



JRC TECHNICAL REPORTS

Strengthening Chemical Accident Prevention and Preparedness in European Neighbour Countries

*Prepared for DG-ECHO by the
Major Accident Hazards Bureau
and the Natech Projects*

Maureen Heraty WOOD
Luciano FABBRI
Ana Lisa VETERE ARELLANO
Elisabeth KRAUSMANN
Zsuzsanna GYENES

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Abstract

The Seveso Directive aims at control of major hazards associated with dangerous substances and has existed as legislation in the European Union since 1982. It was the first comprehensive legislation of its kind in the world and continues to be a leading model for process safety governance globally. In 2014 DG-ECHO and the Joint Research Centre agreed on collaboration the implementation of the Seveso Directive by European Neighbourhood Policy countries in support to the Civil Protection Mechanism 2014-2010. The Year 1 strategy for this project aimed at building profiles of country progress in establishing chemical accident and prevention programmes. It also began the first phase in making a selection of analytical tools accessible to support government and industry in their efforts to perform hazard identification and risk analysis and understand results. This document proposes a strategy for Year 2 of the project. The proposal describes a strategy targeted to establish and maintain visibility and direct communication on the project with EU Neighbour Countries, determine a first subset of countries for in order to begin targeted capacity building, and to complete a first set of online tool prototypes for implementation support as well as identify opportunities for further tool development in future.

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1 BACKGROUND

In 2014 DG-ECHO and the Joint Research Centre agreed on collaboration the implementation of the Seveso Directive by European Neighbourhood Policy countries in support to the Civil Protection Mechanism 2014-2010 (Decision No. 1313/2013 of the European Parliament). These countries are specifically Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine in the east, and to the south (from west to east along the Mediterranean coast), Morocco, Algeria, Tunisia, Libya, Egypt, the Palestinian Authority, Israel, Jordan, Lebanon, and Syria. (See **Figure 1**, next page) This document represents a preliminary proposal for Year 2 of this DG-ECHO – JRC collaboration.

The Seveso Directive aims at control of major hazards associated with dangerous substances and has existed as legislation in the European Union since 1982. It was the first comprehensive legislation of its kind in the world and continues to be a leading model for process safety¹ governance globally. In addition to 28 Member States, a number of Candidate Countries are in the process of adopting Seveso legislation. The UN ECE Industrial Accidents Convention, targeting accidents with transboundary impacts, was modelled in large part after the Seveso Directive. Moreover, numerous countries that were once colonies of Great Britain and France, have adopted a substantial portion of the Seveso approach into their chemical accidents prevention legislation. Most recently, the UN Environment Programme, with substantial support from the European Commission, has developed a comprehensive programme, the Flexible Framework for Chemical Accident Prevention and Preparedness, on implementing a Seveso-like programme or improving programmes with Seveso-type provisions, in developing countries, including comprehensive guidance and tools for building capacity to improve and support chemical accident prevention and preparedness (CAPP) programmes.²

¹ “Process safety” is the name commonly used for the body of knowledge and practices established to support chemical accident prevention on sites that process, handle or store dangerous substances. The term does not expressly include safety of dangerous transport but the nature of the risk and principles underlying risk management are virtually the same. For this reason, capacity building efforts sometimes include transport of dangerous goods if it is a particular country concern.

² This document generally uses the term “chemical accident prevention and preparedness” (or CAPP or “chemical accident prevention”, for short) rather than the term “Seveso”. Chemical accident prevention is a more transparent terminology for third countries where other legislative regimes are operative. It also implies an openness to incorporating complementary initiatives of international organizations and other non-EU countries that do not go under the name “Seveso”. All the same, the Seveso Directive is explicitly the reference model for all capacity building efforts targeted by this project.

2 Strengthening Chemical Accident Prevention and Preparedness in European Neighbour Countries

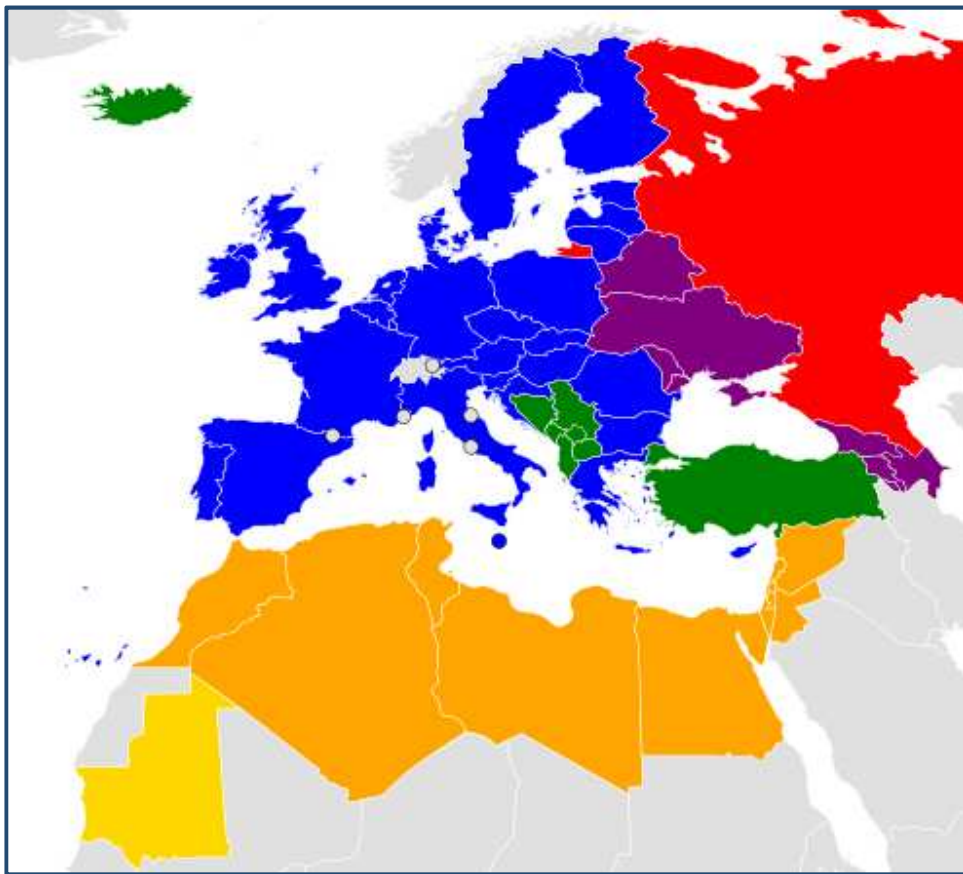


FIGURE 1: MAP SHOWING ENPI COUNTRIES IN PURPLE AND GOLD

3 Strengthening Chemical Accident Prevention and Preparedness in European Neighbour Countries

EXPECTED SITUATION AT THE END OF YEAR 1

Year 1 aims at building profiles of country progress in establishing chemical accident and prevention programmes. It also begins the first phase of making a selection of analytical tools accessible to support government and industry in their efforts to perform hazard identification and risk analysis and understand results. These two linked competencies are essential to risk management of chemical hazard sites as well as government oversight in this regard.

By the time Year 2 of this project begins, Year 1 deliverables should have been completed, resulting in the following:

- **A strategy document to identify initial programme scope and define core elements, expert and policy resource needs, and operating mechanisms.** Initial strategy development will include:
 - Advice and input from DG ECHO, DG ENV and relevant experts in other DGs, Member States and the international community in a brainstorming meeting.
 - A survey of priorities and needs of ENPI countries in the area of chemical accident prevention and preparedness, legislative frameworks and other related programmes associated with chemical accident risk management (including Natech risk) in ENP Countries.
 - Collection of background information to assist in building a collaborative strategy that takes into account existing challenges and opportunities associated with chemical disaster risk reduction in the involved countries.
 - Missions to selected countries for targeted discussions about needs and opportunities for collaboration.

- **Development of a web platform to establish online infrastructure for information exchange between EC, experts and Neighbour countries.** This task would focus on developing the underlying structure for the content and user management systems, RSS feed capability and search functions. The development activity will result in:
 - A content management system prototype and AIDA basic module³ completed, ready to be launched for beta-testing by interested countries
 - A prototype of the online version of the JRC's Accident Damage Analysis tool, including preliminary physical effect calculations and GIS functionalities.

³ The AIDA Basic Module is a simplified version of the Seveso accident reporting system (eMARS – <https://emars.jrc.ec.europa.eu>) that can be given to countries on a voluntary basis to aid their efforts to support accident reporting and accident data collection. The simplified version of AIDA – or “eMARS Light”, as it is often called – will only include simplified versions of the Accident Profile, Accident Description and Consequence sections of the eMARS reporting (version 2015).

1.1 OVERVIEW OF YEAR 2 EXPECTATIONS

Year 2 is intended to build on Year 1 activities aimed at profiling country situations and establishing a strategic approach that could meet a number of needs identified in the target regions. Year 2 will aim at the following overall objectives:

- Maintaining visibility and direct communication on the project with EU Neighbour Countries
- Identifying a first subset of countries for targeted capacity building, to begin already in Year 2
- Completing a first set of online tool prototypes to support capacity building and identifying potential IT support opportunities in future
- Collecting feedback through project activities to shape the Year 3 strategy of the project

It is important to emphasize that the activities of Year 1 will contribute important knowledge to the execution of Year 1 activities and determine the specific priorities and emphases of Year 2. Hence, the Year 2 proposal provides a general structure of activities that could be envisioned, that is, multilateral and bilateral engagement with countries for capacity building. It also identifies a number of capacity building topics or modules that could be the subject of specific bilateral and/or multilateral activities. In practice, only a subset of these topics or modules will be activated in Year 2, and in large part which ones are in fact prioritized for Year 2 will be based on the profiling and strategy building activities of Year 1 are completed or nearly completed.

2 PROJECT METHODOLOGY AND IMPLEMENTATION STRATEGY

The JRC has long experience in capacity building in support of government efforts to establish and improve chemical accident and prevention programmes. Since the Seveso Directive was first authorized in 1982, the JRC's Major Accident Hazards Bureau (MAHB) has led numerous activities with Member States to research and produce implementation support tools, in particular, technical criteria and guidance for implementation, and contributed to training workshops on implementation of risk management and analysis elements. It also has regularly participated or managed training and capacity building efforts in Candidate Countries for over 15 years through JRC Enlargement projects, Twinning and TAIEX programmes, as well as in third countries (mainly in Europe, Asia and Africa) as a key partner in the UNEP Flexible Framework programme and a frequent contributor to training workshops in support of the UN ECE Industrial Accidents Convention.

From this vast and varied experience, MAHB has derived a number of key principles for achieving tangible results in capacity building projects. In particular, every country's situation is unique. This fact then imposes certain conditions that have to be taken into account in shaping a strategy that brings a concrete value to the country that is, at the same time, both immediately evident and sustainable sustained beyond the life of the project. While these principles are described in the context of a chemical accident prevention programme, they can also be generalized to apply to other types of capacity building projects. These key principles for achieving clear results can be summarized as follows:

- **Developing a country strategy is a bottom-up exercise.** Effective capacity building establishes targets based on an overall assessment of the country's needs. For this reason, each country's capacity building programme will have its own unique starting point and objectives. A country's priorities in this regard can be established on the basis of the country's own informed assessment of its strengths and weaknesses in regard to chemical accident prevention and preparedness. Therefore, the first job of the capacity building team is to help the country ask itself the right questions and interpret the answers in a meaningful context. **Table 1** (on the next page) gives examples of typical factors influencing the direction and content of capacity building to improve chemical accident prevention programmes.
- **Effective capacity building must be based on a systematic structured conceptual approach (e.g., Seveso) , but assumes considerable flexibility in how to make the concept work for each country (e.g., the "UNEP Flexible Framework").** In practice, this factor suggests that the capacity building team has pre-identified the elements of the programme, and can provide support for each, but the country's situation determines which ones are selected to start and, to a large extent, how they are delivered.

- **Capacity building itself requires a flexible approach and so a broad and diverse range of tools is necessary to address the individual needs of each country and promote a sustainable approach.** The toolbox is essentially a collection of services, typically including training workshops on different elements, projects introducing and applying data collection and analytical tools, online access to tools and information, facilitating expert exchanges, and strategic consultations on specific programme aspects. (Training workshops also necessitate a number of different training tools to engage and stimulate the participants to begin to identify the range and type of programmatic changes that might already be possible in the near future.) Being open to opportunity in any one country often also can stimulate innovation and a new tool has sometimes been created on the spot.
- **Maintaining motivation is a key to making and sustaining progress.** Very early in the project, the capacity building team must identify the country's motivation(s) for seeking support in further building its CAPP programme infrastructure. A country that is a serious partner in capacity building often has an immediate situation of concern, for example, a new refinery is being built or numerous serious accidents have occurred involving the transport of dangerous goods. These types of situations often are the catalyst for the country strengthening its commitment to chemical accident prevention and preparedness. In developing the country's strategy, therefore, the most urgent needs often can become the cornerstone around which systematic improvements to the existing infrastructure can be undertaken and thereby give shared direction and purpose to capacity building efforts.

The key principles then lead to the following conclusions about a general implementation strategy. An effective strategy for building capacity to establish or improve a chemical accident prevention programme should in general focus on the following components:

- **A systematic structured conceptual approach** to chemical accident prevention and preparedness as a model and basic training support materials.
- **A set of approaches for obtaining a realistic and comprehensive country profile** to establish country needs and priorities based on the countries strengths and weaknesses in terms of chemical accident prevention and preparedness.
- **A range of thematic units for capacity building** covering elements of the conceptual model, or addressing horizontal issues. A thematic unit will typically focus on specific principles for effective risk management, analysis, enforcement and monitoring. Its delivery is realized through a combination of training, analytical tools, facilitation, consultation, adapted to in-country circumstances.
- **Ongoing development and improvement of capacity building tools** consisting of a combination of training, direct support with analytical tools and access to an existing knowledgebase, facilitation of expert exchange and knowledge sharing, and ad hoc consultation for crisis situations.
- **Individual implementation plans for a country (or region)**, developed in collaboration with the lead government stakeholder(s) on a solid awareness of its needs and priorities in the context of the Seveso approach and in consideration of time and resources available.

The EU experience also suggests that capacity building projects do not have to be solely at country level. Where there is sufficient motivation and needs in common, capacity building may also focus on a broader geographic region. Such a multilateral project is expected to follow the same key principles as a country project, but the increased diversity of a multilateral project brings both additional advantages and disadvantages that have to be taken into account in strategy development. Moreover, in order to continue to support Seveso implementation efforts across all neighbor countries over time, general enlargement/neighbor country workshops on Seveso topics should still be organized from time to time (in parallel to country-specific projects) on topics that remain broadly of interest to all countries, e.g., exchange of good practice, lessons learned, etc.

2.1 A MULTI-YEAR STRATEGY FOR IMPLEMENTING FOR CAPACITY BUILDING

The methodology outlined in the previous paragraphs establishes that, on the one hand, capacity building should adhere to a specific model as a vision, but on the other take into account country specific factors to develop the content of the actual capacity building programme. Individual capacity building plans for a country (or region), developed in collaboration with the lead government stakeholder(s) on a solid awareness of its needs and priorities in the context of the Seveso approach and in consideration of time and resources available. Based on the project feedback, implementation plans can be implemented on a country-by-country basis or in groups (a regional approach). It may be that it makes sense to group two or three countries together because of close trade or cultural affiliations or simply because their capacity building needs are well-aligned. Nonetheless, this approach may be valid for some activities and for others, the whole region could be engaged. These decisions depend on outcomes of discussions with countries that will give an indication as to how project resources may best be leveraged for the most benefit.

This approach necessitates a multi-year strategy. In the first instance, gathering and assessing information so that the capacity building strategy is designed to targets specific country needs and leverages particular country or regional strengths, often takes time. Secondly, the strategy itself aims to achieve lasting progress and putting the elements to achieve durable success is usually accomplished via a collection of events, discussions, consultations and mini-projects over time.

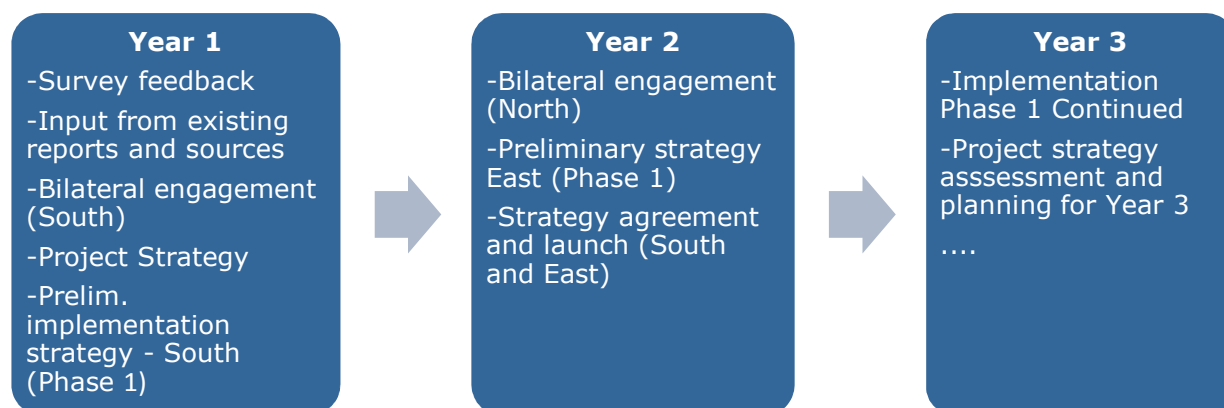


FIGURE 2: PROPOSED PROJECT TIMELINE FOR ESTABLISHING AND IMPLEMENTING INDIVIDUAL IMPLEMENTATION PLANS

In the current project, first-phase capacity building plans will be developed in Year 2 as a follow-up to Year 1 information gathering and planning activities (**Figure 2** above). In general a preliminary plan would be established envisioning a number of events or activities over a two-year period (to start). An “event” in this context is an actual engagement with a country or group of countries to implement the strategy and may consist for example, of an introductory workshop using modules from the “Scene Setting and Awareness Building” topic followed by other events, such as a training workshop, a pilot project for using or developing a tool, or country task group meeting, a stakeholder workshop, or combination of such activities, depending on country priorities.

2.2 STRATEGY FOR IMPLEMENTING THE METHODOLOGY IN THE PROJECT

The implementation and planning of individual country or regional strategies will be established in line with the methodology defined at the beginning of this section. The follow sections describe how the project will address each principle element of the methodology.

2.2.1 A SYSTEMATIC STRUCTURED CONCEPTUAL APPROACH

The conceptual model for capacity building on chemical accident prevention and preparedness in EU Neighbour Countries is the Seveso Directive and basic training materials have already been developed, including training materials for use in third countries. The following documents have been pre-selected to fulfill this purpose in the project:

- The OECD Guiding Principles for Chemical Accident Prevention <http://www.oecd.org/env/ehs/chemical-accidents/Guiding-principles-chemical-accident.pdf>. (The Table of Contents is provided in **Annex 1**).

- The UNEP Flexible Framework for Addressing Chemical Accident Prevention and Preparedness: A Guidance Document and the associated Implementation Support Package. (**Annex 2 and 3**).

The JRC will review options with DG-ECHO and the associated international organizations as necessary for incorporating and adapting this material as a reference for EU Neighbour Countries, which could include, for example:

- revising the documents to address additional needs
- revising the documents to give more visible ownership to the European Commission of these documents
- extracting parts of these documents for an EU package, or translating the document into Arabic and Russian. (The Flexible Framework guidance is already available in Arabic, as well as English, Chinese, French, Spanish and Thai.)

2.2.2 ESTABLISHING A REALISTIC AND COMPREHENSIVE COUNTRY PROFILE

Much of the groundwork for the country profile will be established in Year 1 of the project, particularly through implementation of the survey. In addition, bilateral follow-up will be necessary for all countries selected for capacity building. Engagement of this nature with a subset of ENPI countries in the South is already expected to take place already in Year 1. Bilateral follow-up with countries in the East will take place in Year 2.

The capacity building strategy itself may also include further country profiling based on what is learned in initial exchanges. Often the profile of the country's existing situation in relation to chemical accident prevention must be understood in greater detail by the country itself for long term planning. As such, ongoing work on completing the knowledgebase in this regard is conducted in parallel to other capacity building activities in the project by the country and with support of the project team and the tools provided by the project team. (See **Table 1** on the next page for an example of important questions for planning improvements to the country's CAPP programme.) The Implementation Support Package (ISP) of the UNEP Flexible Framework, created in collaboration with the JRC and other partners, offers a number of tools targeted for examining what is known about existing hazards, associated legal instruments and expertise, and identifying gaps in the chemical accident prevention programme.

In essence, obtaining more information is part of capacity building itself. Therefore, the establishment of a realistic and comprehensive country profile for planning next steps in improving the chemical accident prevention programme is itself a potential Capacity Building Module that can, if needed, be incorporated into a first-phase capacity building strategy for the country.

Table 1
Chemical Accident Prevention and Preparedness Programmes
Factors That May Determine the Direction of Capacity Building

Legislation

1. Strong legislation exists but enforcement and compliance weak
2. Legislation partially exists
3. No relevant legislation at all

Knowledge of hazardous activities

1. They know what are the hazards and where they are
2. They know where big hazards are but not less visible industries
3. They don't know their hazards at all

Existing government

1. One ministry in charge of all related areas
2. A few lead ministries (labour, environment)
3. Many ministries with potential jurisdiction for different elements of safety or industries

Centralized or decentralized government

1. Centralized government for relevant discipline (e.g., enforcement of environmental law)
2. Decentralized government for relevant discipline

Level of government competency in technical disciplines

1. Adequate government staff available with technical competence/ experience in related fields
2. Limited staff with relevant competencies and experience
3. No staff with relevant competencies and experience

Funding support/Political visibility of issue

1. High visibility issue (strong management support/more than adequate funding)
2. Moderate visibility issue (moderate management support/moderate funding)
3. Low visibility issue (low management support/no or few funds available)

Access to information on chemicals and hazardous activities in the country

1. Information on chemicals used/hazardous activities is centrally available and already analyzed
2. Information on chemical hazards is available from many sources but not analyzed
3. Information available on chemical hazards is unknown

Co-operation between relevant government authorities and industry

1. Strong communication established between government and industry players
2. Some communication established between government and some important industry players
3. Little or no communication established between government or industry players

Other factors

- Inventory of hazardous industries exists, or partially exists
- Inspections in some relevant sectors (e.g., labor safety) exist and active
- Active permitting system for environment (enforced)
- Active permitting system for handling chemical substances (enforced)
- Accident database with chemical accidents exists
- Interagency emergency preparedness and response committee exists

2.2.3 A BASIC SET OF THEMATIC UNITS FOR CAPACITY BUILDING UNITS

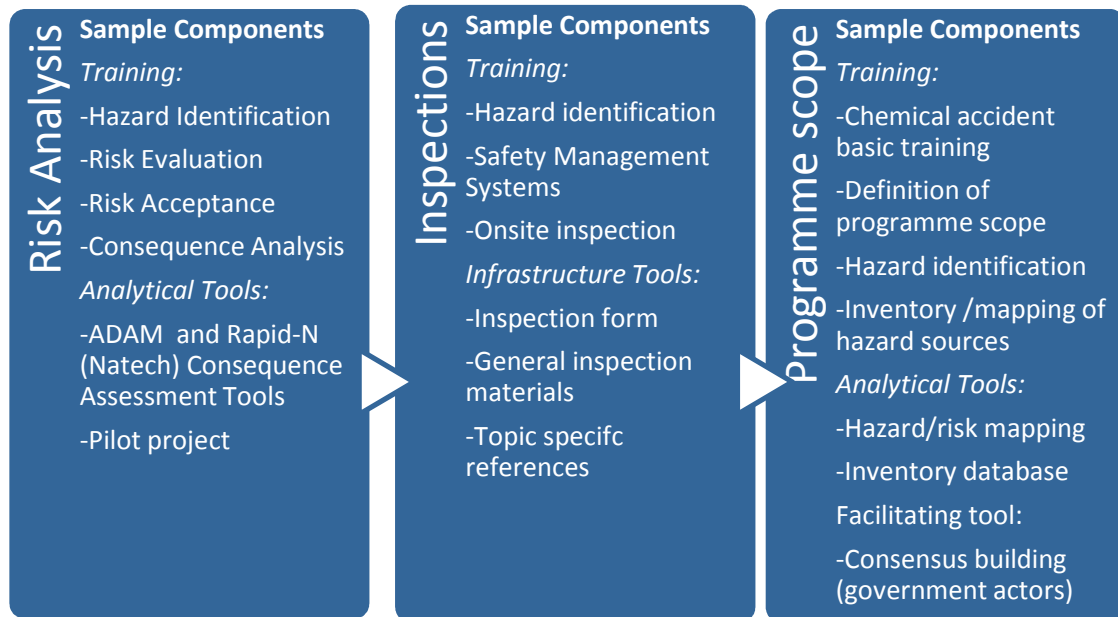


FIGURE 3: SAMPLE COMPONENTS FOR SELECTED THEMATIC UNITS

A thematic unit can cover the entire conceptual model or focus on specific elements of the conceptual model, such as specific principles for effective risk management, analysis, enforcement and monitoring, but whose delivery (i.e., combination of training, analytical tools, facilitation, consultation) is adapted to in-country circumstances (See **Figure 3** above). A thematic unit is a flexible tool based on a structured set of common principles. Every thematic unit is adapted and refined to address specific country needs, take account of the existing awareness and knowledge about chemical accident prevention, and to leverage existing in-country advantages. For example, relevant university experts may be invited to contribute to a training module or other project event. Their contributions are normally of significant value due to their use of local case.

Capacity building is a dynamic process in which the focus (which element or elements of the Seveso Directive) and support tools (see **Table 2** on the next page) are selected based on the country's own motivation and an analysis of the most important gaps in its existing infrastructure for chemical accident prevention and preparedness. Given this perspective, it follows that delivery of a thematic unit is not a one-time event. A minimum time frame for completing a unit is usually one year but often can be multiple years for units with a high technical complexity (e.g., risk analysis), and depending on the target audience. The current situation of the country and its objectives for capacity building determines the process for completing a thematic unit and how long it will take. It should be recognized that the full set of thematic units for establishing a CAPP programme, if starting from top to bottom, may take more than a decade to implement.

Table 2 – Page 1 of 2
Chemical Accident Prevention and Preparedness Programmes
Types of Capacity Building Tools

1. Direct training of users and (when appropriate) trainers

Delivery of a module always includes training of some type and a few modules only consist of training. Training consists of a collection of presentations, interactive exercises, demonstrations, and other audiovisual support that can be delivered in the context of a workshop or online course. Training materials for each module have already been developed but every new training requires reviewing and updating materials and matching materials to the audience. It is almost always the case that new ideas for training also emerge with each workshop. The results can be made more powerful if the training is accompanied by other tools that facilitate dissemination of the learned concepts or their incorporation into a programmatic element.

2. Analytical and infrastructure tools, including tools for risk analysis, accident investigation and analysis, and programme administration

Analytic tools are typically models, methodologies and computer programmes, that combine models and methodologies with data inputs and algorithms, for making retrospective or prospective analyses for decision making. In general, analytical tools are grouped into three categories: risk analysis, accident analysis, and hazard and risk mapping.

- Risk analysis
- Hazard and risk mapping
- Accident analysis

Risk analysis tools, that include components such as hazard identification, consequence assessment, risk evaluation, and risk ranking, are the core analytical tools of risk management. For countries with limited resources and expertise, gaining low-cost access to such tools and training is essential to building a more robust chemical accident prevention programme. Effective government oversight also requires an inventory of hazards and their geographical location, putting increasing pressure on the availability of hazard and risk mapping tools. In particular, risk mapping tools for large areas of land using generalized information are greatly desired but hardly available, with a few in the testing phase within international organizations (including the JRC). Finally, once a country has acquired its expertise in risk analysis, it places increasing importance on accident investigation and lessons learned analysis.

In addition to analytical tools, the basic infrastructure often requires database management and interactive tools for establishing and maintaining a hazardous site inventory, reporting and registering accidents, and inspection tools.

Table 2– Page 2 of 2
Chemical Accident Prevention and Preparedness Programmes
Types of Capacity Building Tools

3. Tools that give easy access to expert knowledge

Access to expert knowledge is a significant challenge for both developed and developing countries. Chemical accident prevention relies on information from a wide variety of disciplines within chemical and mechanical engineering as well as natural and social sciences. Most regulators and operators need to have access to only a subset of this knowledge, but the diverse types of knowledge required (equipment operational norms and standards, various process technologies, substance-specific behavior and properties, human and organizational psychology, systems management, etc.) is still an ongoing challenge for risk management and its oversight. While there is a lot of information available on relevant procedures and intervention strategies; inspection and audit tools; standards and criteria; lessons learned from accidents and experience, etc. that is very specific to different industry sectors, substances and elements of safety management, More tools and strategies that support expert networks, online knowledge bases and other information exchange mechanisms are needed.

4. Strategies for facilitating stakeholder outreach for consensus building, raising awareness, and education

The success and duration of programme improvements depends on stakeholder support and on the capacity for all responsible parties to fulfil relevant obligations. For example, the UNEP Flexible Framework usually requires establishment of a task force of government stakeholders to develop consensus on new programme elements and responsibilities. It may be also a priority in some countries to develop a programme to build risk management capacity in industry. Capacity building tools of this nature often include mechanisms that facilitate input and consensus from stakeholders, and could also include such elements as designing training materials or courses to professional networks or universities. At the moment some good tools exist, notably the UNEP Flexible Framework ISP, but it remains a very small collection on limited topics. This project is likely to generate innovation and development in this regard if a need is identified that cannot be addressed by an existing tool.

5. Ad hoc consultation for crisis situations

Recent experience has indicated that there are still no good mechanisms to address the immediate information needs that often arise when a serious chemical accident occurs. In developing countries, practical information for responding to specific topics of accidents, especially since they may involve hazards specific to the substance involved, is sometimes an urgent necessity. In both developed and developing countries, mechanisms to obtain advice on relevant experts for managing and following up on crisis situations are still not very well established.

The components of a base set of training modules for Seveso implementation already exist as a result of many years of training to support Seveso implementation in Member States, Enlargement, and implementation of the UN ECE Industrial Accidents Convention. The JRC has access also to a rich collection of materials through the UNEP Flexible Framework Programme, developed as team collaborations for different country projects. On the other hand, more complex tools, such as low- cost consequence analysis models, industry specific inspection criteria, and other specialized support identified in Items 2-5 on the next page depend on dedicated research and technical exchange, such that, piece by piece, over time, knowledge is becoming more widely accessible to everyone. In this way, the capacity building process plays a strong role. It is in large part the impetus for prioritising which knowledge needs to become more accessible. Moreover, content and approaches that lead to successful capacity building continually evolve in time. Constant innovation is required to adapt to individual country needs and through necessity, new materials and tools begin to emerge.

From past experience in capacity building for chemical accident prevention, it is already possible to identify a set of thematic units likely to become part of the capacity building strategy of one or more countries involved in the ENPI project. There are essentially six typical themes that routinely are selected as capacity building priorities by developing countries, as indicated in the following paragraphs. As is probably evident, the first thematic unit is a general thematic unit to define the conceptual model, achieve a common understanding of its main objectives, and establish the context and starting point of the capacity building effort. The remaining thematic units all focus on various essential building blocks of chemical accident prevention programmes.

1. **Chemical Accident Prevention Awareness and Needs Analysis.** Many countries asking for assistance may have neither a targeted nor a systematic approach to chemical accident prevention. The objective is to identify priorities for filling these gaps in relation to the country's key concerns and strengths in order to target and plan capacity building efforts. This thematic unit usually consists of identifying the country's key concerns, strengths and potential vulnerabilities to chemical accident risks; presenting the Seveso model; and identifying where the country has coverage and gaps in terms of knowledge, authority and systems for its implementation.
2. **Analysing Potential Hazard Sources and Establishing Programme Scope.** A systematic approach requires identifying and prioritizing hazard sources, that is, the types of facilities that represent a major chemical hazard. The overall objective is for the country to identify and prioritise its hazard sources in order to create an appropriate scope for implementing new elements of chemical accident prevention. This thematic unit usually builds understanding on classification and labelling, common hazardous substances in industry, the relationship of hazardous properties and substance volume, the basics of hazard identification and accident analysis, and consequences of different types of accidents (fires, explosions, toxic releases) in relation to people and the environment. The activity may include mapping of hazard sources or establishing a register, or a system for collecting more information

on hazard sources to be able to identify scope. It also provides input for proposed legislative changes.

3. **Risk Analysis.** Competence in risk analysis is fundamental to chemical risk management and related government enforcement and oversight. Government and industry actors with relevant responsibilities must have their own competence or easy access to it. The objective of this thematic unit is to provide the target audience (to be determined based on the country needs) the ability to understand the risk analysis process, design and perform a risk analysis for specific purposes, and interpret the results. It consists of training on all aspects of the risk analysis process, from hazard identification, consequence, to risk evaluation, acceptance, and decision making. In addition, it aims to embed competence in an area of government or industry, so that it becomes part of operations, requires hands-on activities and access to a risk analysis tool. Hence, various pilot projects may be designed including, using a risk analysis tool to perform an analysis on a particular case in a particular geographic area.
4. **Natech Risk Analysis.** An accident in which a natural hazard causes a technological accident, specifically associated with chemical hazard sources, is a natech event. It is a specific type of accident that assigns additional scenarios and parameters in the context of traditional risk analysis for risk management. In certain geographic areas, for example, flood-prone areas and earthquake zones, the potential natech risk may be particularly high if there is a high hazard industry in the area. In such cases, reducing the risk requires the focused attention of government industry actors on this specific accident cause. The objective of this thematic unit is to build capacity in identifying, preventing and preparing for natech risks on specific sites and across a geographic area, analysing natech risk potential of specific sites and geographic areas, and identifying and implementing appropriate measures for reducing risk and mitigating the impacts of such events. It is similarly constructed to the Risk Analysis Thematic unit but also includes natural hazard dynamics in modeling and tools applied, and a focus on natech-specific scenarios, parameters, and control measures.
5. **Hazardous Facility Inspections or Audits.** Inspections are the government's most important and, at the same time, its most challenging enforcement tool. Process safety inspections are substantially different from inspections related to environmental protection or labour safety. Even though they share objectives of preventing harm to human health or the environment, the origin, and therefore, the prevention of such harm is vastly different from the other disciplines. The objective of this thematic unit is to support launching of a self-sustaining programme to build and maintain inspectorate competence in how to inspect a site in order to assess compliance with chemical accident prevention program regulations. Under the Seveso Directive, the inspector seeks not only compliance with objective requirements of the law, but also, to gain assurance that risk has been adequately

reduced in compliance with the General Duty Obligation.⁴ This thematic unit necessitates training on hazard identification and risk analysis, the operator obligations to implement safety management systems, draw up a safety report, and develop emergency plans, and investigate and analyse accidents. It should include inspections strategy and on-site demonstration of inspection techniques. Additional components may be necessary over time, depending on the situation, to sustain competency acquired through training, e.g., access to expertise through academia, a professional network, etc, or a train-the trainer-programme. Most components of the Inspections Thematic Unit are also basic elements of training for industry operators on how to audit their sites to assess their own chemical risk management programmes.

- 6. Industry Outreach and Capacity Building.** Industry operators are morally and legally responsible for preventing chemical accidents on their sites. This responsibility requires the proper knowledge and competence to manage chemical risks on their sites effectively and for demonstrating that they have also met their legal obligations in this regard. The objective of this thematic unit is to support launching of a self-sustaining programme to build and maintain industry knowledge and competence. It can include all the thematic units above, adapted for industry, but in addition, it would help the country develop a strategy on how to engage and build competence in industry. It will be important that the thematic unit includes mechanisms for leveraging existing professional networks and academia to support outreach and training in the long term.

These six thematic units cover the typical types of topics that are in demand in capacity building projects. Training materials largely exist and can be adapted for new capacity building projects, but there are still significant gaps in tools needed for sustainability. For example, in Year 1 this project already began working on development of user-friendly and accessible analytical tools and information hubs. Other needs may require strategic support, such as helping to establish expert networks or to engage a specific target audience, etc.

In addition to these six thematic units identified above, there are numerous other thematic units that might be alternatively suggested by a country, for example, land-use planning, accident analysis and investigation, information to the public and building public awareness, IT infrastructure for chemical accident prevention, etc. A new thematic unit can easily be constructed from existing training modules and existing tools and also incorporating new mechanisms. It is expected that the unique needs of countries in the project will naturally generate new ideas for delivering thematic units in any case.

⁴ The Seveso Directive general duty clause obliges the operator “to take all measures necessary to prevent major accidents and to limit their consequences for man and the environment.”

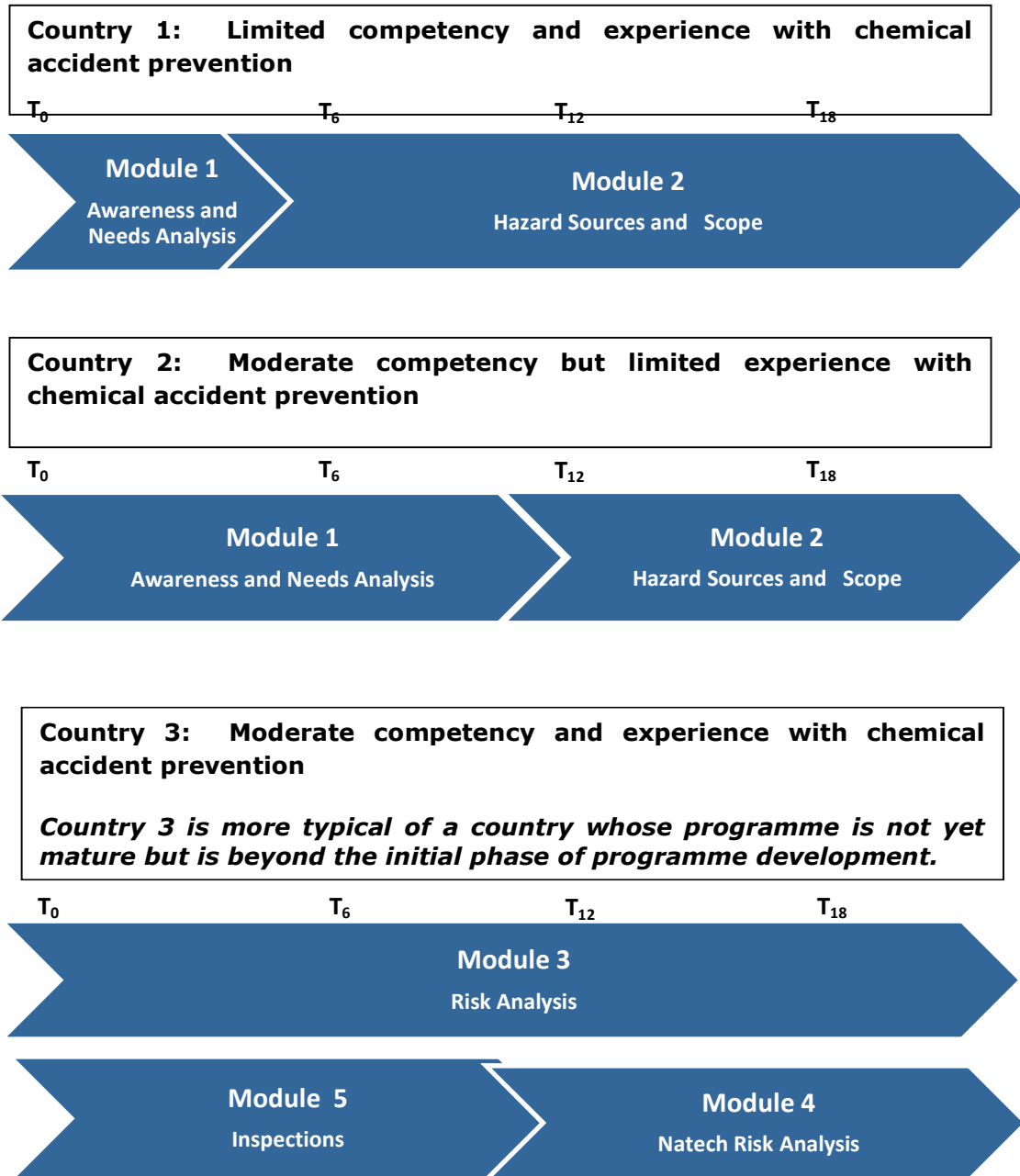


FIGURE 4: EXAMPLES OF CAPACITY BUILDING APPROACHES USED BY DIFFERENT COUNTRIES

Countries will vary in terms of which thematic unit they prioritise first. A version of Thematic Unit 1 is almost always necessary so that the country and the capacity building team share the same vision of where the country is starting and where it wants to go, using the Seveso Directive as the common reference model. Some countries that have strengths in relevant competencies and experience (in chemical classification, environmental protection, etc.) may move on quickly to focus on a programme building block, or possibly even two complementary building blocks.

By way of example, **Figure 4** on the previous page shows the choices made for two actual country capacity building projects (Country 1 and Country 2), adapted somewhat for purposes of comparing the choices made for two different country profiles. Country 3 represents any one of a number of countries that have participated in capacity building projects after having established the Seveso model or Seveso model components in legislation and the institutional infrastructure. (This was the typical situation of accession countries in the early 2000's.) It can be observed that Country 1 needed substantial awareness building. Country 2 needed some awareness building to ensure all involved stakeholders shared the same vision and were at the same level of understanding before moving ahead. The countries represented by Country 3 all had moved beyond the conceptual model and were focused on building technical capacity.

2.2.4 TRAINING MODULES FOR CAPACITY BUILDING

A comprehensive list of typical training modules that form the basis of thematic units for capacity building in chemical accident prevention and preparedness is shown in **Table 3** on the next page. Normally, the scene setting and awareness modules, and the modules on analytical methods, are deployed for every project to some extent. Depending on the thematic unit topic, a collection of training modules is chosen and may be delivered over time through workshops and other mechanisms. A typical 2-3 day workshop (a thematic unit often has more than one workshop event) will usually consist of at least 3-4 different topic modules, and can include relevant presentations from the government and other stakeholders, interactive modules, discussion and feedback, and sometimes a visit to an industrial hazard site.

A number of excellent reference materials already exist for delivering these thematic units. Below is contains a list of the sources that would be consulted in this project in the first instance, depending on which thematic units are applied. There are numerous other references that may surface or be rediscovered over the course of the project and there may also be resources within the EU Neighbour Countries that could be relevant and useful. For example:

programmes

Table 3
Chemical Accident Prevention and Preparedness Programmes
Training Modules for Capacity Building

Topic 1. Scene setting and awareness modules

- Overview of a model chemical accident prevention programme
- Chemical accident basic training (Understanding the nature of chemical accidents/hazardous substances and industry sectors/chemical accidents in daily operations/the philosophy of chemical accident and natech prevention)
- Development of a country situation report and strategy

Topic 2. Outreach and establishing expert networks

- Responsibilities of authorities and engaging and building capacity in authorities
- Responsibilities of industry and engaging and building capacity in industry and academia

Topic 3. Analytical and infrastructure tools supporting prevention of chemical accidents

- Hazard identification and risk analysis of high hazard establishments
- Hazard identification/risk analysis for preventing natech (natural causing technological) accidents
- Analysis of accidents and lessons learned

Topic 4. Building the chemical accident prevention programme

- Definition of programme scope (substances and industries covered)
- Definition of programme content (obligations of industry and government)
- Assignment of programme oversight responsibilities (ministries, agencies, legislation)
- Inspections strategy, tools, documentation and follow-up
- Implementing safety management systems (SMS) and assessing SMS compliance
- Writing safety reports and assessing safety reports for compliance
- Land-use planning

Topic 5. Information infrastructure needs for chemical accident prevention

- Inventory of hazardous establishments/hazard and risk mapping
- Accident notification and reporting
- Inspection and compliance tools

- Existing JRC-MAHB, UNEP and UN ECE training materials, including presentations and interactive exercises developed for various thematic units (or applicable to a cross-section of thematic units). In general, JRC-MAHB and UNEP have core training materials for each thematic unit and some have also been developed for UN ECE training workshops.
- JRC-MAHB reference materials on different elements of the Seveso Directive (e.g., inspections, land-use planning, safety management systems, and safety reports)
- JRC-MAHB studies of risk management and enforcement in different industrial sectors
- UN ECE guidance documents on safety reports, implementation in specific industrial sectors, and on hazard rating systems (product of a bilateral collaboration led by JRC-MAHB)
- UNEP-OCHA Fast Environment Assessment Tool (FEAT) for identifying and mapping industrial hazards by industrial sector with risk rating on the basis of substance usage assumptions by sector.
- The UNEP Responsible Production Tool Kit is a potential resource for working with industry partners, and in addition to English, has been translated into French and Arabic.

2.2.5 ONGOING DEVELOPMENT AND IMPROVEMENT OF CAPACITY BUILDING TOOLS

The capacity building tools are the building blocks of the thematic units. The thematic units are nothing more or less than a collection of these tools and the same tool may be important for more than one thematic unit (e.g., risk analysis tools). This category consists of a wide range of different mechanisms that can be applied and collectively can help ensure that improvements are sustainable over the long term. The development of affordable and practical tools to support the diverse needs of chemical accident prevention programmes, particularly for countries with limited resources, is far behind what is actually needed.

Tools that are considered either necessary, or extremely useful, in sustaining an effective chemical accident prevention programme can be loosely grouped into five categories:

1. Direct training of users and (when appropriate) trainers
2. Analytical and infrastructure tools, including tools for risk analysis, accident investigation and analysis, and programme administration
3. Tools that give easy access to expert knowledge
4. Strategies for facilitating stakeholder outreach for consensus building, raising awareness, and education
5. Ad hoc consultation for crisis situations.

A more detailed description of each tool is provided in **Table 2** on pp. 12-13. The provision of direct support in the form of analytical tools and access to existing knowledge is an area that needs focused attention. For this reason, Year 2 of the

Table 4 – Page 1 of 2
Chemical Accident Prevention and Preparedness Programmes
JRC Analytical and Infrastructure Tools

The JRC has been at the forefront of development of analytical tools for chemical accident risk analysis and management, with the unique advantage of a fruitful testing ground and diverse user base. Elements of IT infrastructure unique to chemical accident risk management have also been developed by the JRC. Tools that are available or could be in future are described below:

- **GIS-ARA** – The **Geographic Information System – Area Risk Analysis** is an analytical tool facilitates an aggregation and visualisation of chemical accident risk based on the contribution of all risk sources, that is, including fixed installations, transport modes, and pipelines, in a selected geographic area. Based on input data, the application can calculate and display, individual area iso-risk curves, the relative contribution to overall area risk of each individual risk source, F-N curves and I-N histograms, and land use planning zones. These outputs give support to decision making in regard to:
 - 1) identifying priority interventions to mitigate the risks/consequences of potential accidents;
 - 2) improving the transport infrastructures to reduce risk;
 - 3) planning urban development by taking into account major accident hazards;
 - 4) assessing compatibility of new industrial developments with current land use

Status: *Online version in development*

- **ADAM** – The **Accident Damage Assessment Model** is an analytical tool for predicting accident consequences. It analyses the sequence of events leading to a potential incident from the initial release in relation to potential consequences, including modelling of pool spreading and evaporation, and flammable and toxic effects. The results of the analysis can be displayed in tabular & graphical form, to facilitate visualization of the severity and extent of the impact, and its effect on the population and environment. Damage assessment is a necessary input to a **GIS-ARA** analysis.

Status: *Bestest version available for pc. Online version in development.*

- **eMARS** – The **Major Accident Reporting System (eMARS)** is an online reporting tool whose primary purpose is to facilitate reporting of major chemical accidents by Member States as required by the Seveso Directive. The eMARS database came into existence with the first Seveso Directive in 1982. Since 2000, the eMARS database has also supported global exchange of lessons learned, by hosting accident reports volunteered from non-EU countries through EC partnerships with OECD, UN ECE, and UNEP. Nearly 800 chemical accidents can be viewed on line by the public and 100+ are in process for future publication. <https://emars.jrc.ec.europa.eu>

Status: *Available Online – New version in development*

Table 4 – Page 2 of 2
Chemical Accident Prevention and Preparedness Programmes
JRC Analytical and Infrastructure Tools

- **AIDA and eMARS light** – The **Accident Information Data Analysis (AIDA) Tool** still in development is envisioned as both an analytical tool for recording accidents and analysing lessons learned from accidents. The first phase of development of this tool focuses on the infrastructure service which is a simple programme, **eMARS Light**, modeled after eMARS that a country can adapt and use its own data collection inventory.

Status: *Beta test version of eMARS Light is nearly available. Analytical part is planned for future.*

- **Rapid-N** – **RAPID-N** is a web-based analytical tool for Natech risk assessment and mapping. It is intended to support decision-making for managing technological risks that may be triggered by a natural hazard event (Natech). Rapid-N analyses risk potential by combining data on technological hazards and natural hazards in a selected geographic area, taking in to account site specific features, such as expected release scenarios under natural disaster conditions and safety measures in place. It is composed of four main modules:

- Scientific tools (scientific calculations, GIS analysis, and reference materials)
- Natural hazards (including site-specific natural hazard information)
- Facilities and process equipment (data on specific sites, equipment, and substances)
- Risk assessment (damage classifications, fragility curves, consequence modeling, etc.)

The results of the risk assessment are presented as summary reports and interactive risk maps showing natech event probabilities and the areas possibly affected by the events.

Status: *Available online. <http://rapidn.jrc.ec.europa.eu/>. Currently limited to earthquake hazards only. Coverage of other natural hazards is a future objective.*

- **Industrial risk mapping tool.** Risk mapping industrial hazards is a particularly challenging analytical function because chemical hazards are substance and process-specific and cannot be generalized. Nonetheless, UNEP-OCHA has come up with a promising methodology, intended originally for emergency teams responding to natural disasters. The Fast Environmental Assessment Tool (FEAT) links a vast number of substances with specific industrial processes, to allow estimating potential risks if the industrial activity of sites in a specific geographic region have been identified. This methodology can be adapted for industrial risk mapping.

Status: *Testing of the FEAT tool for use in industrial risk mapping is a future activity.*

- **eSPIRS** – the Seveso Plant Information Reporting System is a chemical facility registry and mapping tool developed for EU Member States to fulfil their obligation to report their Seveso establishments to the European Commission. As of mid-2015, it will be a public database. It is envisioned that the eSPIRS programme can be adapted for use by other countries as a hazard establishment inventory.

Status: *Creation of an inventory tool for third countries is a future activity.*

project specifically targets development of online web services for risk analysis, accident data collection and analysis, and access to knowledge sources. Currently, JRC-MAHB has a number of established tools and tools in development, hosted by MAHB's new MINERVA platform for technical exchange on chemical accident prevention (<https://minerva.jrc.ec.europa.eu>). (See **Table 4** on the previous pages.) Similarly, there is potential in this field for finding ways to foster in-country knowledge development through expert exchange, education and professional networks, and to establish mechanisms for ad hoc consultation (e.g., when an accident occurs), to support the country's progress towards a sustainable infrastructure. Additional tools of this type may be produced in the process of adapting a selected thematic unit to country needs.

Translation into local languages (mainly Russian, Arabic and French) may also have to be a consideration in working towards making existing tools more accessible. While over the past several years, numerous useful tools for different risk management needs and Seveso requirements specifically have already been produced by the European Commission, other international organisations, EU and national research projects, industry groups, and Seveso competent authorities, they may remain inaccessible to East and South neighbours, even when all the necessary passwords and weblinks are provided, because they are not in a local language. Translation will become a fundamental consideration as this area of activity evolves, but on a case-by-case basis, since translation may be expensive and sometimes challenging logistically.

2.2.6 POTENTIAL RESOURCE NEEDS

The resource needs of this project are described in terms of resources to execute the strategy from the side of the European Commission. It does not address the resource situation in the neighbor countries, a factor that cannot be directly addressed by the project, but that will have to be taken into account in country-specific strategies. The project's resource needs can be categorized in terms of Seveso competences, specifically personnel with necessary expertise to manage and run capacity building activities, IT competences, and miscellaneous funds for missions, meeting administration, participant travel, and possibly translation.

Personnel funding is envisioned mainly for IT staff that perform the online programming for the analytical tools and exchange platform, since the JRC-MAHB does not have this expertise in-house. These experts are external but work on site under JRC management. In addition, at least one temporary staff expert in Seveso or natech expert fields may be funded by the project to augment the in-house availability of Seveso expertise.

In addition, the project will rely on external experts in various Seveso competences (see **Table 5** on the next page) for specific events or subprojects. It is expected that the majority of experts will be working, (or have significant past experience) in a relevant capacity in Member State Competent Authorities (e.g., inspectors) or industry (e.g., a plant or corporate safety manager). In particular, competent authority and industry representatives (whether current or formerly) offer direct expertise from experience

inspecting, overseeing and/or managing risks of specific sites and hazards, as inspectors, government experts, policy managers or operators engaged with major hazard sites. In addition, many of them have experience in capacity building in some of the neighbor countries, giving useful insights from that perspective.

Notably, among the staff of the JRC-MAHB, all the necessary competences in the above table are present to some degree (and in many cases, quite a significant degree). However, it is generally advisable to incorporate external experts in almost all training and support activities of the project. They bring a richness to the training with their own ideas and perspectives, bringing involvement of perspectives from other Member States and industry partners, and they help distribute the work of organizing and lecturing at workshops and in collaborating with countries on subprojects within the activity, thereby, extending the reach of Commission resources.

Table 4
Chemical Accident Prevention and Preparedness Programmes
Typical Seveso Competences

Seveso competences are the range of competences necessary for training on the Seveso Directive and its components. A number of competences are generally required, but in particular,

- experience in Seveso policy implementation and implementation strategies,
- knowledge on what is a chemical accident, how they occur and how to analyse accidents to obtain lessons learned,
- knowledge of hazardous substance classifications, typical industries using or handling these substances, and the accident phenomena that substances in combination with process may produce,
- experience in identifying major chemical hazard sites of significant risk to the surrounding community,
- expertise in hazard identification, consequence analysis, and in the design and execution of risk analyses for specific objectives
- knowledge of government infrastructure needs (e.g., reporting mechanisms, procedures and tools) necessary for effective implementation
- experience and knowledge working with key requirements of the Directive, mainly, safety management systems, safety reports, land use planning, and inspection, and.
- Experience working with government and industry operators engaged in Seveso implementation, and in developing countries in particular.

3 PROPOSED YEAR 2 PROJECT WORK PLAN

The proposed year two project work plan envisions two main tasks:

- Development and Launching of Phase 1 Implementation Plans of the Capacity Building Strategy
- Further Development of Capacity Building Tools

3.1.1 DEVELOPMENT AND LAUNCHING OF PHASE 1 IMPLEMENTATION OF THE CAPACITY BUILDING STRATEGY

Phase 1 implementation will aim at achieving a number of initial objectives:

- **A practical strategy for each region over the next two years.** The strategy could be entirely regional or focused on individual countries with some activities for the region (or all Neighbour countries) planned in parallel. This decision will evolve with output from activities in Year 1. This planning also assumes that scoping of the situation in South countries will be completed by the end of Year 1 (although part of capacity building itself can sometimes include more in-depth exploration of a country's needs). The scoping exercise will be continued in Year 2 focusing this time on the East. A Strategy Plan for the region or for individual targeted countries (or both) will be developed on this basis by the end of the project year.
- **Two or three scoping events in the East possibly combined with workshops.** These events may consist of visits to different countries, or a workshop for the entire region. The decision will evolve following closer interaction with the countries on the basis of the survey and other inputs that will result from Year 1 activity.
- **Two or three capacity building events (workshop, small project, etc.) in the South.** These events may also consist of bilateral, multilateral or regional events, depending on the Year 1 inputs.
- **A workshop on the Rapid-N tool for Natech risk analysis.** This workshop will also include an introduction of the ENPI project. Enlargement countries and new Member States may also be invited (under a different budget line).

The number of events in each region is subject to change if circumstances warrant, since it is difficult to envision the logical progression of activities at this point in time. For example, if there is a tendency to prefer large scale workshops

at the regional level, they may absorb more time and resources, but achieve the same results, reducing the number of events required.

3.1.2 FURTHER DEVELOPMENT OF CAPACITY BUILDING TOOLS

Year 2 will continue the development of capacity building tools. It will continue the development of the analytical tools initiated in Year 1 and also begin development or improvement of additional tools. The planned activities are as follows:

- **Extension of the Accident Damage Analysis Model (ADAM) prototype** to include the physical effects resulting from fires, explosions and toxic dispersions. A prototype of the online version of the basic ADAM structure will be completed by the end of Year 1. In Year 2 the addition of consequence analysis models will be added. For a description of ADAM, see **Table 4** on p. 21.
- **1st phase development of a new prototype for the Rapid-N (Natech Risk Analysis) tool**, with the view to including flood events. Flood events are likely to be important natech triggers in several of the neighbor countries. For this reason, further development of this tool has been added to Year 2. A description of Rapid-N can be found in **Table 4** on p. 22.
- **Develop new content for capacity building on the MAHB MINERVA technical exchange platform, focusing in particular on sections specific to industrial sectors.** Content will in part be selected and prioritized based on the results of the Survey of Chemical Accident Prevention and Preparedness Programmes in ENPI Countries and further needs identified through bilateral exchanges with ENPI countries. If a need is identified, and resources remain available, a new activity may also be launched (e.g., development of a site inventory tool or pilot project on risk mapping).

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