the area of integrated risk management.

The deliverable D 31 (D.9.B) "Reports on the surveys with the advisory group" summarises the main results of the survey.

In addition, the advisory group members participated in the workshops organised in June 2006 and 25 January 2007 (final conference).

**Fig. 10: Picture of the advisory group meeting on the 26.01.2007**

An official meeting of the advisory Group held at the Ecole des Mines de Paris on the 26th of January 2007.
As said in the deliverable D27-32 (D.9.A) "Minutes of the meeting of the Advisory Group – 26 January 2007", "*the value of the main achievements of SHAPE-RISK was also highlighted together with the quality of the work conducted*".

### 1.9.4 List of deliverables

The list of deliverables is given in the table below :

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.9.A | Minutes of the Advisory Group meeting | WP 9 | 28.08.2007 | 28.02.2007 | MAHB – JRC |
| D.9.B | Reports on the surveys with the Advisory Group | WP 9 | 28.02.2007 | 28.02.2007 | MAHB – JRC |

**Tab. 17: List of the WP 9 deliverables**

### 1.9.5 List of milestones

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.9.A | Advisory Group meetings | WP 9 | 31.08.2005 | Replaced by the electronic survey | MAHB – JRC |
| M.9.B | Surveys within the Advisory Group about the SHAPE-RISK achievements | WP 9 | 28.02.2006 | 30.06.2006 | MAHB – JRC |

**Tab. 18: List of the WP 9 milestones**

## 1.10 WP 10 – Overall management

### 1.10.1 Objectives and results

Within the SHAPE-RISK organisation, WP 10 aims at the overall co-ordination and management of the project. INERIS is the only partner working in this work package. INERIS is both the administrative co-ordinator and the technical co-ordinator of the SHAPE-RISK project.

In this respect, the WP 10 has three objectives :

- to monitor the project progress according to the initial work plan,
- to organise review meetings and workshops, exchange of communication among partners, and solve co-ordination problems,
- to organise and consolidate administrative and financial periodic reporting,
- to approve and modify all the technical documents one the other hand.

### 1.10.2 The meetings

Different meetings were organised by INERIS during the project in order to give a good opportunity to each partner and to meet stakeholders:

– The kick off meeting of the project (22nd and 23rd April 2004).
– The three workshops in December 2004.
– The kick off meeting of the second period of the project in May (31.05.2005).
– The three workshops in December (12.12.2005).
– The mid-term assessment in December (13.12.2005).
– The kick-off meeting of the WP 7 (March 2006).
– The first workshop (June 2006) and finally the final conference.
– The final conference (25-01-2007).

It can be reminded here that Olivier SALVI and Christophe BOLVIN presented the results of SHAPE-RISK during the CCA Conference at Porvoo in October 2006.

**Fig. 11: Picture of the CCA meeting**

**Fig. 12: Presentation of the SHAPE-RISK results by Christophe Bolvin and Olivier Salvi**

### 1.10.3 Strategy to achieve the objectives

In order to manage this project, INERIS chose to spread the good practises into practical documents. For example, a monthly time sheets was developed at the beginning of the project, with the reference of the “Guide to financial issues”(see figure below).

**Monthly TIME SHEET**

Contract n° : NMP2-CT-2003-505555 SHAPE-RISK

| | | | |
|---|---|---|---|
| Contractor : | | Project Month : | |
| Person in charge of the work : | | Calendar Month : | |
| Labour Cost Category : | | Work Package : | |

| | |
|---|---|
| Objective | |
| Results | |
| Deviation | |
| Request to the coordinator | |

Labour time :

Hours

Actual Labour Cost(1) :

€

SIGNATURES

| Actor | | Official Manager | |
|---|---|---|---|
| Date | Signature | Date | Signature |
| | | | |

(1) : Cost for remuneration of salary including social charges (see "Guide to Financial Issues relating to Indirect Actions of the Sixth Framework Programmes, April 2004, p. 142)

**Fig. 13: Time sheet used**

Another tool developed is the “Reporting expenses Forms”.

It can be noted here that lots of partners thanked INERIS for the quality of the co-ordination.

### 1.10.4 List of deliverables

The table below presents the deliverables of the WP 10.

| Del. no. | Deliverable name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| D.10.A | Six monthly periodic activity report<br>and annual periodic activity report | WP 10 | 31.08.2004<br>28.02.2005 | 30.09.2004<br>15.04.2005 | INERIS |
| D.10.B | Six monthly periodic activity report<br>and annual periodic activity report | WP 10 | 31.08.2005<br>28.02.2006 | 31.08.2005<br>28.02.2006 | INERIS |
| D.10.C | Six monthly periodic activity report,<br>annual periodic activity | WP 10 | 31.08.2006<br>28.02.2007 | 31.08.2006<br>28.02.2007 | INERIS |

**Tab. 19: List of the WP 10 deliverables**

### 1.10.5 List of milestones

The M.10.A and M.10.B are completed.

| Milestone no. | Milestone name | Workpackage no. | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|---|
| M.10.A | Kick off meeting | WP 10 | 31.03.2004 | 22.04.2004 | INERIS |
| M.10.B | Mid-term meeting with an evaluator | WP 10 | 31.08.2005 | 13.12.2005 | INERIS |
| M.10.C | Final Conference | WP 10 | 28.02.2007 | 25.01.2007 | INERIS |

**Tab. 20: List of the WP 10 milestones**

# 2. DISSEMINATION AND USE

## 2.1 Publishable results

The publishable results of the Final plan for using and disseminating the knowledge are presented in the table below which provides an overview, per exploitable results, of how the knowledge could be exploited or used in further research.

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
|---|---|---|---|
| 1 | The Constitution of a scientific community, which served as a discussion platform and strategy building on industrial safety related matters.<br><br>The Community consists of 19 partners from 12 European countries.<br><br>The heterogeneity of participating partners ensured the coverage of a broad application area, by including: prevention of major accidents, prevention of occupational accidents, and protection of the environment.<br><br>The list of participating members is as follows: INERIS, MAHB, RIVM, VTT, RISOE, VSB, JSI, ISPESL, TNO, HSE, DEMOKRITOS, CMI, OvGU, IDEAS, FPMs, UKEA, BAM, VITO, University of Manchester | Public authorities<br><br>Industry and SMEs<br><br>Consultants | 1. The European Technology Platform on Industrial Safety.<br><br>2. In SHAPE-RISK, "national interactive groups" have been developed. In each group, industry and competent authority representatives were identified.<br><br>All partners of SHAPE-RISK participate frequently in national or international meetings, dealing with either scientific or regulatory related issues. They fostered the promotion activity of the SHAPE-RISK findings.<br><br>3. The SHAPE-RISK members have promoted the main achievements and recommendations of SHAPE-RISK through many dedicated presentation an lectures during some relevant national and international events.<br><br>4. SHAPE-RISK and the speed up dissemination of knowledge and experiences gained on previous works.<br>*JRC/MAHB has reactivated a European Working Group on Land-Use Planning* |

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
|---|---|---|---|
| | | | *(EWGLUP) to give some guidance of "good practice" to competent authorities with the application of article 12 of Seveso II directive. INERIS takes part actively in this working group on behalf of the French ministry of ecology.*<br><br>*This initiative represents a good opportunity of dissemination and valorisation of the ARAMIS and SHAPE-RISK projects, in particular for objective 2 of the EWG.* |
| 2 | An extensive list of tools (software) and Service Platforms (web-portals) existing in Europe and used by the Industry, consultants or Public Authorities<br><br>This presentation is available on the SHAPE-RISK website. (WP 3 synthesis document) | All stakeholders interested in, or working with tools, service platforms and information systems to support the production of safety reports for SEVESO and IPPC compliance | 1. The partners disseminated the document to the national and European platforms<br><br>2. The partners encouraged the creation of a "one-stop-shop" where all this information is available. |
| 3 | Presentation of three successful methodologies for the analysis of accidental impacts on environment :<br>- the "H&V index", a Czech method,<br>- the "Guideline for the performance of environmental risk assessment", a Spanish method,<br>- the "Sara risk analysis for accidental release", a Finnish method. | Public authorities<br><br>Industry and SMEs<br><br>Consultants | 1. The existing methodologies are promoted by SHAPE-RISK partners with the help of the national and European platforms.<br><br>2. The partners encouraged the creation of a "one-stop-shop" where this information is |

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
|---|---|---|---|
| | The description of these methodologies are available on the SHAPE-RISK website. | | available:<br>- guidelines (developed in the "New approach" by the Industry and Competent Authorities)<br>- methodologies (how to integrate occupational and external risks assessments, how to assess the environmental consequences generated by an accidental accident, etc.)<br>- indicators used in safety management systems<br>- etc.<br><br>3. The successful methodologies were presented during the ESREL 2006 conference. |
| 4 | The synergies existing between IPPC and SEVESO directives and the possible strategies for an integration.<br><br>The WP 1 synthesis documents present an extensive overview of the problems associated with the above issues and propose some recommendations for a possible way forward. | Public authorities<br><br>Industry and SMEs<br><br>Consultants | 1. The partners promote the SHAPE-RISK website and ideas with the national and European platforms.<br><br>2. The partners encouraged the creation of a "one-stop-shop" where this information is available. |

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
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| | | | 3. The problems raised by the project and recommendations were presented at the ESREL 2005 conference, ESREL 2006 and ESREL 2007 conference. |
| 5 | The specific problems encountered by Industry (including SMEs) for the implementation of IPPC, SEVESO, ATEX and other occupational safety directives<br><br>(See the WP 1, WP 2 synthesis documents) | Public authorities | The presentation of these problems to the Committee of Competent Authorities responsible for the implementation of the Seveso Directive in their Member States. |
| 6 | The inventory of the management of occupational risks and external risks (for France, Germany, Greece, the United Kingdom, Finland, Austria, Spain and the Netherlands), the comparison of management of occupational risks approaches and the comparison of methods for assessing external risks.<br><br>See the WP 2 synthesis document. | Public authorities<br><br>Industry and SMEs<br><br>Consultants | 1. The problems raised by the project and recommendations were presented at the ESREL 2005 conference, ESREL 2006 and ESREL 2007 conference.<br><br>2. INERIS organised three meetings in the Chambers of Commerce to disseminate results and recommendations. |
| 7 | Review of the risk perception analysis.<br><br>Review of the regulatory and policy framework in the EU focused on the EU legislation for the environment, HSE in relation to the public involvement in decision-making processes. | Public authorities<br><br>Industry and SMEs<br><br>Other national or European projects | 1. The Synthesis document is available on the web site. |

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
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| | Assessment of tools and methods for an effective risks communications.<br><br>See the WP 6 synthesis document. | | |
| 8 | Promotion of the need for a EU policy framework for HSE management in order to harmonise EU regulation, support integrated HSE management and optimise the efficiency of integrated risk management.<br><br>Within the SHAPE-RISK project, the problem of consistency of the directives was raised by the Industry and the SMEs (directives related to Occupational and health Directive (1989), ATEX, SEVESO II, IPPC, REACH and GHS : Globally Harmonised System).<br><br>This result is extracted from the WP 7 synthesis document. | All stakeholders interested in risks assessments:<br>– Public authorities<br>– Industry and SMEs<br>– Consultants | Organisation of meetings outside the consortium: In the plan for using and disseminating knowledge, a table described the participation of the partners in many events for the dissemination of the results. |
| 9 | The recommendation to apply the Deming cycle for the revision / development of regulations.<br><br>This result is extracted from the WP 7 synthesis document. | Public authorities | Organisation of meetings outside the consortium: in the plan for using and disseminating knowledge, a table described the participation of the partners in many events for the dissemination of the results. |
| 10 | Promotion of cleaner and safer production systems.<br><br>This recommendation is extracted from the WP 7 synthesis | All stakeholders interested in risks assessments :<br>Public authorities | The SHAPE-RISK members encouraged the development of interaction between existing projects and networks. |

| N° | Deliverables / results | Interested parties | Exploitation of the result: Dissemination mean / action |
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| | document and is part of the document's action list. | Industry and SMEs<br><br>Consultants<br><br>Other national or European projects | The final workshop and conference gave the opportunity to invite members of the Technology Platform and of the IMPULSE project, whose aim is to work for cleaner and safer production. This workshop was an excellent opportunity to discuss further the SHAPERISK achievements with a larger audience and to get a feedback on the proposed recommendations. |
| 11 | Review of tools monitoring performance with respect to the HSE management and provision of guidance on methods to improve the performance of HSE management.<br><br>This recommendations is part of the WP 4 synthesis document. | Industry and SMEs | 1. The partners disseminated the document at national and European meetings.<br><br>2. During the ESREL 2006 conference, results of this WP 4 were discussed. |
| 12 | To invite Industry and Competent Authorities to develop the use of the "New Approach", defined in a Council Resolution of May 1985.<br><br>This new approach is proposed within the WP 7 document. It has been endorsed by Industry. | Competent Authorities | The results of the project were presented, for example, to the CCA members. |

The SHAPE-RISK members have promoted the main achievements and recommendations of SHAPE-RISK in some very specific international conferences. In particular:

- SRA annual meeting in Paris in 2005,
- ESREL 2005 (Safety and Reliability for Managing Risk) 27-30 June 2005 Tri City Poland;
- ESREL 18-22 September 2006 in Portugal.

The final conclusions of SHAPE-RISK will also be presented at the next ESREL 2007 conference.

Some papers were also were also published in the national press (for example: presentation of the project in the “Techniques de l’ingénieur” in France).

**The main recommendations of SHAPE-RISK have been disseminated in the Strategic Research Agenda written by the European Technology Platform Industrial safety. Several partners of SHAPE-RISK are involved in the preparation of new European projects.**

## 2.2 Ideas for further work and conclusions of the consortium

### 2.2.1 Ideas for further work

Each work package identified a list of research and development needs which should be afforded to improve the knowledge and the integration of occupational and environmental risk assessment and management for industry. Since some R&D recommendations are similar between WPs, therefore the recommendations are briefly organised according to the topics regulation / technical aspect / organisational / Human / risk communication aspects.

#### 2.2.1.1 Regulation topics

- Improve the synergies between the two Directives IPPC and SEVESO,
  - by extending to all countries the practice of presenting both safety report and environmental impact assessment in a co-ordinated way;
  - by including an environmental risk assessment for abnormal and near-accidental cases;
  - by improving the compatibility of the notions of industrial installations between the two Directives;

- Develop next generations of BREF documents having safety on an equal basis with prevention of pollution, and include facts on available techniques to simultaneously reduce the impact and the accidental risk at industrial installations.

#### 2.2.1.2 Technical topics

- Develop tools for SMEs with condensed information and based on the needs of the SMEs to meet the legal requirements regarding occupational and external safety integration;

- Develop new ToSPIS (i.e. Tools, Service Platforms, Information Systems) to support the assessment of alternative technology options in the integrated framework of safety and pollution prevention;

- Develop useful, early indicators for occupational and major hazard safety, including the use of safety culture or safety attitude assessments;

- Make effective risk analysis tools available incorporating occupational safety and major hazard issues;

- Collect data on the lessons learned from past major accident concerning the impact on the environment of different substances, even if they are not classified as dangerous or priority pollutants;

- Develop an harmonised generally acceptable tool for environmental impacts of chemical accidents, based for example on similar platform as project ARAMIS, taking also into account transboundary effects;

- Improve the understanding of transient accidental (acute) exposure and pollution (chronic) exposure;
- Develop methodologies to take benefits into account when making decisions on environment and safety issues as a whole at an industrial site;
- Develop external costs for industrial sectors other than energy, integrating environmental and safety externalities. (e.g. ECOSIT project and other projects [ISIS, 2003]);
- Take into account the new risks from the emerging technologies.

#### 2.2.1.3 Organizational topics

- Identify simple, effective and adequate management systems;
- It should be investigated how good management systems can reduce the number of legal requirements, by reducing the number of administrative bodies handling Health, Safety, and Environment management;
- It should be investigated how one should deal with shared ownership and responsibility (industrial parks);

#### 2.2.1.4 Human topics

- Guidelines need to be developed to support communication of safety-critical information to multi cultural/multi lingual work forces, including the use of graphics and virtual reality techniques;
- Optimisation of the individual training programmes, improving the bad points and enhancing the good points of each field (occupation risk, SEVESO II, IPPC);

#### 2.2.1.5 Risk communication

- Address the issue of potential conflicts on providing information to the public and security related aspects (transparency vs. security).
- Despite the commonly accepted principle of democratic governance, the current practice in environmental decision-making has demonstrated that the public is hardly ever involved in playing an active role in this process. It is therefore necessary to explore which are the main mechanisms that hampers an effective public participation.
- In any decision-making process that makes use of the results of any risk analysis, it is of key importance to understand the role played by uncertainty. In this respect, it is

important to understand whether any input from the public could contribute to address the issue of uncertainty within the risk analysis process.

- ❖ Analyse the existing communication campaigns which were used in some Member States to improve trust in their regulatory bodies, in order to try to generalise best practices on this topic.

- ❖ Understand how transboundary risky situations can be addressed by a proper risk communication campaign.

- ❖ Explore the role played by media as a powerful instrument for risk communication.

### 2.2.2 Conclusions of the consortium

Based on the integration of the various topics (regulations, organisational and human issues, technical aspects and risk communication) and the outcome of the blueprint scenarios, the SHAPE-RISK project can be summarised in 4 key recommendations, which form together the final SHAPE-RISK advice:

1. There is a strong need for a EU policy framework for HSE management in order to harmonise EU regulation, support integrated HSE management and optimise the efficiency of integrated risk management in the context of the sustainable development of the European process industry. Key elements of such a policy framework are the extension of the BAT discussion with safety aspects and life-cycle considerations, and the further adoption of the New approach and performance-based regulation in HSE management;
2. There is a need for eco-design tools for industrial processes, adopting the life-cycle approach and the concept of industrial parks in a industrial ecology perspective, in order to reduce significantly the overall impact of industrial activities on HSE;
3. There is a need for adequate tools to support integrated HSE assessment and management. Adequate tools mean available, user-friendly, up-to-date and respond to the needs of the end-users. Ideally, HSE tools will be provided by the one-stop-shop platform;
4. There is a need to promote risk communication and improve the risk perception by correctly informing the public and all involved actors (e.g. industry, authorities, public, stakeholders). Transparency and efficiency of risk communication should be enhanced, in order to build the trust of the public and to involve them as soon as possible in the decision process, aiming at the promotion and diffusion of risk awareness in the society as a whole.

These recommendations were the result of a large debate among SHAPE-RISK partners and received a strong support from industry representatives, consultants and Competent Authorities.