

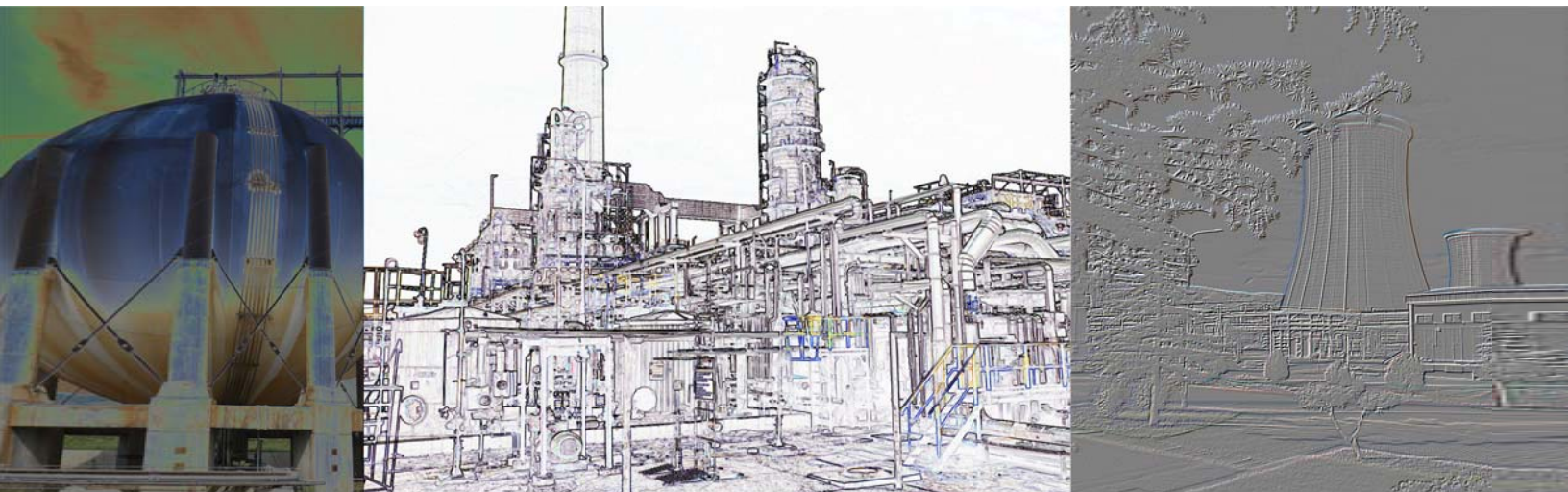
JRC TECHNICAL REPORTS

Strategy for Capacity Building on Chemical Accident Prevention and Preparedness Programmes in EU Neighbourhood Countries

Prepared for DG ECHO to Support Capacity Building for Seveso Directive Implementation
within the EU Civil Protection Mechanism

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Abstract:

The European Union established the European Neighbourhood Policy (ENP) in 2004 to promote an area of peace, stability and prosperity in its immediate neighbourhood with the Countries to the East (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine) and to the South (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria, and Tunisia). It aims at developing tighter and more beneficial relations between the EU and her neighbours in political, economic and cultural domains, and in particular on security matters, as well as extending and enhancing current existing cooperation frameworks in order to reduce the likelihood of any new divide appearing. The strengthening of the safety and security with the EU Neighbourhood Countries, also from an economical and resources sharing angle, is identified as a great strategic priority by the European Commission and the EU and is an issue that has acquired a more relevant importance following the latest developments in some of these countries. One particular area of shared concern is the control of chemical accident risks. The Seveso Directive has existed as legislation in the European Union since 1982 and holds a long history of regulatory responses aimed at controlling sites where dangerous substances are processed and stored and where accidents may result in fatalities and serious injury to people or damage to the environment. As such, there is considerable logic in accelerating implementation of a Seveso approach in Neighbourhood Countries to continue the momentum towards Seveso becoming a standard approach to chemical accident prevention and preparedness worldwide. For this reason, the Civil Protection Mechanism 2014-2020 (Decision No. 1313/2013 of the European Parliament), managed under DG-ECHO, introduced a new initiative, Seveso Capacity Building in EU Neighbourhood Countries strategy to collaborate with its neighbours on strengthening chemical accident prevention and preparedness programmes. The Joint Research Centre's Major Accident Hazard Bureau is leading the implementation of this initiative on behalf of DG-ECHO. The JRC therefore has analysed its own experience in capacity building, conducted research and sought expert feedback to produce this strategy document for the initiative. This report presents the final strategy that is the outcome of this process.

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ACRONYMS AND ABBREVIATIONS

APELL	Awareness and Preparedness for Emergencies at Local Level
CAPP	Chemical Accident Prevention and Preparedness
CPM	European Union Civil Protection Mechanism
DG DEVCO EUROPEAID	Directorate General Development and Cooperation - EuropeAid
DG ECHO	Directorate General Humanitarian Aid and Civil Protection
DG ENV	Directorate General Environment
DG JRC	Directorate General Joint Research Centre
EC	European Commission
EEAS	European External Action Service
EIB	European Investment Bank
ENP	European Neighbourhood Policy
ENPI	European Neighbourhood and Partnership Instrument
MAHB	Major Accident and Hazards Bureau
NGO	Non-Governmental Organization
OECD	Organisation Economic Cooperation and Development
PPRD EAST	Eastern Partnership Flagship Initiative for the Prevention, Preparedness and Response to Natural and Man-Made Disasters
SMS	Safety Management System
TAIEX	Technical Assistance and Information Exchange
TEIA	Transboundary Effects of Industrial Accidents
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme

UNECE United Nations Economic Commission for Europe

UNEP United Nations Environment Program

EXECUTIVE SUMMARY

The European Union established the European Neighbourhood Policy (ENP) in 2004 to promote an area of peace, stability and prosperity in its immediate neighbourhood with the Countries to the East (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine) and to the South (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria, and Tunisia). It aims at developing tighter and more beneficial relations between the EU and her neighbours in political, economic and cultural domains, and in particular on security matters, as well as extending and enhancing current existing cooperation frameworks in order to reduce the likelihood of any new divide appearing. The strengthening of the safety and security with the EU Neighbourhood Countries, also from an economical and resources sharing angle, is identified as a great strategic priority by the European Commission and the EU and is an issue that has acquired a more relevant importance following the latest developments in some of these countries.

One particular area of shared concern is the control of chemical accident risks. In both industrialised and emerging economies, the pace of change in this era creates significant challenges in both industrial and industrialized countries associated with chemical accident prevention and preparedness governance. Growth in many economies has in numerous cases outstripped the capacity to manage this and other externalities that accompany growth. Some of the most common industrial processes in the world, such as petroleum refining and storage, mining, paint and dye manufacture, and fertilizer production, are major sources of chemical accident risk. To further complicate matters, there is a wide diversity of risk sources – combinations of processes, equipment and substances that can trigger an accident - that require specific control strategies and technologies. In addition, the dynamics of time, economy and human intervention introduce constant change, destabilizing the status quo, and mandating an ongoing vigilance as to the relevance of the existing control measures.

The Seveso Directive has existed as legislation in the European Union since 1982 and holds a long history of regulatory responses aimed at controlling sites where dangerous substances are processed and stored and where accidents may result in fatalities and serious injury to people or damage to the environment. It was the first comprehensive legislation of its kind in the world and continues to be a leading model for process safety governance globally. It is a performance-based measure that places direct responsibility on operators for keeping their plants safe, but imposes also rigorous requirements on government authorities to track and motivate operator progress. Numerous versions of the Seveso Directive are being implemented outside Europe in a growing number of both developed and developing countries.

As such, there is considerable logic in accelerating implementation of a Seveso approach in Neighbourhood Countries to continue the momentum towards Seveso becoming a standard approach to chemical accident prevention and preparedness worldwide.

For this reason, the Civil Protection Mechanism 2014-2020 (Decision No. 1313/2013 of the European Parliament), managed under DG-ECHO, introduced a new initiative, Seveso Capacity Building in EU Neighbourhood Countries strategy , to collaborate with its neighbours on strengthening chemical

accident prevention and preparedness programmes. The Joint Research Centre's Major Accident Hazard Bureau is leading the implementation of this initiative on behalf of DG-ECHO.

Capacity building for Chemical Accident Prevention and Preparedness (CAPP) is a complex and resources intensive undertaking. Capacity building projects in this field are intended to help countries identify needs and gaps and get the most from the technical and economic assistance offered to make progress in reducing chemical accident risks. As a first step, the JRC therefore has analysed its own experience in capacity building, conducted research and sought expert feedback to produce this strategy document for the initiative. It outlines an approach to addressing anticipated needs based on a number of principles that have proved effective in guiding similar past projects, especially where adequate political commitment and leadership exists to help drive change.

Furthermore, an expert workshop took place from 26th March 2015 to 27th March on the premises of the European Commission's Joint Research Centre in Ispra (Italy). The workshop aimed to foster an exchange of views and capture experiences and knowledge of a variety of experts from international organisations, government, and industry with experience in building activities for improving chemical accident prevention in developing countries. The outcomes of the workshop were intended to provide feedback and improve the strategy and also to facilitate the possibility for future collaboration with individual organisations and experts in the context of this project.

The strategy presented in this report is therefore based on a combination of JRC experience, research, and expert input. It consists of four chapters and three annexes as follows:

- Chapter 1 describes the JRC project methodology first proposed in late 2014 and elaborated further in this report.
- Chapter 2 summarises outcomes from an expert workshop of experts from international organisations, Member State competent authorities, and industry convened in March 2015 to review and comment on the strategy and methodology, and to provide advice on tools, resources and approaches that could contribute to effective implementation.
- Chapter 3 presents a hierarchical process modelling to help guide and assess progress within the capacity building process in individual countries.
- Chapter 4 outlines the conclusions and recommendations from this collective input, establishing key principles for defining project actions and sequence of events.

PROJECT BACKGROUND, PURPOSE AND STRATEGY

The initiative aims at building sustainable CAPP programmes in ENPI countries through a consistent support and guidance on a bilateral, multilateral or regional basis to countries participating in the programme. The strategy for achieving this goal is intended to optimize access to existing knowledge and tools developed in the EU and elsewhere to facilitate effective government and industry execution of

their responsibilities in preventing chemical accidents that can harm individuals, communities and the environment. For this purpose, the project strategy is around the achievement of these key objectives:

- To establish active partnerships with Neighbourhood Countries and identify critical priorities for improving the effectiveness of programme implementation and specific gaps in technical knowledge and tools necessary for additional progress.
- To give access to information, tools and knowledge produced by the JRC and the vast network of EU government, industry and international stakeholders in long collaboration with the European Commission on this important topic.
- To offer training workshops and individualised advice and support for improving capacity over time, as feasible and based on objectives agreed with participating countries.

Effective capacity building should be based on a systematic structured conceptual approach (e.g., Seveso), but assume 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. Areas that often require specific attention in developing countries are:

- **Understanding the nature of a chemical accident.** Applying a common definition of chemical accident and collecting and analysing accident information to understanding where and why chemical accidents are occurring in the country.
- **The institutional framework for monitoring and enforcing chemical risk management.** Establishing/ reinforcing enabling legislation and associated regulatory requirements. The influences of interfacing legislation, such as chemical identification and labelling requirements, may also need to be addressed.
- **Risk assessment of hazardous chemical sites.** Recognizing which sites are hazardous, identifying the factors contributing to higher or lower risk, and estimating the level of risk (severity/frequency). The ability to identify chemical hazards and assess risks is essential for enforcing and implementing almost every element of a CAPP programme.
- **Technical and practical training for implementing key programme components.** An urgent need in many countries is often to establish sustainable training programmes for industry safety managers and government inspectors on safety management systems for chemical hazard sites and how to recognize and implement appropriate prevention and mitigation measures.

Over the last few decades, the international community has obtained considerable experience in capacity building in a variety of fields, in particular the fields of environmental protection and disaster risk reduction that are closely related to chemical accident prevention. Taking on board this collection of ideas and key principles, it is proposed that the implementation of this project incorporate the following main elements:

- A **systematic structured conceptual approach** (the Seveso Directive) to chemical accident prevention and preparedness as a model and basic training support materials.
- A **mechanism, or mechanisms, 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.

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.** This thematic unit usually consists of identifying the country's key concerns, strengths and potential vulnerabilities to chemical accident risks; presenting the Seveso model; identifying where the country's has coverage or gaps in terms of knowledge, authority and systems for its implementation.
2. **Analysing Potential Hazard Sources and Establishing Programme Scope.** The activity may include mapping of hazard source or establishing a register, or a system for collecting more information on hazard sources to be able to identify scope.

3. **Risk Analysis.** This unit consists of training on all aspects of the risk analysis process, from hazard identification, consequence, to risk evaluation, acceptance, and decision making.
4. **Natech Risk Analysis.** 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.
5. **Hazardous Facility Inspections or Audits.** This thematic unit necessitates training on hazard identification and risk analysis, and 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.
6. **Industry Outreach and Capacity Building.** 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.

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 Chapter 1. A number of excellent reference materials already exist for delivering these thematic units, many of them produced by the JRC-MAHB, but also by UNEP, UNECE and other international organisations.

OUTCOMES FROM THE EXPERT WORKSHOP

In March 2015 a workshop was organised by MAHB and DG ECHO to bring together a number of experts with experience in capacity building activities related with chemical accident prevention and to capture their knowledge and field experiences through a one-day brainstorming event. It was expected that the expert feedback and lessons learned would confirm, enhance and elaborate on the initiative's strategy and implementation methodology.

The goal of the workshop was to obtain feedback from the experts to improve the strategy and methodology for capacity building in EU Neighbourhood Countries that will be implemented in the project. The workshop sought in particular to promote an exchange of views among experts to capture experiences and knowledge from a variety of experiences associated with capacity building to improve chemical accident prevention and preparedness in low and middle income countries.

Several recommendations emerged from the analysis of the collective feedback of the experts' workshop for individual country projects and for ensuring the overall initiative achieves appreciable results. These recommendations are presented below as "options to consider" since it cannot be foreseen beforehand which recommendations are workable in different countries, needs and requirements are different in each country. Each "project" is a partnership between the European Commission and the country involved. The project partners decide together how to move forward. Feasibility of various recommendations depends on the country's political commitment and resources and ownership and commitment on both sides to project goals and objective.

1. Establishing a collaboration starting point, project leaders and stakeholders

Establish an informed starting point

At the very first stage, the project should first seek to establish a good understanding of the country's policy framework, what it covers, and where and how much resources are focused towards driving policy goals. This understanding helps establish a basis for dialogue to explore a starting point for collaboration.

Involvement of key leadership

At an early stage, the project should identify those people in the country who are empowered to drive policy implementation and to bring the different elements forward necessary for establishing a CAPP capacity.

2. Tailoring project focus to meet country needs and competences

Focusing on country needs

The project should also seek to tailor some activities to address priority or strategic needs specific to the country.

Tailoring the project to internal competences

The project should assess and designate the core capabilities and expertise required in the field of CAPP by the country and identify the country's available or needed competent (technical) people to deal with the relevant scientific, technical and legislative issues.

Anticipating specific needs in regard to infrastructure and tools

Each project should assist the country in identifying and setting aside the necessary resources for investing both in new research and new technology, tools, templates and standards. Each project should facilitate technology transfer towards the country to help in developing databases, setting up enforcement infrastructures, e.g., an efficient inspection system, and sharing of information among ministries and for industry and the public.

3. Leveraging existing resources and infrastructures

Leverage existing internal resources and infrastructures

Capacity building has the greatest chance of success when it builds on existing efforts and resources. Competences available within inspectorates, universities, and specific companies, for example, should be identified and enlisted to assist in project developments.

Leverage existing external resources

Each project should take into account potential contributions of national and international partners that may enhance project outcomes. Collaboration between relevant external players may bring different perspectives, knowledge and experience along with their contact networks to project implementation.

4. Sustainability

Components of a strategy to achieve sustainable improvement

Each project should seek to design specific activities in a country with the view to the sustainability of the project results and outputs. Sustainability requires a national vision for reducing risk, including a common view of what is and is not acceptable risk.

Process safety and safety culture

The project should assist the country in establishing a national vision about culture of risk, in particular process safety and safety culture, and developing a strategy for raising awareness among the authorities, industry and communities including informing and educating the public.

Competence

Each project should assess and designate core capabilities and expertise required in the CAPP field by the country and identify the country's available or needed competent (technical) people to deal with the relevant scientific, technical and legislative issues. The project could assist the country in making available (or set aside) the necessary resources to maintain and develop such competence and expertise.

5. The role of the public

The workshop participants also mentioned the public as an important stakeholder, but there were few concrete suggestions about how the initiative could promote public involvement.

6. Practical considerations

As the capacity building project will interact with different cultural, economic and legislative contexts, its success can depend on practical details and facts characteristic of the country.

A CAPACITY BUILDING MODEL

Implementing a national capacity building program is a complex process involving several professional and technical disciplines as well as a large numbers of interested parties with differing aims. Furthermore, the existing political, legislative and socio-economic environment within the country can represent challenging constraints in implementing the capacity building program as this constrains EU accepted/acquired policies, concepts and methods which may differ from the country ones. Moreover, in order to run such a program successfully the country should have an approach that can manage all of the different elements and activities under one framework.

In this regard, a hierarchical process model can work as a communication tool that increases commitment and collaboration of the participating stakeholders and shareholders as well as enhancing clarity of the capacity building vision. A hierarchical process model is made of a hierarchically structured set of processes distributed at different levels of definition and where each level describes its corresponding part of the system. All processes can be classified on a continuum scale in-between "hard" (i.e. processes dealing with more physical, technical and engineering issues) to "soft" (i.e. processes which are driven by a strong human component).

The JRC proposes to apply such a model as a basis for establishing a baseline for the country at the start of the project in the context of a capacity building index. Responses to the survey on chemical accident prevention and preparedness in Neighbourhood countries responses will in the first instance serve as surrogate indicators of the robustness of the different processes identified within the capacity building hierarchical process. In initial dialogues the country situation in comparison to the model may be modified as survey responses are clarified and gaps in knowledge, due to limitations of the survey approach are addressed.

The hierarchical process methodology proposed within the context of modelling a capacity building system is based upon the "BCIOD+R" framework developed at Bristol University (UK). In this framework top process of the capacity building process model is broken down into six necessary and sufficient subsidiary processes, which addresses the areas of Business (B), Customer (C), Integration (I), Operation

(O), Delivery (D) and Regulation (R) [19]. Under the top process the BCIOD+R processes are assigned the following names which are meaningful and formative to both the experts and non-experts.

(B) Having the necessary resources

Any activity requires adequate human and economic resources. For building CAPP capacity, it is advantageous if the country has in place

- Qualified and competent people within academia or the research community and within institutions and authorities as well as access to international experts,
- Adequate financial resources budgeted from national or available international sources, and/or
- Access to additional funding mechanisms either internally or from the international community.

(C) Maintaining a relationship with stakeholders and shareholders

Effectiveness of policy implementation interacts and affects several stakeholders in the country. If relations with stakeholders are not properly managed many problems can accumulate through misunderstanding. Positive indicators for CAPP capacity building include:

- Maintaining connections with appropriate national, regional and, international institutions and organisations, with industries and multinationals, and with professional institutions, industry associations and global companies
- Having appropriate means of working together with other institutes and organisations, such as intergovernmental and interagency arrangements for co-operation and rules and protocols for dispute resolution
- Having an inclusive approach that involves key participants in policy and communication planning and also ensure important information, results and outcomes are disseminated to stakeholders.

(I) Integrating people and processes

This is necessary for assuring team building within all of the persons involved in the capacity building activities and within all the different areas. It addresses also the means required for the proper functioning. It concerns team commitment and morale, cross discipline exchange and sharing so that the players understand their part in the whole exercise. For a CAPP capacity building programme, it is advantageous if the country:

- Emphasises team building by including key government staff in design and planning, in field implementation activities, and in communication

- Enhances a sense of ownership by maintaining stability and continuity of staff in key roles, ensuring individual roles are clarified, decision-making and responsibility are distributed across the team in accordance with these roles and by
- Involves different perspectives through liaising with networks with related responsibilities, encouraging exchange and sharing across disciplines, and identifying and linking with shared interests and common goals across sectors.

(O) Having an operational capability

Most of the issues addressed in this process are of technical nature and are linked with supporting and assisting the country in key technical areas to strengthen its capacity/systems. Operational capacity for a CAPP programme can be strengthened by:

- Maintaining technical and scientific knowledge including organisation of standardised and specific training, organisation of study visits (with other ministries, governments), organisation of workshops for exchanging good practice and experience, organisation of an e-learning system for professional development, and making available standardised and specialist education curriculums
- Having the appropriate technical means in place, such as the necessary data, tools, operational equipment, firefighting staff and equipment, civil protection measures in place for chemical emergencies, and medical emergency teams with appropriate expertise
- Having the scientific and technical infrastructure, including centres of excellence, university curriculums addressing the necessary scientific disciplines, and research centres with expertise in relevant disciplines

(D) Maintaining the assessment and delivery process

This process is necessary for maintaining that all the means are put in place to keep the capacity building activities ongoing. For CAPP capacity building, key advantages can be:

- Having means of measuring performance and gauging progress and monitoring change and the impacts of change.
- Maintaining important working relationships, including the smooth functioning of cooperative arrangements with established knowledge networks and of collaborations and coordination between all stakeholders contributing to the process.

(R) Having a legal framework in place compliant with international law

This process is necessary for addressing all of the key legal and regulatory issues, including international law, essential for justifying and supporting capacity building. Capacity for building the CAPP programme could be measured by strengthened by:

- Having adequate legislation and regulation,

- Having institutions that ensure the law is enforced,
- Having a legal system that supports enforcement of the law,
- Having political support for enforcement of the law, and
- Having tools and guidance for compliance with the law.

The model itself is expected to evolve and change with input from the workshop experts and the countries themselves and from experience accumulated in the project over time. Application of the model will undergo a first test of robustness in analysis of the survey responses for each country. Countries can comment as to whether the outcome of the survey for their country is representative or if the model could be elaborated and changed to generate a better reflection of its circumstances. A peer review of the model may also be separately conducted

At various intervals of each country project, the JRC intends to conduct one or more evaluations using a mechanism (e.g., another survey, country interviews, case studies of industry sectors, or other means) on the basis of the model. In preparation for this exercise, the model may be re-evaluated to confirm that it remains reflective of the general experience of the project, including the country stakeholders as well as external experts involved.

CONCLUSIONS AND RECOMMENDATIONS

The report concludes with a number of conclusions and recommendations on different aspects of the initiative. Several main principles have been identified along with some initial recommendations on how they might be achieved. It must be emphasized that as the initiative evolves new recommendations may also evolve from experience in working with countries on an individual basis.

The principles and recommendations are briefly summarised as follows:

1. Bringing a diversity of expertise to the initiative

Participants of diverse expertise and background can bring a better understanding of how the process works to contribute to the initiative's overall success. Recommendations include establishing ***an advisory group of experts for the Seveso ENPI initiative*** to assist the JRC in developing and maintaining a successful CAPP strategy in project countries and ***establishing a country coordinating committee for each project*** consisting of internal leaders in government and industry to guide the project's strategy and implementation.

2. Establishing a baseline for improvement/Measuring tangible and intangible capacity/Evaluating progress

Implementing the Seveso Directive is a long process which should be monitored against a set of goals on a regular basis and eventually act upon the findings. Recommendations include ***developing an index to measure the capacity building progress over time*** using the Capacity Building Hierarchical Process Model in Chapter 3 as the reference model and ***applying the index to each country's survey responses to establish an initial reference point.***

3. Verifying the level of political commitment, national vision and cooperation between ministries

Political commitment is needed to establish a national vision and high level cooperation in government is necessary to implement the vision. Recommendations include ***following up on the survey to build a picture of the country's current perception and risk tolerance, its political commitment and policy vision*** for controlling chemical accident risks and ***establishing initial project expectations based on these inputs.***

4. Identifying and building motivation/ Promoting national leadership

The involvement of all parties (business, public and regulators) working together will motivate a reasonable and practicable CAPP system. Recommendations ***include identifying and involving parties that have a leadership role in the country early in the project*** and ***initiating pilot projects with a few countries with strong political commitment that can serve as potential models*** for future projects of bilateral collaboration for additional projects.

5. Involving the right people / Multi-sector engagement/ Ensuring sustainability through giving ownership

It is paramount that people who will implement and represent end-users of the project results are involved from the beginning. Recommendations include ***encouraging the country to establish a central coordinating body*** to improve the openness of communications and exchange information and experience and ***involving qualified and experienced government and industry experts in the discussions*** about the ways tools, procedures and regulations can be adapted to address deficiencies and gaps in the country's approach and infrastructure for chemical accident prevention.

6. Ensuring industry involvement

Each project needs to involve representatives of leading industries, promoting active input and exchange of views. ***Recommendations include inviting industry representatives to participate in meetings of the coordinating group*** and ***engaging industry in specific technical approaches aimed at boosting industry capacity***, for example, establishing training and guidance for hazard identification, or developing a checklist for storage sites.

7. Involvement of the public

Fostering engagement of the general public as well as special interests is an additional investment in the sustainability of the CAPP programme. Recommendations include **inviting the country to consider involving the media to build an understanding of chemical accident risks** and relevant terminology and **facilitating inclusion of representatives of local government, local fire protection services and plant communities** in the coordinating committee or in specific events. The project could also **bring awareness of available resources and tools for promoting local community involvement** such as the UNEP APELL programme.

8. Promoting sustainability by promoting sustainable training options

The results and outputs of a project are sustainable when these (1) are effectively maintained or can be further developed within the country after the end of the project and (2) create opportunities for developing new relationships as well as enlarging the cooperation in CAPP. Recommendations include **offering adequate training materials and programmes** that the country can use for its future internal training and **establishing a stable core group of qualified national experts and skilled trainers** who can disseminate knowledge and expertise in trainings and workshops continuously over the long term. It could also be useful to **develop a suite of toolkits and standards** for sharing and disseminating materials.

9. Extending EU networks and tools in support of Neighbourhood countries

Expert knowledge and expert systems held by JRC-MAHB itself, as well as that offered by EU Member States, are a credible and valuable point of reference and information for third countries. Recommendations include **making available JRC tools and products** and adapt as appropriate and necessary for project countries and **enhancing the JRC's Minerva website to maximize access** to knowledge, tools, advice and experience in the expert community and foster collaboration. The JRC should also **actively recruit qualified EU experts to train trainers in project countries** and maintain a level of ongoing support to bolster the retention of trained trainers. It would also be very important **to bring and retain the country in the international community's network** of experts as a source of ongoing support.

10. Building on relevant experiences and tools from international projects

The EU and international organisations have engaged for many years in capacity building in chemical accident prevention and preparedness as well as in related emergency response activities. Recommendations include **building on the resources and activities of international organisations** in the country to give project momentum and leverage experience and successes and **taking advantage of specialised tools and products** for CAPP capacity building in leading international organisations, particularly UNEP, UNEP-OCHA and UNECE.

11. Adapting to country realities/Defining context-specific expectations and objectives, i.e., to match resource, competence, culture and logistical practicalities

Capacity building has the greatest chance of success when it builds on existing efforts and resources. Recommendations include **identifying needs and opportunities and feasible options for implementation from a top-down perspective** and **soliciting bottom-up inputs with relevant stakeholders, such as operational staff, industry representatives** both formally and informally. A good strategy may also be to **identify small improvements that can be implemented in a short time frame**, providing motivation for working on greater challenges over the long term.

12. Learning from experience/ Benchmarking existing practice

Benchmarking against established systems in other countries can help identify areas where maximum gain can be achieved for an achievable investment. Recommendations include **initiating the development of relations with national and international actors in the CAPP field** and **fostering and maintaining cooperation between national and international governmental institutions** and organisations in other domains or new activities. **Synergies with activities of international organisations should also be exploited** to establish new relationships and opportunities for benchmarking and stimulating ongoing improvement. The project participants could also learn from the **sharing of experiences from other similar CAPP projects**, e.g., the UNEP Flexible Framework Case Studies [10] and the JRC Enlargement Project from 2001-2003 on Seveso Implementation in pre-Accession countries [see <https://minerva.jrc.ec.europa.eu> under "Publications"].

13. Periodic review and adjustment of strategy and implementation approaches

The capacity building process itself needs periodic evaluation to ensure that the approach is having an impact in the right direction. Recommendations include **engaging the Seveso ENPI advisory team in defining an interim process for measuring progress** for the initiative and **engaging the country project coordinating committee to provide the necessary information to measure progress** at an interim stage

1 INTRODUCTION AND REPORT PURPOSE

The European Union established the European Neighbourhood Policy (ENP) in 2004 to promote an area of peace, stability and prosperity in its immediate neighbourhood with the Countries to the East (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine) and to the South (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria, and Tunisia) and shown in Figure 1.1. It aims at developing tighter and more beneficial relations between the EU and her neighbours in political, economic and cultural domains, and in particular on security matters, as well as extending and enhancing current existing cooperation frameworks in order to reduce the likelihood of any new divide appearing. The strengthening of the safety and security with the EU Neighbourhood Countries, also from an economical and resource-sharing angle, is identified as a great strategic priority by the European Commission and the EU and is an issue that has acquired a more relevant importance following the latest developments in some of these Countries.



Figure 1.1 The sixteen Partner Countries in East Europe and the southern Mediterranean (highlighted in dark green) falling under the European Neighbourhood Policy

The EU supports those countries in these fields in different ways and through different mechanisms and tools which allow them, for instance, to participate in European programmes that can assist in their political and economic reform efforts or have a direct interest in the internal market. In 2013, the European Commission established the initiative “Seveso Capacity Building in EU Neighbourhood Countries” funded by the Civil Protection Mechanism 2014-2020 (Decision No. 1313/2013 of the European Parliament) in accordance with the EU civil protection assistance policy, under the direction of the European Commission’s Directorate for Humanitarian Aid and Civil Protection (DG-ECHO). The Joint

Research Centre's Major Accident Hazard Bureau is leading the implementation of this initiative on behalf of DG-ECHO.

The first year of the initiative (2014-2015) aimed to define a comprehensive approach to its implementation on the basis of past JRC experience and experience in the international community with capacity building both generally and specifically in the area of disaster risk reduction in emerging/developing countries. In addition, the first year focused on obtaining knowledge on the individual Neighbourhood Countries to help future planning and establish potential priorities in terms of content.

This strategy report describes the results from these strategy-building activities of 2014-2015. It proposes a methodology for the initiative, identifying programme scope, core elements, expert and policy resource needs, and operating mechanisms. The information in the report is based on a combination of JRC experience, research, and expert input (primarily from the expert workshop described in Chapter 2). It consists of four chapters and three annexes as follows:

- The JRC proposed the initial project methodology in late 2014, published in the document entitled, "Strengthening Chemical Accident Prevention and Preparedness Programmes in European Neighbourhood Countries"¹ The methodology is elaborated in this report in Chapter 1.
- The JRC then convened a workshop of experts from international organisations, Member State competent authorities, and industry to review and comment on the strategy and methodology, and to provide advice on tools, resources and approaches that could contribute to effective implementation. The workshop is summarised in Chapter 2, highlighting the detailed advice and specific recommendations from the expert participants.
- In order to run a capacity building programme successfully a country must have an approach that can manage all of the different elements and activities under one framework. It can be helpful, therefore, to clarify first the concept and scope in a systems thinking framework and in a second step use hierarchical process modelling to model the capacity building system for a CAPP programme. Such a model is proposed in Chapter 3.
- Chapter 4 outlines the conclusions and recommendations from this collective input, establishing key principles for defining project actions and sequence of events. It is expected that the work programme of the initiative as well as individual country projects will be built on these principles. They may also provide lessons that require the principles and recommendations themselves to be adapted.

¹ Wood, M., L. Fabbri, A. L. Vetere Arellano, E. Krausmann, and Z. Gyenes. 2014. Strengthening Chemical Accident Prevention and Preparedness Programmes in European Neighbour Countries. Publications Office of the European Union: Luxembourg. EUR 27169.

- Annex A provides an overview of some of the EU Neighbourhood Countries profile.
- Annex B outlines briefly the current and previous capacity building activities organised within the EU Neighbourhood Countries.
- Annex C list the resources used and consulted for this report.

The first year activities provided an important baseline for shaping the future initiative work plan. It is expected that the conclusions and recommendations from each input to the initiative will be re-evaluated over time with experience. It will be of great interest to observe how plans evolve and what expectations are confirmed and which ones are replaced with new concepts. It is possible that the initiative may not make an impact in every country. However, it is hoped that there can be lessons learned from the experiences of some countries that can eventually help all neighbouring countries, and indeed, all countries working towards achieving reduction of chemical accident risks.

1.1 BACKGROUND, PURPOSE AND STRATEGY OF THE INITIATIVE

Single catastrophic events involving dangerous substances continue to occur with alarming frequency throughout the world. Technological advances and economic growth patterns in the 21st century create a dynamic and complex dimension to the management of chemical accident risks. In both industrialised and emerging economies, the pace of change in this era creates significant challenges in both industrial and industrialized countries associated with chemical accident prevention and preparedness governance. More than ever in this era, developing countries are experiencing rapid economic development in certain chemical dependent sectors, including oil and gas, mining, fertilizer, pesticide production and numerous support industries to growing economies that also handle large quantities of dangerous substances such as the manufacture of various building materials. These countries are also often the same countries whose populations are growing and growth very often takes place in the vicinity of economically thriving areas. Land-use decisions often ignore not only industrial risks but the presence of natural hazards that can greatly increase industrial accident risk potential in these densely populated zones. Hence, developing countries face a particular dilemma in that the presence of hazardous substances is increasing, probably substantially, and concurrently exposing greater numbers of the population to these risks. For government administrators in developing countries, it is a constant and difficult struggle to implement effective chemical safety and regulation programmes to keep up with the fast rate at which the sources of chemical hazard are rapidly increasing. While scarce open source data exists to measure the chemical accident rate outside Europe, anecdotal evidence from newspapers and other sources raises concern about the frequency with which such accidents occur in crowded city neighbourhoods of developing countries, in particular, in oil and gas facilities, where a number of catastrophic chemical accidents have occurred over the last 3 years, for example: Ukraine (tank storage fire, 2015), the Philippines (shoe factory, 2015), Mexico (mining spill, 2014), India (refinery fire, 2013), Azerbaijan (oil tanker fire, 2013) and Egypt (refinery fire, 2012).

The Seveso Directive has existed as legislation in the European Union since 1982 and holds a long history of regulatory responses aimed at controlling sites where dangerous substances are processed and stored and where accidents may result in fatalities and serious injury to people or damage to the environment. It was the first comprehensive legislation of its kind in the world and continues to be a leading model for process safety² governance globally. It is a performance-based measure that places direct responsibility on operators for keeping their plants safe, but imposes also rigorous requirements on government authorities to track and motivate operator progress. Numerous versions of the Seveso Directive are being implemented outside Europe in a growing number of both developed and developing countries.

As such, there is considerable logic in accelerating implementation of a Seveso approach in Neighbourhood Countries to continue the momentum towards Seveso becoming a standard approach to chemical accident prevention and preparedness worldwide. It can also be argued that the EU has considerable strategic motives for aiding its neighbours in this regard.

The EU Member States live next door to each other, particularly on northern and Eastern borders, and all ENPI countries share responsibility for one or more important natural resources, such as the Danube River or the Mediterranean Sea. One accident can destroy the use and access of this resource for all bordering countries, often affecting livelihoods on all sides for years to come. The EU has experience with several transboundary accidents over the past few decades and most notably, the Baia River mining disaster of 1999, in which 100,000 m³ of cyanide-contaminated water was released in Romania due to excessive flooding and causing considerable eco-damage downstream to the Tisza and Danube rivers.

The European Union is Party to the Convention of the UN Economic Commission for Europe (UN ECE) on Transboundary Effects of Industrial Accidents (TEIA) in Europe, in force in the European Union and in numerous European Neighbourhood Countries to the north and east since 1999.

Globalization of the European economy brings other accidents close to home particularly when European multinationals are involved. It can be reasonably assumed that European multinationals are present in every ENPI country. While these multinationals are usually more than willing to impose European standards to chemicals management, they face stiff competition from other operators who are less committed to such standards in the face of weak (compared to the EU) national chemicals management regulation.

More broadly, European companies at home are also at a disadvantage in competing for market share in any place in the world as long as there are countries who continue to offer less regulated market

² "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.

conditions. The disadvantage becomes elevated when these countries also benefit from special trading relationships with the European common market.

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 EU countries (notably 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.³

1.1 GOALS, OBJECTIVES AND STRATEGY

The initiative aims at building sustainable CAPP programmes in ENPI countries through a consistent support and guidance on a bilateral, multilateral or regional basis to countries participating in the programme. The strategy for achieving this goal is intended to optimize access to existing knowledge and tools developed in the EU and elsewhere to facilitate effective government and industry execution of their responsibilities in preventing chemical accidents that can harm individuals, communities and the environment. For this purpose, the strategy is around the achievement of these key objectives:

- To establish active partnerships with Neighbourhood Countries and identify critical priorities for improving the effectiveness of programme implementation and specific gaps in technical knowledge and tools necessary for additional progress.
- To give access to information, tools and knowledge produced by the JRC and the vast network of EU government, industry and international stakeholders in long collaboration with the European Commission on this important topic.
- To offer training workshops and individualised advice and support for improving capacity over time, as feasible and based on objectives agreed with participating countries.

³ 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.

Developing a country strategy is a bottom-up exercise. In the initiative's first phase, EU expert interventions will target building national capacity in government and industry based on a country's priority needs and internal advantages (e.g., experts in industry and academia, and regulatory and legislative strengths), supplemented by multilateral expert workshops for all Neighbourhood Countries or a specific region. 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.

Maintaining motivation is a key to making and sustaining progress. Very early in each country 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.

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. To address this need, the first year of the initiative includes conducting a survey to establish each country's profiles in regard to existing (known) hazards, the frameworks in place to address them and their effectiveness. In a subsequent phase, as countries engage and make progress, a regional approach may become possible in which certain countries and industry sectors become drivers for establishing regional networks of exchange and capacity support with the view to making the region self-sufficient and self-motivated towards further progress over the long-term. It should be recognized that reaching the goal of an effective and comprehensive CAPP programme, if starting from top to bottom, takes years to achieve. Some countries may be already well-advanced on this road, but seeking targeted technical support in certain areas, or simply looking to exchange experience and collaborate with other countries as a way to stimulate innovation in their programmes and implement important lessons learned from accidents elsewhere.

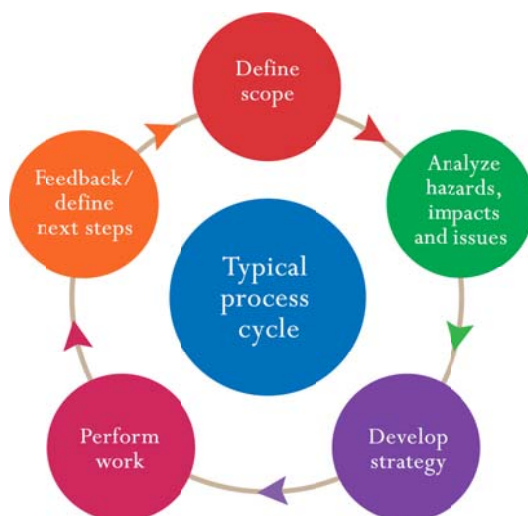


Figure 1.2 A standard process cycle

As shown in Figure 1.2 a typical country project might start with an introduction to the programme to stakeholders establishing a set of agreed objectives, including analysis of potential chemical hazards, and associated barriers to and opportunities for addressing them. The stakeholders at this stage tend to be relevant government ministries with representatives of those industries who have already significant awareness and interest in working on chemical hazard issues (since part of the process of programme building and improvement includes bringing awareness to the wider community of interests, there may be less representation outside government in the first stage - an objective of the project could be targeted to build awareness). The results will be used to define a strategy and priority actions that the parties could already initiate in the project. Training workshops would accompany the project to provide awareness and knowledge to support decision-making.

1.1.1 ACCESS TO INFORMATION, TOOLS AND KNOWLEDGE

The JRC has worked together with DG-ENV, Member State competent authorities and industry for over 30 years to disseminate good practice for chemical accident prevention and to build an extensive European knowledgebase on industrial risk assessment and lessons learned from accidents. Since early 2000 both JRC and a number of Member States have played complimentary roles in assisting Candidate and Pre-Accession Countries in building capacity to implement Seveso effectively. Moreover, the emergence of closer co-operation among international organisations with mandates associated with chemical accident prevention and preparedness under the umbrella of the Inter-Agency Coordination Group for Chemical

and Industrial Accidents⁴, provides additional tools, materials and opportunities for collaboration to support the Commission's initiative to promote improvement in chemical accident prevention in the EU's neighbourhood countries.

This experience suggests a team approach to the project that allows a varied combination of competence and experience to influence strategy and training.

- The Commission brings a broad perspective on different implementation approaches, access to a wide range of information and specific core competences for chemical risk management with experience in applying this knowledge to a variety of national and local settings.
- Member States and industry experts bring some similar and some different competences, as well as a wealth of practical experience in applying the science of prevention on a multitude of highly diverse chemical hazard sites.
- International organisations have dedicated programmes and tools to support important aspects of chemical accident prevention and preparedness as well as substantial experience and credibility in developing countries in targeting their services to achieve long term sustainable progress in environmental management and disaster risk reduction.

The initiative would also rely on knowledge and networks of other policy DGs providing various types of related support to the ENPI countries. In particular, advice and practical support from DG-ENV, DG-ENLARG and DG-DEVCO and potentially other relevant policy DGs is essential to developing links across policy programme areas that are vital to the creation and sustainability of expert resources and knowledge in the regions. Various other EU support instruments could also be employed to support elements of the programme (e.g., Twinning projects, where knowledge transfer (good practice, lessons learned, etc.) from EU Member States can be targeted to meet needs in ENPI countries).

⁴ The Group includes some of the Commission's long time international partners in this field, including the Organisation for Economic Cooperation and Development (OECD), the United Nations Environment Programme, and the United Nations Economic Commission for Europe (UNECE). The European Commission and Member States have worked together with UNECE to provide advice and technical support to countries on implementation of the Transboundary Convention on Industrial Accidents since its inception. They have also worked closely with UNEP since 2007 in building the Flexible Framework, a programme aimed at fast-growing economies and developing countries that are experiencing rapid industrialization and need support to address the increased risks of chemical accidents. The Group also offers more opportunity for European Commission collaboration with other organisations contributing substantial support to chemical accident prevention, preparedness and response, including the World Health Organisation, the Joint Environmental Unit of UNEP and the UN Office for the Coordination of Humanitarian Affairs (UNEP-OCHA JEU), and the Organisation for the Prohibition of Chemical Weapons (OPCW).

1.1.2 TRAINING WORKSHOPS AND INDIVIDUALISED SUPPORT

Capacity building 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.

Effective capacity building also is 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. Areas that often require specific attention in developing countries are:

- **Understanding the nature of a chemical accident.** Applying a common definition of chemical accident and collecting and analysing accident information to understanding where and why chemical accidents are occurring in the country.
- **The institutional framework for monitoring and enforcing chemical risk management.** Establishing/ reinforcing enabling legislation and associated regulatory requirements. The influences of interfacing legislation, such as chemical identification and labelling requirements, may also need to be addressed.
- **Risk assessment of hazardous chemical sites.** Recognizing which sites are hazardous, identifying the factors contributing to higher or lower risk, and estimating the level of risk (severity/frequency). The ability to identify chemical hazards and assess risks is essential for enforcing and implementing almost every element of a CAPP programme.
- **Technical and practical training for implementing key programme components.** An urgent need in many countries is often to establish sustainable training programmes for industry safety managers and government inspectors on safety management systems for chemical hazard sites and how to recognize and implement appropriate prevention and mitigation measures. Such programmes may begin with training to address basic safety management deficiencies on sites, with a view to eventually moving towards an approach that looks both at technical measures and safety management systems.

1.2 OVERVIEW OF THE IMPLEMENTATION METHODOLOGY

Over the last few decades, the international community has obtained considerable experience in capacity building in a variety of fields, in particular the fields of environmental protection and disaster risk reduction that are closely related to chemical accident prevention. As noted in Box 1, Agenda 21 from the United Nations Conference on Environment and Development (UNCED) of 1992 specifically outlined the principles of capacity building that are still applied today [1]. While there can be substantial technical

differences, a number of common principles to the experience emerge. A UNEP discussion paper [2] on the topic also suggested that these principles could include:

- Identifying needs and building on existing capacities;
- Being clear about the objectives;
- Using a wide range of capacity building approaches;
- Target the right people to build a critical mass;
- Making the training-of-trainers approach work;
- Institutionalizing capacity building programmes at regional and national level.

The UN Development Programme defines the five steps of, capacity building (or “capacity development” which is the term UNDP uses) as [3]:

1. Engage stakeholders on capacity development;
2. Assess capacity assets and needs;
3. Formulate a capacity development response;
4. Implement a capacity development response;
5. Evaluate capacity development.

The UNDP process recognizes that capacity building is a long term process emphasizing national ownership, necessitating that the country’s motivation is the main driver of change. It stresses the importance of leveraging national systems and adapting to local conditions. Therefore, empowerment of those in the line of responsibility in industry and government, creation of in-country experts who can train others, networks that sustain dialogue and encourage a dynamic approach, are examples of objectives that can lead to sustainability of capacity building successes.

Most recently, the Sendai Framework for Disaster Risk Reduction 2015 -2030 [4] provides a particularly relevant direction for this initiative. It defines the priorities for disaster risk reduction of the next 15 years as follows:

- Priority 1: Understanding disaster risk
- Priority 2: Strengthening disaster risk governance to manage disaster risk
- Priority 3: Investing in disaster risk reduction for resilience
- Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

This initiative proposes to focus on Priority 1 of the Sendai Framework. The JRC is well-positioned, as a main centre of technical and scientific exchange in chemical accident prevention in the European Union, to provide assistance and leadership to support country efforts to support this priority. Indeed, from the JRC’s experience of more than a decade of capacity building in this area, it is clear that there is a strong need in developing countries for more widespread competence and access to analytical and management tools to understand, prioritise, control and communicate chemical accident risks, both within government and industry. The challenge of understanding and prioritising chemical risks represents a significant obstacle to progress in reducing these kinds of accidents and disasters in the developing world. Making

access to knowledge and tools an option for the mainstream line staff of numerous organisations with responsibilities linked to managing the country's chemical accident risk would allow the rationalisation and optimisation of resources to reduce chemical risks more efficiently and effectively. Moreover, a

Box 1 Capacity building and Agenda 21

The details of Agenda 21 were agreed at the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro (Brazil) in 1992. It remains the global blueprint for sustainable development. Chapter 37 of Agenda 21, 'National mechanisms and international cooperation for capacity building', notes that:

- "The ability of a country to follow sustainable development paths is determined to a large extent by the capacity of its people and its institutions as well as by its ecological and geographical conditions."
- "Specifically, capacity building encompasses the country's human, scientific, technological, organisational, institutional and resource capabilities."
- "A fundamental goal of capacity building is to enhance the ability to evaluate and address the crucial questions related to policy choices and modes of implementation among development options, based on an understanding of environmental potentials and limits and of needs as perceived by the people of the country concerned. As a result, the need to strengthen national capacities is shared by all countries."
- "The overall objectives of endogenous capacity building in this programme area are to develop and improve national and related sub-regional and regional capacities and capabilities for sustainable development ..."

broad-based competence in chemical accident risks in government and industry is conducive to transparency and public dialogue on the topic.

In focusing on technical progress in terms of growing competence and establishing a technical infrastructure for understanding risks, the approach has some limitations. A number of papers produced by the academic and international communities also suggest that progress in capacity building is influenced also by power relations within the country, and that there are often institutional barriers of a generic nature (e.g., resources, wages and civil service laws) that bring challenges and slow the rate of progress if they are not addressed. This initiative recognises these limiting factors but in large part cannot address them directly. For this initiative, this reality suggests that capacity building efforts should focus on finding simple means to achieve some meaningful successes in the short term that may encourage liberalization of norms that create obstacles to broader achievement. Indeed, in some countries long term success may depend on the evolution of political, social and cultural attitudes and structures. Capacity building efforts need to identify practical opportunities, while at the same time establish a vision that can motivate a broader change in the longer term. DG-ECHO similarly has experience in supporting political change to improve the effectiveness of disaster risk reduction for all hazards, including man-made hazards.

There are a number of other ideas for approaching capacity building in recent literature. For example, Al-Namari et al. [5] recommend that legal responsibilities need to be updated and aligned with the principles of comprehensive disaster management (and not just emergency management) for all three levels of governance (i.e., municipal, governorate, and national). They also encourage decentralization of disaster risk reduction responsibilities and promoting disaster management authorities as professional services as ways of increasing competence and accountability. Hagelsteen et al. [6] surveyed several capacity building providers, and identified a number of valuable insights in terms of both perceived strengths and gaps of capacity building efforts. They emphasize understanding local context as one of the most important variables for the initiative's success which imposes a particular burden of preparing thoroughly for capacity building interventions. This perception also gives particular importance to pre-project capacity assessment, monitoring and evaluation during the project and analysing lessons learned from the experience. They note that terms such as "local context" and "ownership" and the role of the project need to be clarified concretely. They also warn against relying too heavily on training of individuals, recommending a more holistic approach and a mix of activities that can potentially address both short and long term needs.

Taking on board this collection of ideas and key principles, it is proposed that the implementation of this initiative incorporate the following main elements:

- A **systematic structured conceptual approach** (the Seveso Directive) to chemical accident prevention and preparedness as a model and basic training support materials.
- A **mechanism, or mechanisms, 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.

1.2.1 A SYSTEMATIC STRUCTURED CONCEPTUAL APPROACH

The conceptual model for capacity building on chemical accident prevention and preparedness in EU Neighbourhood Countries is the Seveso Directive and basic training materials have already been developed, including training materials for use in third countries. Documents that may be useful for this purpose include The OECD Guiding Principles for Chemical Accident Prevention [7] and The UNEP Flexible Framework for Addressing Chemical Accident Prevention and Preparedness and the associated Implementation Support Package [8]. The JRC will review options with DG-ECHO and the associated international organizations as necessary for incorporating and adapting this and other material as a reference for EU Neighbourhood Countries.

1.2.2 ESTABLISHING A REALISTIC AND COMPREHENSIVE COUNTRY PROFILE

Much of the groundwork for the country profile will be established in Year 1 of the initiative, particularly through implementation of a survey of each Neighbourhood country on chemical accident risks, policies addressing chemical accident risks and resources available for their implementation. 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. 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.

1.2.3 A BASIC SET OF THEMATIC UNITS FOR CAPACITY BUILDING 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. A thematic unit is a flexible tool based on a structured set of common principles as shown Figure 1.3. 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.

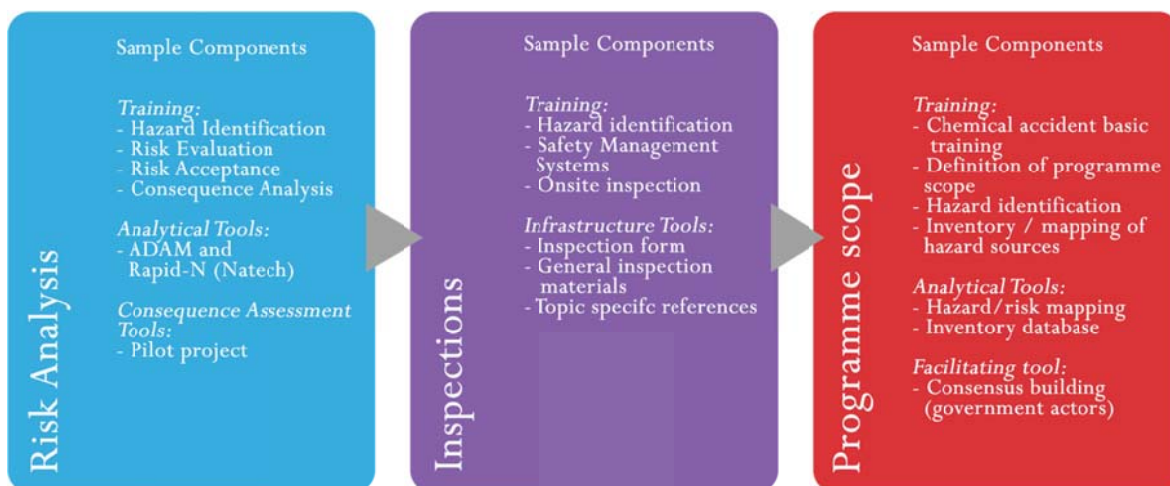


Figure 1.3 Sample components for selected thematic units

Capacity building is a dynamic process in which the focus (the element or elements of the Seveso Directive) and support tools (training, analytical tools, etc.) 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.

The components of a base set of thematic units 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. In any case, the capacity building process is at heart a dynamic process. Content and approaches continually evolve over time due to the constant innovation required to adapt to individual country needs, and also as an outcome of trainer preferences and the emergence of new materials and tools.

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 programme. 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 not have neither a targeted or 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; identifying where the country's has coverage or 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 prioritize 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 source 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 course 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, 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. activity 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, 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.⁵ This thematic unit necessitates training on hazard identification and risk analysis, and 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 training-the-trainer programme. Most components of the Inspections Thematic Unit are also basic

⁵ 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."

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 programmes. Training materials largely exist and can be adapted for new capacity building programmes, but there are still significant gaps in tools needed for sustainability. For example, in Year 1 this initiative 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 programme will naturally generate new ideas for delivering thematic units in any case.

Countries will vary in terms of which thematic unit they prioritize 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 who 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 1.4 and Figure 1.5 show the choices made for two actual country capacity building projects (country 1 and country 2), adapted somewhat for purposes of comparing the choices. Country 3 shown in Figure 1.6 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. 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.



Figure 1.4 Example (Country 1): Limited competency and experience with chemical accident prevention



Figure 1.5 Example (Country 2): Moderate competency but limited experience with chemical accident prevention

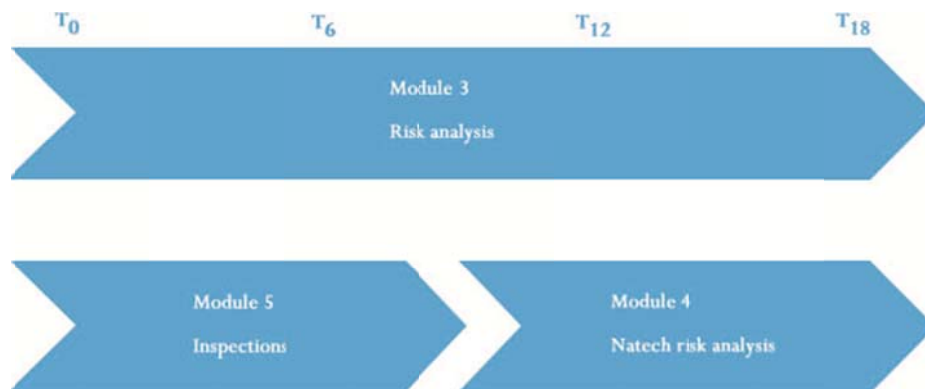


Figure 1.6 Example (Country 3): Moderate competency and experience with chemical accident prevention. Country 3 is more typical of a country whose programme is not yet mature but is beyond the initial phase of programme development.

1.2.4 TRAINING MODULES FOR CAPACITY BUILDING

A comprehensive list of typical training modules that form the basis of capacity building thematic units in chemical accident prevention and preparedness is shown in Box 2. 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 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 this work and there may also be resources within the EU Neighbourhood Countries that could be relevant and useful.

- 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 Flash 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.

Box 2 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 programmes

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

1.2.5 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:

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

A more detailed description of each tool is provided in Box 3. 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 initiative specifically targets development of online web services for risk analysis, accident data collection and analysis, and access to knowledge sources. In Box and Box are shown a number of current JRC-MAHB established tools and tools in development, hosted by MAHB's new MINERVA platform for technical exchange on chemical accident prevention (accessible at <https://minerva.jrc.ec.europa.eu>). 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.

Box 3 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.

Box 3 (cont'd) 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.

Box 4 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:

- identifying priority interventions to mitigate the risks/consequences of potential accidents;
- improving the transport infrastructures to reduce risk;
- planning urban development by taking into account major accident hazards;
- 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: Beta test 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

Box 4 (cont'd) 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, modelled 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:

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

2 OUTCOMES FROM THE EXPERT WORKSHOP

In March 2015 a workshop was organised by MAHB and DG ECHO to bring together a number of experts with experience in capacity building activities related with chemical accident prevention and to capture their knowledge and field experiences through a one-day brainstorming event. It was expected that the expert feedback and lessons learned would confirm, enhance and elaborate on the initial strategy and implementation methodology described in Chapter 1.

2.1 DESCRIPTION OF THE WORKSHOP

The goal of the workshop was to obtain feedback from the experts to improve the strategy and methodology for capacity building in EU Neighbourhood Countries that will be implemented in the initiative. The workshop sought in particular to promote an exchange of views among experts to capture experiences and knowledge from a variety of experiences associated with capacity building to improve chemical accident prevention and preparedness in low and middle income countries.

As indicated in Table 2.1, the workshop was divided into four parts. The first part provided the background on the initiative and presented its strategy and implementation methodology. The second and third sessions formed the heart of the workshop, consisting of presentations intended to promote participant discussions on the session topics. The second session was designed to obtain feedback on specific experiences with capacity building in neighbourhood countries. The third session was divided into a further two parts and was intended to obtain general feedback in regard to needs and priorities of low and middle income countries from experience across various capacity building projects in developing countries. The first part of Session 3 was aimed to solicit feedback from the perspectives of experts working with different country stakeholders, notably government and industry. The second part of Session 3 sought to identify commonalities and differences in terms of the types of assistance provided, in particular, tools, knowledge and practical considerations. The last session was a closing session for summarising the feedback from the previous sessions.

In order to direct the exchange to these outcomes, in the background materials provided prior to the workshop, the JRC identified a number of sub-objectives for reflection and feedback at the workshop. Specifically, participants were asked to:

- Confirm and refine MAHB's methodology for helping emerging economies build capacity for reducing chemical accident risk;
- Highlight most common failure and success factors for capacity building on chemical accident prevention. What are often the biggest challenges? Is there any commonality in terms of opportunity, points of departure that have more chance of success?

- Examine capacity building challenges and opportunities from a vertical perspective;
- Where possible, obtain insight on strengths and weakness of chemical accident prevention in the different Neighbourhood Countries from both a Government and industry perspective;
- Where possible, outline expectations as to priorities and possible points of departure for capacity building in the different Neighbourhood Countries;
- Identify potential opportunities for regional or multi-country approaches to address common needs, e.g., technical training, special projects, harmonising approaches, etc.;
- Examine capacity building challenges and opportunities from a horizontal perspective;
- Identify typical commonalities in terms of support needs;
- Identify priorities for development of analytical and infrastructure tools (e.g. for risk analysis, for accident reporting, establishment mapping, etc.);
- Identify practical issues that may have to be addressed or if addressed, could greatly increase chances of success (i.e., translation of documents) ;
- Identify synergies with other tools and projects (offered or managed by other organisations) that may enhance specific capacity building objectives;
- Anticipating common needs and priorities for development of analytical and infrastructure tools.

Presentations from the workshop can be found at this website address:
https://minerva.jrc.ec.europa.eu/EN/content/27f24945-22d5-497d-9633-585cfefb96f7/seveso_enpi_2015_expert_brainstorming_workshop

Table 2.1 Outline of the workshop agenda

European Commission DG-ECHO and the Joint Research Centre Brainstorming Workshop on a Capacity Building Strategy for Seveso Programme Implementation in EU Neighbourhood Countries 26-27 March 2015, Ispra (Italy)		
Afternoon day 1		
Start of meeting		
Moderator: Maureen Wood (JRC)		
14:00	Welcome and Introduction of Participants	Georg Peter (JRC)
Session 1: project overview		
14:20	Agenda and Meeting Objectives	Maureen Wood (JRC)
14:30	Presentation of the DG-ECHO ENPI project	Roberto Schiliro (DG ECHO)
14:45	EU Environment Policy Linkages	Alexandros Kiriazis (DG ENV)
14:50	Summary of the project Methodology	Maureen Wood (JRC)
15:10	The UNEP Flexible Framework and Summary of Experience	Kaj Madsen (UNEP)
15:30	Discussion	
16:00	Coffee Break	
Session 2: anticipating individual country needs		
16:15	Introduction to the Session	JRC
16:20	Capacity Building from the Perspective of the UNECE Industrial Accidents Convention	Virginia Fuse (UN ECE)

European Commission DG-ECHO and the Joint Research Centre Brainstorming Workshop on a Capacity Building Strategy for Seveso Programme Implementation in EU Neighbourhood Countries 26-27 March 2015, Ispra (Italy)		
16:35	Experience in Capacity Building in East Neighbourhood Countries	Magda Duta (Consultant)
16:50	Seveso Capacity Building from a Trainer Perspective	Mark Hailwood (Government of Baden-Wurtemberg)
17:05	Discussion – Range of expectations for chemical accident prevention capacity in ENPI countries Strengths and weakness of government -Strengths and weakness of industry -Motivations and priorities -Possible points of departure -Potential for regional/multi-country approaches	(JRC)
18:15	Adjourn	
Morning day 2		
Moderator: Maureen Wood (JRC)		
08:30	Introduction to the programme of the day and Session 3	(JRC)
Session 3: anticipating common needs across countries - part 1		
08:35	Capacity Building from a country Perspective	Natalia Ungurean, Ministry of Environment, Moldova

European Commission DG-ECHO and the Joint Research Centre Brainstorming Workshop on a Capacity Building Strategy for Seveso Programme Implementation in EU Neighbourhood Countries 26-27 March 2015, Ispra (Italy)		
08:50	Experience in Capacity Building within Francophone North Africa	Franck Prats, INERIS
09:05	Experience in Capacity Building from an Industry Perspective	Graham Dalzell, Consultant Charles Cowley, Consultant
09:35	Discussion: Anticipating Common Needs Across Countries, Part 1 - Commonalities in terms of support needs (General awareness training, technical training, co-ordination and communication between stakeholders, etc.) - Practical issues (i.e., translation of documents) - Synergies with other tools and projects elsewhere available	
10:25	Coffee Break	
	Discussion: Anticipating Common Needs Across Countries, Part 2	
10:40	Overview of JRC Tools (Existing, In Development, Potential) -GIS-ARA/ADAM -Rapid-N - Establishments and Mapping -AIDA/eMARS Light MINERVA -The MINERVA Web Platform	(JRC)

<p>European Commission DG-ECHO and the Joint Research Centre</p> <p>Brainstorming Workshop on a Capacity Building Strategy for Seveso Programme Implementation in EU Neighbourhood Countries</p> <p>26-27 March 2015, Ispra (Italy)</p>		
	-Analyses and Technical References	
11:25	<p>Discussion: Anticipating Common Needs Across Countries, Part 2</p> <p>-Priorities for development of analytical and infrastructure tools</p> <p>-Useful tools available from other organisations</p>	
Session 4: closing session		
12:15	Summary of Important Findings from Discussions and Final Comments	(JRC and DG-ECHO)
12:45	Adjourn	

2.2 DESCRIPTION OF WORKSHOP PARTICIPANTS AND PARTICIPANT ORGANISATIONS

The participants in the expert workshop, and presented in Table 2.2, included representatives from government institutions, international organisations, national research centres and private companies. The key strengths of these experts lay in their past contributions in capacity building associated with chemical accident prevention and preparedness and/or as line staff with direct responsible in their own organisations (government or industry) for directly implementing aspects of chemical accident prevention policy and process safety management. It was considered that the insights of different experts with a diversity of related but distinctly separate experiences in supporting technical implementation of chemical accident prevention policy in their own countries could add significant value to the project strategy and its implementation.

Moreover, a number of experts at the workshop had experiences in working to improve process safety implementation in one or more of the neighbourhood countries. It was expected that their impressions of

priorities in individual countries would be particularly useful additions to the construction of individual country profiles for the project. Their perspectives on various regions and countries could potentially advance planning in terms of the possible capacity building themes that would be of most interest to a number of countries.

Table 2.2 Participants in the expert workshop

Participant	Organisation (country)	Contact details
1. Marie-Ange Baucher	OECD	Marie-Ange.Baucher@oecd.org
2. David Bosworth	Consultant	daveabosworth@gmail.com
3. Charles Cowley	Consultant	charlescowley@btinternet.com
4. Ana Maria Cruz	Kyoto University (Japan)	anamaria@drs.dpri.kyoto-u.ac.jp
5. Graham Dalzell	Consultant	gdalzell468@btinternet.com
6. Pavel Danihelka	University of Ostrava (Czech Republic)	Pavel.Danihelka@vsb.cz
7. Maria Magdalena Duta	Consultant	DutaMagda@yahoo.com
8. Ron Evans	Consultant	Ronald.Evans@semperoptimus.co.uk
9. Virginia Fuse	UNECE	Virginia.Fuse@unece.org
10. Serkan Girgin	DG JRC - CIP	Serkan.Girgin@jrc.ec.europa.eu
11. Richard Gowland	Independent Process Safety Specialist	Rtgowland@aol.com
12. Enrico Guagnini	DG JRC - MAHB	Enrico.Guagnini@jrc.ec.europa.eu
13. Zsuzsanna Gyenes	DG JRC - MAHB	Zsuzsanna.Gyenes@jrc.ec.europa.eu
14. Mark Hailwood	LUBW Government of Baden-Württemberg (Germany)	Mark.Hailwood@lubw.bwl.de
15. Alexandros Kiriazis	DG ENV	Alexandros.Kiriazis@ec.europa.eu
16. Elisabeth Krausmann	DG JRC	Elisabeth.Krausmann@jrc.ec.europa.eu

Participant	Organisation (country)	Contact details
17. Kaj Madsen	UNEP	.eu Kaj.Madsen@unep.org
18. Georg Peter	DG JRC	Georg.Peter@ec.europa.eu
19. Franck Prats	INERIS	Franck.Prats@ineris.fr
20. Roberto Schiliro	DG ECHO	Roberto.Schiliro@ec.europa.eu
21. Francisc Senzaconi	General Inspectorate for Emergency Situations	senzacof@mai.gov.ro
22. Michael Struckl	Federal Ministry for Science, Research and Economics (Austria)	Michael.Struckl@bmwfw.gv.at
23. Natalia Ungurean	Ministry of Environment (Moldova)	Natalia_Ungurean@mail.ru
24. Lorenzo van Wijk	Consultant	Lorenzo.vanWijk@risktech.eu
25. Ana Lisa Vetere Arellano	DG JRC - MAHB	Ana.Vetere@jrc.ec.europa.eu
26. Emilia Wahlstrom	UNEP/OCHA	wahlstrom@un.org
27. Maureen Wood	DG JRC - MAHB	Maureen.Wood@jrc.ec.europa.eu

Experts from EU Member State Competent Authorities

The participants included a number of current and former personnel associated with the Seveso Directive implementation in EU competent authorities. In this group, there were experts who had many years of experience in implementing inspection obligations for an EU competent authority. Participants associated with EU competent authorities also included experts providing national or regional government and industry with specialised support to technical obligations, including inspections, risk analysis, safety management systems, accident analysis, and emergency planning and response. In addition, some of the competent authority experts had responsibilities associated with managing the ongoing development and implementation of Seveso national policy. In addition to general advice, there were notable insights from the experts on the status of Seveso programme implementation in francophone North Africa and in the six Neighbourhood Countries to the East.

Experts from industry

The workshop also benefitted from the participation of a number of experts who had several decades of experience as process safety managers in industry who then became consultants to governments and industries in third countries aiming to improve their chemical accident risk management programmes. All of these experts also had experience in one or more of the EU Neighbourhood Countries and provided candid reflections on their experiences with case study examples. These experts particularly highlighted the importance of supporting industry efforts to obtain more ability to address chemical accident hazards, the necessity of establishing networks for professional development, and bringing industry together with government to strengthen the capacity on both sides.

Experts from the international community

The presence of representatives from the international organisations who have dedicated missions associated with chemical accident prevention in developing countries was also essential to the success of the workshop. The international organisations have in general the longest and most consistent experience in providing targeted technical assistance to help countries improve their overall process safety risk governance. These organisations have also generated specific tools that could be readily used to support different thematic areas of the Seveso ENPI initiative, for example, the UNEP Flexible Framework, the UNEP APELL Framework, the UNECE technical guidelines for implementing aspects of the Industrial Accidents Convention, and the OECD Guiding Principles for Chemical Accident Preparedness and Response. These organisations and their resources are briefly summarised below:

- **DG ECHO PPRD East - Seveso Directives Capacity Building**

Three experts in the workshop, including a competent authority representative from Moldova, had participated in this project from 2012-2013. DG ECHO PPRD EAST aims overall to contribute to the development of the Partner Countries' civil protection mechanism for disaster prevention, preparedness and response through cooperation at local, national and regional level, improve their bilateral and regional cooperation for a coordinated, effective and efficient disaster response, and build awareness among the population regarding risk exposure, prevention, preparedness and response capacities in the region. The Seveso Directives Capacity Building programme aims to familiarise disaster risk management professionals with the Control of the Major Accident Hazards Regulations (COMAH) under the scope of Seveso Directives, to illustrate the administrative and operational requirements of the Directive as well as to point out the challenges for a possible legislative approximation. It also organises field visits and hands-on exercise for the experts with the assistance of the PPRD East Exchange of Experts programme. In particular, it was clear from the interventions of the workshop experts that the Seveso ENPI project can to some extent design its interventions as a specific follow-up to the past activities conducted within this programme.

- **UNECE Industrial Accident Conventions programme [9]**

The Convention on the Transboundary Effects of Industrial Accidents (TEIA) aims at protecting human beings and the environment against industrial accidents with transboundary effects by preventing such accidents as far as possible and mitigating their effects. Under the guidance of the United Nations Economic Commission for Europe (UNECE), the Convention on the Transboundary Effects of Industrial Accidents was adopted on 17 March 1992 and was signed by 26 UNECE Member Countries and the European Union and entered into force on 19 April 2000. Notably, the Member Countries of UNECE include the six EU Neighbourhood Countries to the East. UNECE has been heavily engaged in supporting their efforts to improve chemical accident prevention and preparedness in the last decade in support of the Convention. More information is available at <http://www.unece.org/env/teia.html>.

To this end, the Convention has produced a number of guidelines associated with Seveso implementation with third countries as a main target audience, given that EU Member States are already implementing the Convention in large part through implementation of the Seveso Directive. These guidelines are already translated into three languages (English, French and Russian) and include:

- ∴ Guidelines to facilitate the identification of hazardous activities for the purposes of the Convention (guidelines for location criteria);
- ∴ Safety guidelines and good practices for tailing management facilities;
- ∴ Safety guidelines and good practices for pipelines;
- ∴ Guidelines and sectoral checklists for preparation and inspection of a safety report;
- ∴ Draft safety guidelines and good industry practices for oil terminals.

In addition, the UNECE has an ongoing technical assistance programme and in this context has held a number of fact-finding missions in the six EU Neighbourhood Countries to the East that are additional sources of information for the country profiles of these countries.

- **UNEP Chemical Accident Prevention and Preparedness Initiatives (also Flexible Framework Initiative) [10]**

UNEP's Division of Technology, Industry and Economics works with many partners to address three of UNEP's six strategic priorities: climate change, harmful substances and hazardous waste, and resource efficiency. Within this division, UNEP is leading three important programmes associated with chemical accident prevention, preparedness and response:

- ∴ The **Flexible Framework for Addressing Chemical Accident Prevention and Preparedness** aims to promote the improvement in chemical accident prevention and preparedness especially in countries that need support to address the increased risks of chemical accidents due to their rapidly industrializing economies. A country can adapt its CAPP Programme elements relevant to its legal and cultural context, risk priorities, resources and experience following the recommended approach in the Flexible Framework Guidance. This approach is flexible enough to be adapted to countries with either no existing programmes or limited legal and policy instruments in relation with chemical safety. Also, the Flexible Framework can be adapted to countries that wish strengthening existing programmes.
- ∴ The **Awareness and Preparedness for Emergencies at Local Level programme (APELL)** is developed by UNEP in conjunction with Governments and industry with the purpose of minimising the occurrence and harmful effects of technological accidents and environmental emergencies [11]. The APELL strategy is to identify and create awareness of risks in an industrialised community, to initiate measures for risk reduction and mitigation, and to develop co-ordinated preparedness between the industry, the local authorities and the local population. The programme provides a common-sense approach to accident prevention and response and can be applied to any risk situation, whether man-made or natural. It can be initiated by any party, although companies can be expected to take the lead, and can be facilitated by Governments or by industry associations. APELL can be applied both in developed and developing countries as well as in remote or urban areas.
- ∴ UNEP's **Responsible Production Approach** has been designed to increase overall safety, to reduce chemical emergencies and the resulting environmental, social and economic impacts by helping companies and their managers address potential risks along the value chain - both at site as well as with business partners, suppliers, clients and local communities [12]. Responsible Production offers guidance on understanding hazards, controlling and preventing exposure to hazardous substances, reducing accident risks and engaging stakeholders. This Approach also promotes chemical product stewardship through risk planning, management and communication.

More information is available at <http://www.unep.org/dtie/>.

- **The UNEP-OCHA Joint Environmental Unit (JEU) [13], [14]**

The United Nations Environment Programme (UNEP)/ UN Office for the Coordination of Humanitarian Affairs (OCHA) Joint Environment Unit (JEU), housed within OCHA's Emergency Services Branch, helps Member States to prepare for and respond to environmental emergencies. The Environmental Emergencies Centre (EEC - www.eecentre.org), operated by the UNEP-OCHA JEU seeks to build the capacity of high-risk low and middle-income countries to respond to environmental emergencies by strengthening their own on external resources and services. It offers specific tools to help countries develop greater capacity in preparing and responding to environmental emergencies, such as:

- ∴ **The Hazard Identification Tool.** The goal of the HIT is to limit the consequences of natural disasters and technological accidents on man, hence to reduce the number of victims. The HIT builds on the idea that the identification of hazardous installations contributes to this goal.
- ∴ **The Flash Environmental Assessment Tool (FEAT),** tool that helps to identify existing or potential acute environmental impacts that pose risks for humans, human life-support functions and ecosystems, following sudden-onset natural disasters. FEAT focuses primarily on immediate and acute impacts arising from released hazardous chemicals.
- ∴ **Guidelines for Environmental Emergencies,** prepared to advise providing/donor and recipient/affected countries on how to mobilize, receive and/or provide international assistance in the event of an environmental emergency.

More information is available at www.unocha.org/unesp and on the Environmental Emergencies Centre (EEC - <http://www.eecentre.org>)

- **The OECD Working Group on Chemical Accidents (WGCA) [15]**

The OECD Programme on Chemical Accidents addresses a subject that concerns everyone who uses or handles hazardous chemicals, works in a chemical plant, or lives near one. This programme helps public authorities, industry, labour and other interested parties prevent chemical accidents and respond appropriately if one occurs. Since its inception in 1987, the OECD WGCA has made substantial contributions in the field of chemical accident risks governance. The Programme's flagship products are:

- ∴ **The Guiding Principles for Chemical Accident Prevention, Preparedness and Response** which address all aspects of preventing and managing chemical accidents;
- ∴ **The Guidance on Developing Safety Performance Indicators** in which SPI serves as a guide for key stakeholders to determine if their implementation of the Guiding Principles has led to improved chemical safety;

- ∴ **Corporate Governance for Process Safety Guidance for Senior Leaders in High Hazard Industries.** This guidance aims to identify the essential elements of corporate governance for process safety. It is complementary to the OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response and the OECD Guidance on Developing Safety Performance Indicators.

In addition, over the past two decades the WGCA has sponsored special projects and workshops that are considered essential references for governments and industry associated with specific technical elements and implementation responsibilities that are the foundation of a nation's ability to address chemical accident risks comprehensively and effectively. More information is available at <http://www.oecd.org/env/ehs/chemical-accidents/thechemicalaccidentsprogramme.htm>.

2.3 OUTCOMES FROM THE BRAINSTORMING

During the brainstorming comments, observations and feedback were collected about the needs of the EU Neighbourhood Countries in terms of chemical accident prevention and the necessary type of resources and players to address these needs. Participants also discussed how they could share their experiences in helping the countries build and improve their chemical accident prevention programme and what could be undertaken to improve the approach towards capacity building framework proposed by MAHB.

For the sake of clarity the experts' comments, observations and feedback are organised as follows,

- About the needs of the countries
- About the resources
- About the players
- About sharing experiences
- About improving the approach

The feedback are further divided into thematic units and numbered as follows:

- Thematic Unit 1 = Chemical Accident Prevention Awareness and Needs Analysis.
- Thematic Unit 2 = Analysing Potential Hazard Sources and Establishing Programme Scope.
- Thematic Unit 3 = Risk Analysis
- Thematic Unit 4 = Natech Risk Analysis
- Thematic Unit 5 = Hazardous Facility Inspections or Audits
- Thematic Unit 6 = Industry Outreach and Capacity Building

2.3.1 ABOUT THE NEEDS OF THE COUNTRIES

Experience has shown that often countries ask for assistance in implementing and building a chemical accident prevention capability without having neither thoroughly assessed what their needs, resources and strength/weaknesses are nor developed an approach to reach their chemical accident prevention objectives. The feedback provided by the participants is synthesized and presented in Table 2.3.

Table 2.3 Feedback provided by the experts about potential needs of Neighbourhood Countries

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
Available expertise in the country is insufficient in regard to the different aspects associated with chemical accident prevention. Hence, there is a need to focus particularly on building competence. This requires assessing the country's knowledge baseline to ensure that learning tools and training programmes are tailored to the country's needs and will be effective.	✓	✓	✓	✓	✓	✓
The project should identify who is "empowered" in the country to initiate and bring the different elements forward necessary for establishing a chemical accident prevention capacity.	✓	✓	✓		✓	✓
There is a need to understand what is the country's current perception and tolerance of risk and to identify its vision on risk.		✓	✓	✓	✓	✓
It is important to analyse the coping capacities of countries and in particular how "well" they are handling industrial hazards.	✓	✓	✓	✓	✓	✓
A culture of chemical accident prevention (as well as safety culture) is often absent or not fully acquired by the country.	✓	✓	✓			✓
An important message to industry is that every accident, every incident is an unnecessary drain on the organisations resources.	✓	✓	✓			✓
Making progress generally requires overcoming the existing "good news" culture, denial of major hazards and consequences, audit and blame as well as compliance cultures and move forwards towards an open and "rock the boat" culture.	✓	✓	✓	✓	✓	
Technical people from various sectors (government, academia,	✓	✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
industry) within the country must be involved in capacity building efforts to deal with the scientific, technical and legislative issues of the different chemical accident prevention aspects.						
Work might be needed to establish a databases and system to map and host information about chemical industries/facilities since often the country has not mapped its industrial facilities.	✓	✓				
There is a need for quality safety management systems (SMS) with relative measurement criteria both from the side of the competent authority as well as chemical establishment operator.	✓	✓	✓	✓	✓	✓
Operators need to learn how to prepare safety reports and competent authorities need to learn how to assess them.	✓	✓	✓	✓	✓	✓
It may be necessary to establish a safety report template whose structure and content is in line with the reality of the country.	✓	✓	✓	✓	✓	
Many countries need to establish transparent and comprehensible standards for the various government and industry stakeholders with important obligations.	✓	✓			✓	✓
Many countries are lacking Seveso-style inspectors who form a stable group without rotating every 2-3 years (excessive staff turnover).	✓	✓	✓	✓	✓	
The necessary human and economic resources need to be available to develop expertise as well as the required systems such as tools and software.	✓	✓	✓			
There should be a progress index that can help donors to prioritize and optimize their efforts and resource allocation.	✓				✓	✓
A country that is beginning the process of implementing its CAPP capacity will urgently require training and access to risk assessment tools.	✓	x		✓	✓	✓
A country may have knowledge of risk assessment techniques but limited access to risk assessment tools.	✓			✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
Tools, training and support activities should be designed to be realistic and relevant to the country's situation, adapted to the country available resources and existing competencies.	✓	x			✓	✓
MAHB is assessing the Seveso Directive status in the Neighbourhood Countries through a survey.	✓	✓	✓	✓	✓	✓
A significant challenge to overcome is the lack of consistent and regular training in project countries.		✓	✓	✓	✓	
Project countries may also need help in establishing a risk assessment policy and common measures when two or more establishments close to each other (industrial parks). Common permitting may be an option.		✓	✓	✓	✓	✓

2.3.2 ABOUT THE RESOURCES

The country needs to make available competent human resources as well as adequate funding and financial support to support its program aiming at building and maintaining chemical accident prevention knowledge, competence and systems/tools. Funding can be directed towards staff recruitment, international and national expert trainers, equipment purchase or any consumable necessary for instance for training purposes or strengthening country's system and organisations. Table 2.4 outlines the feedback provided by the participants.

Table 2.4 Feedback provided by the experts about resources needed for effective implementation

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
The country must have the expertise and the infrastructure as well as economic resource to organize trainings and develop tools.		✓	✓		✓	✓
The country must allocate time and resources to cover the real duration of a typical capacity building programme (in the range of 7-	✓	✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
10 years).						
Stakeholders must identify and use existing “pockets of knowledge and competence” in the country to optimise the use of resources. Examples of these knowledge islands are universities, research centres, centres of excellence and industry.			✓	✓	✓	✓
The JRC can make available its online tools for risk assessment to be used during the training in the countries, including ADAM for consequence analysis and the Rapid-N tool for assessing Natech risks.		✓	✓	✓	✓	✓
The JRC can adapt its services to Neighbourhood country needs, e.g., developing a lessons learned bulletin on accidents in a neighbour region, translation of key MAHB publications in local languages, and access to guidance documents and tools developed in Member States.	✓	✓	✓	✓	✓	✓
It could be possible for more advanced chemical hazard sites to open their doors to the country’s experts and officers for training purposes. These industries can be identified by the country itself.		✓	✓			✓
The Flexible Framework offers detailed guidance on establishing or improving programmes, including tools for analysing the country’s existing situation and generating a needs assessment.		✓	✓	✓	✓	✓
The UNEP-OCHA/UNECE two-hour introductory course on chemical accident prevention and preparedness is available in Russian, French and English and could be useful for preparing participants for training and awareness activities within the project.		✓	✓	✓	✓	✓
Guidance documents on safety reports have been prepared by UNECE for Armenia, Azerbaijan, Georgia, Moldova, Serbia and Ukraine.		✓	✓	✓	✓	
Universities within countries, such as the University in Moldova, can often provide technical support and assist in creating training and		✓	✓	✓	✓	

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
education networks.						
The UNEP Responsible Production materials should be considered for building capacity in select industries.		✓	✓	✓	✓	✓
The PPRD East program on Seveso also produced training materials on various aspects of Seveso implementation in English, Russian and Romanian.		✓	✓	✓	✓	

2.3.3 ABOUT THE PLAYERS

A capacity building program involves several players and actors who have different interests at stake but who have also different means to contribute to the success of the program. The feedback provided by the participants are synthesized and presented in Table 2.5.

Table 2.5 Feedback provided by the experts about the players

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
Multinationals operating in the country should be involved. They may share experience in implementing Seveso Directive related legislation and regulations.		✓	✓	✓		✓
International organisation such as the European Commission and the United Nations (UNECE, UNEP and OECD) may contribute human and economic resources.		✓	✓		✓	✓
External experts should be open to learning from the countries (e.g. "keep an open mind" and "West might not be best").		✓	✓		✓	✓
Industry can be involved by showing examples of good regulation through professional institutions (e.g. IChemE), European industry associations (e.g. CEFIC, EPSC), global industry associations (e.g. CCPS, IOGP) and global companies (e.g. Shell, BP).		✓	✓	✓		✓
Involving the country's university students helps create sustainability of project advances as these are the next generation taking up the lead.			✓	✓	✓	✓
The country's local experts from central government, local government, universities and research centres should be consulted and valued.		✓	✓	✓	✓	✓
The persons empowered in the country to establish a chemical accident prevention programme should be identified and consulted at the initial stages of the project.	✓	✓	✓	✓	✓	✓
Opportunities should be explored for raising the awareness of the public to obtain their support.					✓	✓
Efforts should also leverage opportunities for coordination and collaboration among the different international Institutions and organizations that may be operating in the country on different		✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
aspects of the topic. Operating with awareness of each other's activities can also help to avoid silo-working.						
Project success requires particular coordination and collaboration among the different country's ministries associated with chemical accident prevention. A good cooperation between the different institutional bodies with involvement in the prevention and the limitation of the consequences of major industrial accidents involving dangerous substances is extremely important.	✓	✓			✓	✓
Respect what is achieved in the country and presume that everyone both on site and regulating the industry is doing their best. They might not be focussing their efforts in the right places but they may be proud of what they have achieved. Listen to them, get their confidence and respect and that will allow them to open up about the underlying problems and driving forces. There will be many people both well qualified and experienced but they may not be in the right places and they may not have the influence that is needed.	✓					✓
Understand the culture and drivers: As with incident investigation, keep asking why until you get the real reasons for any problems and the culture of industry and regulation in that country.	✓	✓	✓	✓	✓	✓
West - West Conflict: or US versus Europe; or prescription vs risk based. They will get mixed messages from different operators and visitors. Lost Time Injuries vs risk numbers. We need to acknowledge that both have lots to offer; technical experts giving the rigour of process safety management and Europe giving the wider holistic view of risk.	✓	✓	✓	✓	✓	✓
It is important that based on the existent situation and on what is intended to be achieved in its Seveso implementation, that each country establish and propose its own strengthening capacity building plan.	✓	✓				✓
Essential for the success of the project is involvement of top technical	✓	✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
staff (national and local level) from all institutional bodies involved in chemical accident prevention and preparedness and eventually selection of Trainers of Trainers.						

2.3.4 ABOUT SHARING EXPERIENCES

Organisation and people who have been involved in chemical accident prevention programs with different roles and responsibilities at different organisational levels are able to share different kinds of personal experience and unique hands-on advice. The feedback provided by the participants are synthesized and presented in Table 2.6.

Table 2.6 Feedback on resources and lessons learned from experience

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
UNECE has several reports on its website from various technical workshops and implementation meetings in the East Neighbourhood Countries that can provide insights into the current Seveso Directive implementation status of Neighbourhood Countries to the East.		✓	✓	✓		✓
The OECD has produced numerous publications on specific implementation topics from workshops and special projects that could be useful for specific training and support efforts.		✓			✓	✓
Examples of how industry can contribute valuable knowledge, experience and advice should be collected. Examples shared at the workshop include: <ul style="list-style-type: none"> An international oil company had to develop a safety process in Tunisia according to the local legislation; In Morocco industry changed its approach to plant integrity following an accident in Senegal; In general North African experience of multinationals can be 			✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
<p>very important - differences could be tricky but may work;</p> <ul style="list-style-type: none"> The UNECE recommended involving Ukrainian oil terminals and ports; Modern industry in Azerbaijan is “trying to be best of the West” with its new offshore installations. 						
<p>Good news culture: many sites and individuals are desperate to please and give good news. Application of hazard identification methods will reveal nothing unless it is appreciated that speaking openly about hazards and problems is the right thing to do. The most basic element of the culture should be that it is OK to talk about hazard and risk at all levels.</p>		✓	✓	✓	✓	✓
<p>The starting point: It takes at least 5 years for a regulatory regime to be developed, put into place and begin to show results. In the meantime, plants will continue to be run in a potentially hazardous way. The first step is to help them to run dangerous plants safely; i.e. living with what you have got. This requires a very rapid overview of the risks by practical, experienced people, identification of potentially catastrophic situations, and communication of the key combinations of hazards, failures, weak points and exposures. It may be appropriate to have multi stage implementation of regulation.</p>		✓	✓	✓	✓	✓
<p>Build on what you have got: while it is tempting to change everything starting with a series of critical audits and recommendations; it is better to identify the processes which are working well, the people who are competent and trying, and the engineered systems in place which make a significant contribution. Maintain them and use them as the basis for future.</p>		✓	✓	✓	✓	✓
<p>Basics first: Get the basic systems of integrity management, competent people, permits, documentation, procedures in place first. Without them, there is nothing to build on. In many places both are deteriorating badly and past the point of no return without major turnarounds. There is no point in building a risk based hazard</p>					✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
management system without them.						
Beware, beware, beware of risk consultants - and of processes and regulations - which are heavily dependent upon consultants for erudite analysis and submission for approval. Any system must be simple to use, easily understood, used, maintained, updated and regulated by local staff without their help. Think long and hard before going down the quantitative risk assessment route and the extent to which regulation and risk management depends upon it. In addition, there can also be the additional complication that the available consultants are not properly trained.		✓	✓	✓	✓	✓
Responsibility and accountability: Even in the West, it is almost impossible to call the accountable people to account. If the operators are from overseas, the key people will be out of the country on the first flight (see Bhopal). The project should make sure that any regulations and processes require that those with higher level accountability for overall risk, resources, contracts and infrastructure are named so that they can be shamed if not prosecuted.					✓	✓
Do not assume that "West is best". We have developed processes and regulations over time. If we were to start again, we would probably develop simpler more balanced and holistic systems. Systems for neighbouring countries should be pragmatic and straightforward so that they can be owned and updated locally. The major overseas companies working in each country will have a major influence upon the attitudes and processes both of industry and the regulator. This may be a positive or a negative influence in implementing the CAPP principles. They will also influence the way and new regulations are implemented, trying to adapt them to their own systems. They need to be part of the discussions with a conscious decision about how much of their approaches are to be encouraged.	✓	✓			✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
Incentives and measurement: you might think you can quantify risk but cannot easily measure culture, attitude, integrity and hazard management					✓	✓
Regarding the inventory of hazardous activities, it often appears that in the project countries each installation is considered separately and not the establishment as a whole. Also there can be specific rules in each country, so to find a common approach for the inventory will be a challenge due to possible differences in the legal requirements of the country.		✓	✓	✓	✓	
In many countries, "major accident" is still not properly defined: it is not a fire, explosion, toxic release which may lead to...! It is about defining how bad it is and each establishment has its own measure about how bad it is.		✓	✓	✓	✓	
Terminology is often not clear: consequence vs. effect vs. impact; risk is not consistently understood.		✓	✓	✓	✓	
Interventions often have to address the problem of motivation. A widespread lack of awareness of major accidents and potential risk means that concern about potential accidents is not a main motivation for reducing chemical accident risk. Most often the motivation of industry regarding Seveso is to get a permit. The motivation of authorities regarding Seveso is to follow a procedure (administrative goals).						✓

2.3.5 ABOUT IMPROVING THE APPROACH

The different organisations have all had different kind of experience in capacity building programs. Hence, they can provide several suggestions to improve the methodology proposed by MAHB. The feedback provided by the participants are synthesized and presented in Table 2.7.

Table 2.7 Feedback provided by the experts on implementing the methodology

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
The JRC could develop an index (based on the Neighbourhood Countries survey results) to measure progress over time in capacity building achieved by both the project and the countries.	✓					✓
It would be useful to focus an initial pilot project with countries that have demonstrated a strong commitment in past similar projects.		✓			✓	✓
For a number of countries support and advice may need to address ageing assets such as pipelines and processing units. This is becoming a major threat in North African countries for energy delivery towards the EU.		✓	✓	✓		✓
As many of the East Neighbourhood countries are part of the UNECE Industrial Accidents Convention it can be a good approach for the chemical accidents prevention.	✓	✓	✓	✓	✓	✓
The engineers and technical people should be involved, promoting ownership such that all is not left exclusively in the hands of the competent authority.		✓	✓	✓	✓	✓
Efforts can also be more successful if the actors involved try to see the problem the way these experts see it. Showing industry and competent authority representatives how to look at simple things such as safety management systems and Seveso style inspections can be highly valuable.		✓	✓		✓	✓
It is important to assess the capacity and roles of training and pilot project participants before every intervention to ensure that they are pitched at the right level in order to make a positive and lasting impact.		✓	✓		✓	✓
Many projects have to start with developing tools to assist the country in understanding risk and identifying its risk vision.			✓	✓	✓	✓
The degree of sophistication of proposed technical approaches should be tailored to the country's level of understanding of safety management, risk assessment, risk culture, available competences,			✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
resources, and practical considerations (logistics).						
The project could benefit from establishment of an expert group to assist the project in producing basic principles documents, in particular for basic enforcement and risk management, for those countries with limited resources and competence for addressing process safety risks.			✓	✓	✓	✓
Given the presence of storage sites in every country, a useful activity could be to make available a safety report template specifically designed for storage sites.		✓	✓	✓	✓	✓
On the basis of survey responses and further bilateral dialogue, external experts can assist the country in identifying good practice to address gaps and weaknesses in the current policy and its implementation.			✓	✓	✓	✓
Tools and systems should be adapted not only to suit the country culture but also to promote independence from consultants (especially for industry operators).			✓	✓	✓	✓
As much as possible, industry engineers and managers, university academic/researchers and expert consultants should be involved in the different training, mentoring and coaching activities. They can provide insights to approaches that might work best, they can reinforce consistency of good practice and be trained as trainers to allow the continuous transfer of knowledge and experience to stakeholders throughout the country.			✓	✓	✓	✓
When design training courses the following practical consideration should be taken into account: <ul style="list-style-type: none"> In the East, Russian is the working language in several countries, Hence, training material should be translated into Russian and training should be delivered in Russian or with Russian interpreters; It is essential that the participants in training workshops are 			✓	✓	✓	

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
<p>properly selected to ensure that so that the most relevant actors receive the training.</p> <ul style="list-style-type: none"> • Experts could be selected on the basis of CVs provided in advance, or required to undergo a short online course, or completing a form that summarises their experience, responsibilities and interests relative to the event. • Training should be tailored for the needs of a specific targeted audience; • Training and workshops should recognise and build on the country's existing policies, infrastructure and practices country relevant to the topics at hand; • It is important that trainers learn about the country to be aware of culture differences and what their expectations can be; • Trainers may need to avoid an over reliance on Seveso terminology when their audience may be unfamiliar with it. 						
<p>When running training courses the following should be taken into consideration:</p> <ul style="list-style-type: none"> • Trainers should neither assume nor take for granted anything. They should and be flexible and prepared to expect the unexpected; • Trainers should be careful with semantics, terminology and language in general as there can be translation/interpretation issues due to language barriers and differences in understanding the meaning due to cultural barriers; • Trainers should listen to their audience, ask questions to make them understand and allow them to interact in their own language; • Trainers should convey concepts and messages in a clear and simple way by telling stories. <p>Trainers should try to be specific, using examples and case studies as</p>			✓	✓	✓	

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
much as possible to illustrate the key points, establish context, and demonstrate various principles of good practice.						
The project should consider cultivating a group of training of trainers as part of a strategy to ensure sustainability of knowledge gains.		✓	✓	✓	✓	✓
The project should consider forming a mixed team of experts to visit countries. For example, the time might include a: <ul style="list-style-type: none"> • human factors expert; • risk assessment expert; • Seveso inspectors expert; • Industry expert along with appropriate Commission experts leading the team.			✓	✓	✓	✓
Examples of the potential loss of infrastructure due to an accident is often valuable as an economic driving force to stimulate the country and its industry in undertaking the necessary actions in the area of chemical accident prevention.		✓				✓
Development of a web platform to establish online infrastructure for information exchange between EC, experts and Neighbourhood countries can be also a support for a good cooperation and exchange of expertise between the different authorities of the same country. The development of websites for knowledge exchange and web-based software tools should be a priority.			✓	✓	✓	✓
Opportunities for promoting industrial safety courses at universities should be exploited as much as possible.			✓	✓	✓	✓
Questionnaires addressed to all institutions with involvement in chemical accident prevention could give a good image of the state-of-the-art and on the existent legal framework and could help each country to analyse the existent situation and also could be a start on realizing the country profile. Also a comparison between country profiles could suggest some common needs.	✓	✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
Site visits are also very important. Even if based on Seveso Directive requirements the establishment is not under the scope of the Directive it gave the possibility to apply in practice the knowledge acquired during the workshop. Also it is an opportunity to simulate an inspection.					✓	✓
How to plan/help a neighbouring country to prevent major accidents? <ul style="list-style-type: none"> • Identify the stakeholders (all authorities, industry/associations, consultants/academia) • Establish permanent discussion body • Prepare guidelines for all topics involving all • Assure details are covered, but allow flexibility/alternatives • Assure that involved parties have clear, not only administrative, understanding of the Seveso issues • Obtain a consensus which safety level is to be followed by the society (=license, ALARA) • Assure coherent coordination of the authorities and Governmental agencies involved • Identify resources & competences needed • Interface among agencies, clear roles and responsibilities? • Explore the advantages of a one-stop-shop approach • Solicit active involvement-participation of the public 	✓	✓				✓
The project should seek to engage actively with competent authorities to leverage good practice. Many times we seem to want to start the production of guidance from a 'standing start' when the state-of-the-art is already being practised by one or more CAs whose work could simply be adapted to a pan European level.	✓	✓	✓		✓	✓
A catalogue of recommended low cost training could be developed for small and medium enterprises and for companies in recently joined members of the EU. This could include workshops and on line resources. In many cases they are already available in English but	✓	✓	✓	✓	✓	✓

Comments / observations / feedback	Thematic Unit					
	1	2	3	4	5	6
need translation. JRC could assist by using its website as a host to much of this material.						
The availability of a shared tool for relative (qualitative) risk mapping could be valuable in order to develop a common vision of chemical accident consequence effects within the different countries, between the country and the technical advice team, and to compare the "risk situations" between the countries.		✓	✓	✓		

2.4 RECOMMENDED OPTIONS FOR CONSIDERATION

The initiative, Seveso Capacity Building in Neighbourhood Countries, is expected to consist of a number of bilateral projects, involving on one side the European Commission (JRC and DG-ECHO) and on the other side, a Neighbourhood country. Several recommendations emerged from the analysis of the collective feedback of the experts' workshop for individual country projects and for ensuring the overall initiative achieves appreciable results. These recommendations are presented below as "options to consider" since it cannot be foreseen beforehand which recommendations are workable in different countries, needs and requirements are different in each country. Each "project" is a partnership between the European Commission and the country involved. The project partners decide together how to move forward. Feasibility of various recommendations depends on the country's political commitment and resources and ownership and commitment on both sides to project goals and objective.

1. Establishing a collaboration starting point, project leaders and stakeholders

Establish an informed starting point

At the very first stage, the project should first seek to establish a good understanding of the country's policy framework, what it covers, and where and how much resources are focused towards driving policy goals. This understanding helps establish a basis for dialogue to explore a starting point for collaboration. Bilateral dialogue can further ascertain where the country has acquired core competences and established infrastructure, both in government and industry, for addressing chemical risks. All of this will ensure that scientific, legislative, infrastructural and economic support are tailored to the country's needs. In particular the project should tailor the learning tools and training programmes specifically for people who are either intimately involved in the CAPP from a technical point of view requiring for instance the application of risk assessment methodologies or involved at a higher level in the CAPP implementation and do not require an in-depth knowledge of the technical aspects.

Involvement of key leadership

At an early stage, the project should identify those people in the country who are empowered to drive policy implementation and to bring the different elements forward necessary for establishing a CAPP capacity. The project will likely confront a multi-layered and complex structure wherein roles and responsibilities for delivering, liaising and decision-making can be unclear, inflexible or overlapping and the terms for success are vague or undefined. Leading government actors usually come from competent authorities involved in environmental management, labour safety, civil protection, and industry/economy and sometimes border and substance control agencies and the transportation authority. Authority control may also be shared between governments according to industry, e.g., the energy ministry oversees the petroleum sector. In addition, local government, leading academics, industry (especially multinational companies), and international organisations and NGOs may also play a role and industry in particular multinationals

Involvement of key experts and stakeholders

The project partners need to develop a collective stakeholder approach to have an effective impact on chemical accident prevention through enhancing and strengthening the consultation, cooperation and coordination between the relevant stakeholders from relevant ministries, competent authorities, industry, expert community, and academia. A trusted communication environment should be in place without existing parallel decision-making structures. Engagement requires clarification and recognition of the long-term role of various parties in chemical accident prevention, assigning responsibilities and accountability to the effectiveness and sustainability chemical accident prevention efforts. Their views and expectations will help shape the way forward. However, each project also needs to ensure that narrow or negative expectations do not block progress, such that it may also actively need to promote an open attitude towards change.

Options for consideration of the Seveso ENPI initiative include:

- Analyse the country's current capacity in dealing with Seveso related obligations with the help of the JRC survey.
- Follow-up on the survey to build a picture of the country's current perception and risk tolerance, its political commitment and policy vision for controlling chemical accident risks.
- Establish initial project expectations based on these inputs. Where there is no political commitment, no policy vision, or intergovernmental co-operation, these aspects may need to be addressed first.
- Identify which parties have a leadership role in the country early in the project in order to initiate and bring the different elements forward necessary for establishing a chemical accident prevention capacity.
- Establish a coordinating committee with all relevant stakeholders and designate a leading authority. This group would serve as a central coordinating body in the country to improve the openness of communications an exchange information and experience. The coordinating body can play a critical role in leveraging available competences and resources and prioritising needs and opportunities for intervention.
- Assist the parties involved in feeling engaged and being motivated to participate by matching competent people with appropriate processes and activities. For example, where inspection practices are a project focus, inspectors could be involved in inspections training, making new checklists for inspections, or producing guidance on assessing SMS or safety reports.
- Involve qualified and experienced government and industry experts in the discussions about the ways tools, procedures and regulations could be adapted to their own approaches or implemented in their existing systems.
- Emphasise to stakeholders that regulations and processes must assign clear responsibilities and accountabilities to people with leadership, or higher level accountability, for overall risk, resources and infrastructure.

2. Tailoring project focus to meet country needs and competences

Focusing on country needs

The project should also seek to tailor some activities to address priority or strategic needs specific to the country. Indeed, the coordinating committee may lead a horizon scanning could to detect emerging risks and threats such as ageing pipelines and processing units as well as capacity gaps such as having inspection system. It could be that also a specific tool or methodology emerges that could be tested for use also in other countries with similar needs.

Tailoring the project to internal competences

The project should assess and designate the core capabilities and expertise required in the field of CAPP by the country and identify the country's available or needed competent (technical) people to deal with the relevant scientific, technical and legislative issues. The level of technical training and expertise may

vary considerably depending on function and sector. The distribution of expertise will also be different in each country. For example, one country may have a highly trained inspectorate but many company sites with limited expertise. Another country could have numerous scientists in government and industry but none have specific expertise in chemical accident risks. These distinctions are important in every aspect of capacity building. Alternatively, it could be that there is high expertise in the multinational companies, but other government and industry partners remain at a low level. In particular, experienced technical or scientific experts may grasp risk assessment concepts more quickly than less experienced or generalist staff. More competent staff will also be more able and willing to engage in the project at a higher level, for example, providing input to guidance or experimenting with a risk assessment tool.

Anticipating specific needs in regard to infrastructure and tools

Each project should assist the country in identifying and setting aside the necessary resources for investing both in new research and new technology, tools, templates and standards designed to (a) assess and manage hazards and risks, (b) collect and host data and information related with chemical assets and vulnerabilities and (c) deliver core services foreseen by the different CAPP policies such as land use planning, safety report preparation, SMS inspection or accident reporting. To this end, each project should facilitate technology transfer towards the country to help in developing databases, setting up enforcement infrastructures, e.g., an efficient inspection system, and sharing of information among ministries and for industry and the public. There may also be a need to develop monitoring and evaluation tools that can help partners prioritizing and optimizing time and resources allocation through the use of indicators.

Options for consideration of the Seveso ENPI initiative include:

- Identify the level of sophistication in working with risk assessment tools of government and industry.
- Require background information from participants in training workshops and pilot projects before the training starts.
- Distribute links to background materials to participants prior to training, such as the Environment Emergencies Centre introductory video on chemical accident risks, or short articles that summarise the key concepts.
- Design the structure of a safety report whose content and preparation is within reach of the industry/country technical competence and legislative capacity as well as available resources.
- Prepare good practice documents in addressing process safety risk to assist the country in the areas that are relevant to addressing its needs and gaps such as hazard identification, risk management and SMS inspections.
- Establish an advisory group of experts for the project and who can assist in the preparation of Safety report template and good practice guidelines and handbooks.
- Assist the country in establishing an IT system for map and host information and inventories on chemical facilities.

- Facilitate the transfer of risk assessment tools (to countries with risk assessment knowledge but limited access to risk assessment tools).
- Develop and make available MAHB's online risk assessment tools to be used within a training context by the country.
- Develop and make available JRC's Rapid-N tool for assessing Natech risks.
- Setup a EC technical team composed of JRC/MAHB, risk and human factors specialists as well as Seveso inspectors and independent consultants to assist the country in the CB project.
- Conduct a Civil Protection field exercise in the country to test its competence and maturity in chemical accident prevention and preparedness planning.
- Include an activity to deal with ageing assets which are becoming a major threat to energy supply stability.
- Design and prepare a "rapid intervention" training and risk assessment toolkit package to be employed within a country that is initiating the process, or is at an early stage, of acquiring CAPP capacity and whose sophistication matches the knowledge and skills of the country in dealing with risk assessment.

3. Leveraging existing resources and infrastructures

Leverage existing internal resources and infrastructures

Capacity building has the greatest chance of success when it builds on existing efforts and resources. Competences available within inspectorates, universities, and specific companies, for example, should be identified and enlisted to assist in project developments. There also may be opportunities for leveraging past or ongoing CAPP related activities supported by international organisations, EU Twinning or other bi-lateral projects.

Leverage existing external resources

Each project should take into account potential contributions of national and international partners that may enhance project outcomes. Collaboration between relevant external players may bring different perspectives, knowledge and experience along with their contact networks to project implementation. International cooperation of this nature can help ensure that there is a coherence in ongoing efforts applied within individual countries and in tools and materials developed to address different issues.

Options for consideration of the Seveso ENPI initiative include:

- Draw on technical skills and competence available within the country in local universities, research centres and industry for training, guidance development and to design implementation of specific project objectives.
- Identify international organisations that can bring their experience into the project as well as contribute with human and economic resources.
- Identify international professional institutions and industry associations that can share with the project their practical experience in process safety.

- Make use of the materials developed under the PPRD East Seveso capacity building project.
- Make use of UNECE materials on the Transboundary Convention prepared for Moldova and on industrial safety and SMS prepared for Armenia, Azerbaijan, Georgia, Moldova, Serbia and Ukraine.
- Make use of the UNECE reports from various technical workshops and implementation meetings which may provide insights into the current status of Seveso programme implementation in the East Neighbourhood countries.
- Involve Ukrainian Oil terminals and docks experience in the project.
- Make use of UNEP's Flexible Framework Initiative and Safe Production materials as well as the two hours online course of UNEP-OCHA JEU available in Russian, French and English on the Environmental Emergencies Centre.
- Use the Environmental Emergencies Centre (www.eecentre.org) for dissemination of materials, guidance and for online exchanges.

4. Sustainability

Components of a strategy to achieve sustainable improvement

Each project should seek to design specific activities in a country with the view to the sustainability of the project results and outputs. Sustainability requires a national vision for reducing risk, including a common view of what is and is not acceptable risk. It also needs to have core capabilities and expertise in all sectors to execute the tasks necessary to implement the country's vision.

Process safety and safety culture

The project should assist the country in establishing a national vision about culture of risk, in particular process safety and safety culture, and developing a strategy for raising awareness among the authorities, industry and communities including informing and educating the public. This should include developing training programmes, educational curriculum and public campaigns. Industry can accomplish this by stressing out the commitment to safety through giving safety the priority over production and costs and understanding that every accident is an unnecessary drain on the organisation resources as well as assigning and empowering people in safety responsibility and accountability.

Competence

Each project should assess and designate core capabilities and expertise required in the CAPP field by the country and identify the country's available or needed competent (technical) people to deal with the relevant scientific, technical and legislative issues. For example, a project objective could be to establish a stable core group of Seveso inspectors with limited staff turnover for inspecting SMS or assessing safety reports. The project could assist the country in making available (or set aside) the necessary resources to maintain and develop such competence and expertise. Also, the project can eventually assist in maintaining such acquired competence in the country and developing it further through industrial safety courses at universities and collaboration with research centres.

Options for consideration of the Seveso ENPI initiative include:

- Develop an index to measure the capacity building progress over time achieved by the project and the Countries.
- Develop a methodology that helps prioritizing and optimizing the project efforts and resources allocated to capacity building.
- Establish a group of experts in training of trainers who will train the country's future trainers.
- Assist the country in creating a stable and effective "Competent Authority" under which to group officials with expertise in Seveso Directive related matters.
- Promote the idea to create a Centre of Excellence or "Seveso school" within the country to train the officials and other people involved in the CAPP domain.
- Identify institutions, competent authorities, industry and experts that will be part of network to which the country can turn for assistance after the project is terminated.
- Deliver technical solutions and tools which the country is able to understand, use, maintain, update and regulate by relying on the available national technical capability and knowledge without needing external help.
- Establish a process that enables a multi-stage capacity growth and implementation to enable the country to handle safely the hazardous establishments. For instance, it takes at least five years for a regulatory regime to be developed and implemented and seven years to have an experienced Seveso inspector.
- Identify professional institutions, European industry associations, global industry associations and companies that can illustrate and promote to industry those attitudes, values, norms, and beliefs which a workforce should share with respect to risk and safety.
- Design training courses targeting Chief Executive and executive senior and line management to illustrate that an effective/efficient safety culture can be maintained for instance through leadership commitment, control and accountability as well as safety education.
- Design training courses targeting the workforce to show the operational behaviours and attitudes in the workplace that contribute to a good process safety and safety culture and which include aspects such as continuous training and incident investigation.

5. The role of the public

The workshop participants also mentioned the public as an important stakeholder, but there were few concrete suggestions about how the initiative could promote public involvement. There is also a difference in terms of actions to involve the general public and actions to involve local communities around chemical processing and storage activities. The UNEP APELL programme was cited as a successful model for involving local communities surrounding hazardous sites. Also, there was at least one example noted of a country that involved the media in high level dialogues as a messenger for promoting change among the general public in terms of awareness of the hazards of dangerous chemicals.

6. Practical considerations

As each capacity building project will interact with different cultural, economic and legislative contexts, its success can depend on details and facts characteristic of the country addressed which cannot be addressed or captured in a general statement. These can be only known through direct on the field experience as well as interactions with the country's institutions and people.

Options for consideration of the Seveso ENPI initiative include:

- Translate training material, tools and websites into Russian, French and Arabic as these are routine working languages in the addressed countries.
- Verify and agree with local translators and interpreters on the correct meaning of the terminology and identify sensitive cultural issues before the training sessions.
- Incorporate the strategic use of websites and web based software tools in training.

3 A COUNTRY CAPACITY BUILDING MODEL

The expert workshop confirms the experiences reported by the international community and in scientific literature that implementing a national capacity building program is a complex process involving several professional and technical disciplines as well as a large numbers of interested parties with differing aims. Furthermore, the existing political, legislative and socio-economic environment within the country can represent challenging constraints in implementing the capacity building program as this constrains EU accepted/acquired policies, concepts and methods which may differ from the country ones.

Moreover, in order to run such a program successfully the country should have an approach that can manage all of the different elements and activities under one framework. It also needs a way to identify and measure changes to verify if progress is being made, where it is being made and if it is in a desirable direction. A systems thinking perspective is nowadays generally accepted within the “capacity building” community as potentially effective in this regard. Hence, it can be helpful to clarify first the concept and scope of the systems. Then the systems’ thinking approach and framework can be replicated by applying hierarchical process modelling [16], [17].

In a systems’ approach the emphasis is placed on “the whole” and the relationships and interactions existing amongst the constituent elements [18]. Hence, the behaviour of the single part of the system is not only defined by its nature but is also shaped by the relationships and interactions amongst the other systems’ constituent parts. Such a perspective helps the country to have access to the whole view of the elements that in effect work together to build capacity. It also helps in understanding and appreciating how changes in one part of the capacity building system will affect the behaviour of the system at different levels through the existing interdependence amongst the different capacity building elements.

A hierarchical process model is made of a hierarchically structured set of processes distributed at different levels of definition and where each level describes its corresponding part of the system. A process can be viewed as an entity that serves a “purpose” and (by interacting with its environment) transforms it into a “purpose achieved”. A process can be made to work by executing a number of processes at the lower level which, by achieving their purposes, can support the upper level process in meeting its purpose. As a simple rule one moves down and upwards the hierarchical process model by asking respectively “how is the process made to work” and “why this process does exist”.

All processes can be classified on a continuum scale in-between “hard” (i.e. processes dealing with more physical, technical and engineering issues) to “soft” (i.e. processes which are driven by a strong human component). The vaguer and softer processes of wide scope are found at the upper levels while processes which are more precisely defined of limited scope are found at the lower level. As deeper levels of processes are added to the previous level more specialised definition and description is required. The success of each process depends on the success of the lower processes, which, in turn, depend on the success of other processes. Hence, for the method to work, the identification of contributing processes

should be all-inclusive. Failure to bring on board all contributing processes can lead to failure of the capacity building system.

Another useful aspect of a hierarchical process model is that it also can work as a communication tool that increases commitment and collaboration of the participating stakeholders and shareholders as well as enhancing clarity of the capacity building vision. It can provide an opportunity for all of the players involved, to discuss, elicit, evaluate and update parts of the capacity building model itself. Therefore, the hierarchical process model approach for all of the experts and players involved in the capacity building program has several benefits including

- formalizing current understanding of the context and scope of those processes which are important for implementing an effective (and sustainable) capacity building program;
- fostering integration of different kinds of information;
- expanding understanding across discipline boundaries;
- facilitating communication among experts from different disciplines, between scientists and managers, and between decision-makers and the public;
- enhancing discussion among people with different points of view;
- sharing viewpoints to develop a common understanding based on multiple viewpoints;
- facilitating the building of a final capacity building process model as a structure for the whole system on which detailed information and attributes can be 'hung'.

The hierarchical process methodology proposed within the context of modelling a capacity building system is based upon the "BCIOD+R" framework developed at Bristol University (UK). In this framework top process of the capacity building process model is broken down into six necessary and sufficient subsidiary processes, which addresses the areas of Business (B), Customer (C), Integration (I), Operation (O), Delivery (D) and Regulation (R) [19]:

- "B" helps in thinking about business processes including finance;
- "C" helps in focusing on customer processes and includes all stakeholders;
- "I" helps in thinking about how processes are integrated and includes human resources;
- "O" is about the 'usual' way of conceiving an operational process which is what we do;
- "D" helps in looking at the processes that help to deliver the others and includes system maintenance;
- "R" helps in focusing on regulatory (and legislative) processes.

The elements of the six themes introduced in Section 1.2.3 can be organised under the above subsidiary processes. For example, the themes "risk", "Natech" and "inspections" are covered by the Operation and Regulation processes.

The process approach can successively offer the possibility to (identify and) attach performance indicators to the different processes composing the model and which indicators can be used by the country to monitor the progress of its capacity building program, step in to address deviations timely and measure the degree of successfully reached objectives [20], [21], [22]. These aspects will be elaborated in the context of the survey analyses and associated capacity building index developed in parallel with this strategy report.

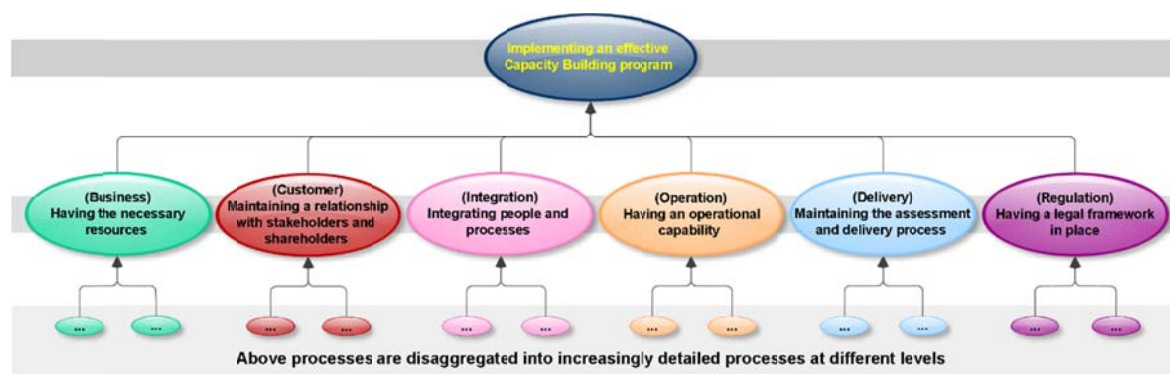


Figure 3.1 A conceptual hierarchical process model

Figure 3.1 shows for illustrative purpose how a hierarchical process model is built by using a top-down approach starting from the top process which is disaggregated into increasingly detailed processes. In this example the country's top process has the purpose to implement a Seveso capacity building program and can be decomposed into the six BCIOD+R subsidiary processes. Each of these six subsidiary can be viewed as being composed of a set of interacting processes defined at a lower level of definition and which identifies what processes are to be carried out to ensure that the top process of the capacity building process model achieves its purpose successfully. The further the decomposition, the more expertise it requires to understand the details of the lower level processes. However, it is important to identify the appropriate the level of decomposition to stop and which depends on the country's purpose and scope of the capacity building system.

3.1 PROPOSAL FOR A CAPACITY BUILDING HIERARCHICAL PROCESS MODEL

This section illustrates how the findings and recommendations are captured within specific processes and organised under the hierarchical process model. The process of building CAPP capacity in a Neighbourhood country can be captured by the top process named "Implementing an effective (and sustainable) capacity building programme". The process is a product evolving from activities in different domains covering the human, financial and physical resources and the legal/political issues necessary to maintain it as well as the technical aspects of the capacity building programme. In order to successfully

meet the demand (or objective) of the top process, the country (top process owner) must ensure that all these domains are properly supervised and monitored for assuring proper performances.

As illustrated in above, under the top process the BCIOD+R processes are given the following names which are meaningful and formative to both the experts and non-experts:

(B) Having the necessary resources

Any activity requires adequate human and economic resources. In particular, this process seeks to ensure that competent human resources and adequate funding are available and stable, and appropriate management and control systems are in place, in order to develop and maintain the implementation strategy over the long term.

(C) Maintaining a relationship with stakeholders and shareholders

Effectiveness of policy implementation interacts and affects several stakeholders in the country. If relations with stakeholders are not properly managed many problems can accumulate through misunderstanding. Lack of communication with stakeholders leads to limited understanding of technical and social challenges faced by key actors in the process. In this situation, proposed solutions often fail to address and remove fundamental barriers to effective performance.

(I) Integrating people and processes

This is necessary for assuring team building within all of the persons involved in the capacity building activities and within all the different areas. It addresses also the means required for the proper functioning. It concerns team commitment and morale, cross discipline exchange and sharing so that the players understand their part in the whole exercise. When functioning effectively, this process gives motivation and direction to all actors involved so that they perform their assigned roles competently and on time.

(O) Having an operational capability

Most of the issues addressed in this process are of a technical nature and are linked with supporting and assisting the country in key technical areas to strengthen its capacity/systems. In particular this process ensures the availability of sufficient knowledge, technical skills and infrastructure for effective implementation. Weaknesses in this process can prevent the system from functioning because various elements are not implemented properly or ignored completely.

(D) Maintaining the assessment and delivery process

This process is necessary for ensuring that all the mechanisms are in place to keep capacity building activities running. In particular, these processes establish feedback and follow-up mechanisms (both internal and external) to detect potential weaknesses in the system and also, conversely identify areas that can be improved and expanded to benefit the process.

(R) Having a legal framework in place compliant with international law

This process is necessary for addressing all of the key legal and regulatory issues, including international law, necessary for justifying and supporting capacity building. An effective legal framework identifies a clear set of relevant, complete and tangible rights and obligations with sufficient detail to avoid ambiguous interpretation and sufficient flexibility to facilitate practical and innovative solutions for implementation. It also plays an important role in maintaining stable expectations and providing the necessary authority and accountability to motivate each responsible actor to meet their obligations in a serious and competent manner.

The top process and its equivalent subsidiary processes are shown in Figure 3.2. The success of the subsidiary processes at the level below are together necessary and sufficient for the success of the top process. Each of the BCIOD+R processes can on their turn be seen as containing other sub-processes describing more detailed and specific facets and can be broken down into sets of processes defined at a higher level of definition. The way of proceeding is illustrated in more detail in the next sections.

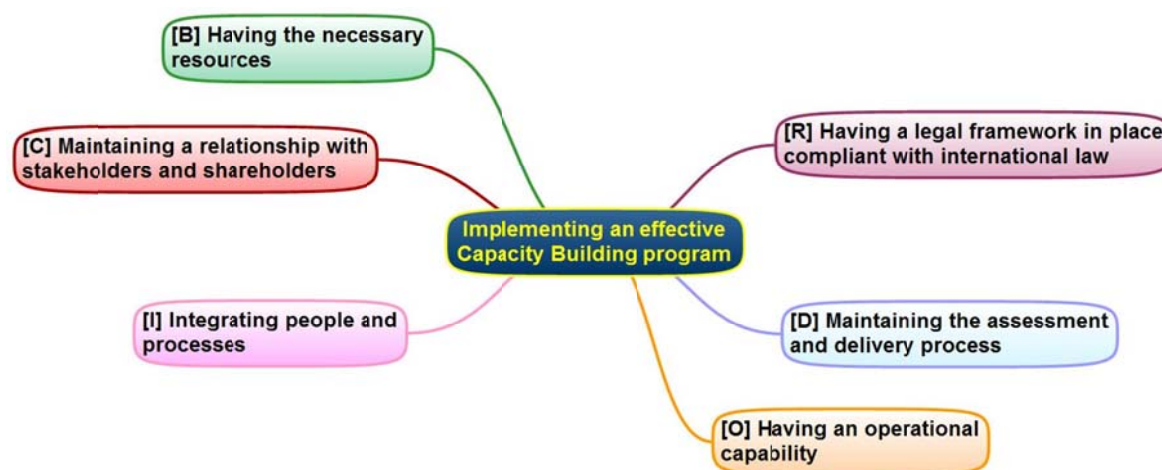


Figure 3.2 A mind-map to capture the elements emerged during the brainstorming under the BCIOD+R structure

3.2 HAVING THE NECESSARY RESOURCES AVAILABLE

A capacity building program requires that the country makes available competent human resources and adequate funding and financial support along with appropriate management and control systems in place. Funding must ensure that the resources are able to cover all expected costs and to meet other additional costs related to the capacity building project such as taking into account inflationary increase, variations in currency exchange rates and new requests for consumables, visa or international travels or even new issues arisen within the building capacity organisation. Also, a budgetary flexibility can avoid delays in the capacity building activities as funds can be shuffled or made available to new issues

emerged within capacity building program. Funding can be directed towards staff recruitment, international and national expert trainers, equipment purchase or any consumable necessary for instance for training purposes or strengthening country's system and organisations. Typical sub-processes falling under this heading are shown in Figure 3.3.

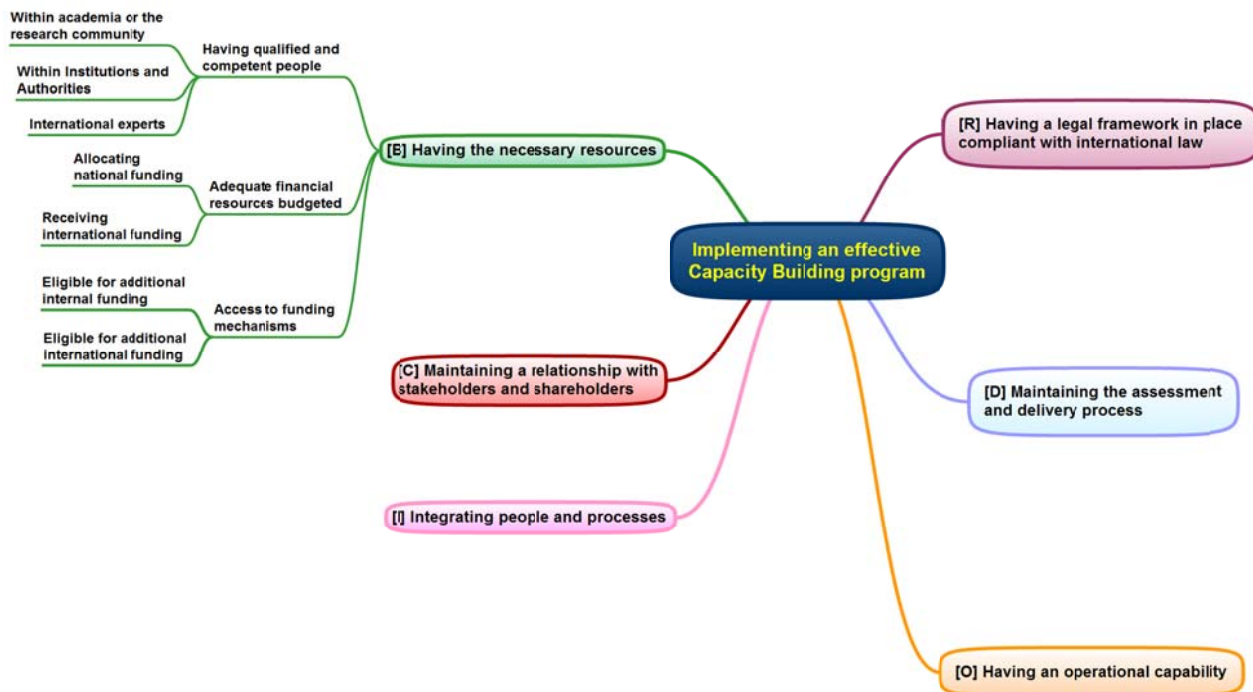


Figure 3.3 A draft mind-map highlighting the Business process

3.3 MAINTAINING A RELATIONSHIP WITH STAKEHOLDERS

A capacity building program involves several stakeholders and shareholders coming from a different cultural background and who have different expertise, expectations, goals, responsibilities and accountabilities. Stakeholders are for instance the country's authorities, industry and public whereas shareholders can be considered to be the public, the media, the European Commission, DG ECHO. Hence it is paramount to have a process in place that enhances the relationships with the stakeholders and shareholders as well as facilitates the understanding of each other such that all entities involved get drawn closer/committed to the purpose of the capacity building program and its outcomes. Typical sub-processes selected for this heading are shown in Figure 3.4.

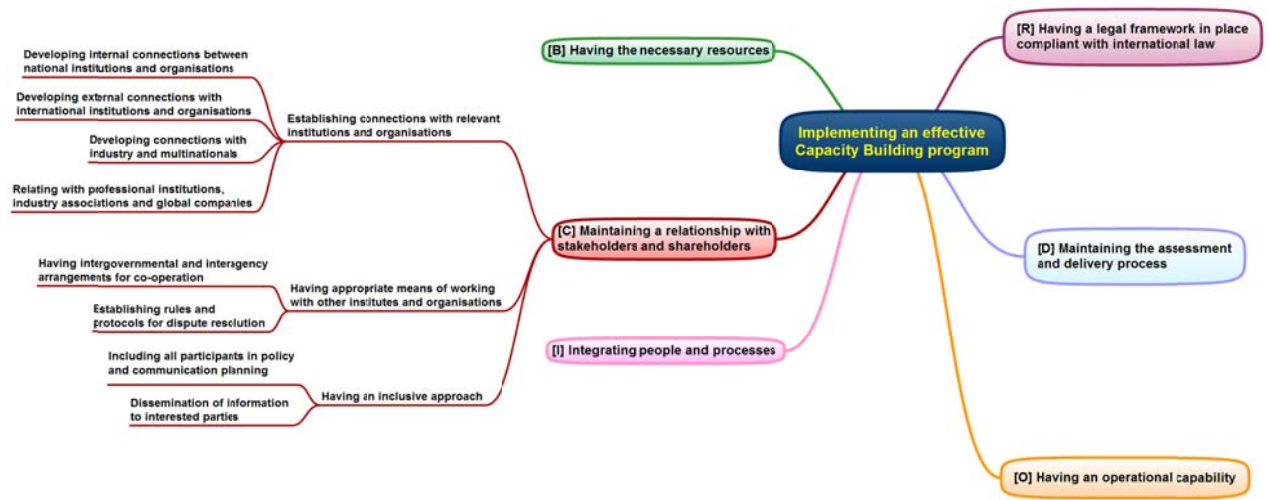


Figure 3.4 A mind-map highlighting the Customer process

3.4 INTEGRATING PEOPLE AND PROCESSES

This process addresses the means required for the proper coordination and collaboration of all the other capacity building processes and the persons involved so as to ensure integration of the different organisational systems with the people and alignment of the activities. This process involves team building, enhancing sense of ownership, stimulating motivation and exchanging and sharing cross discipline. Typical sub-processes falling under this heading are shown in Figure 3.5.

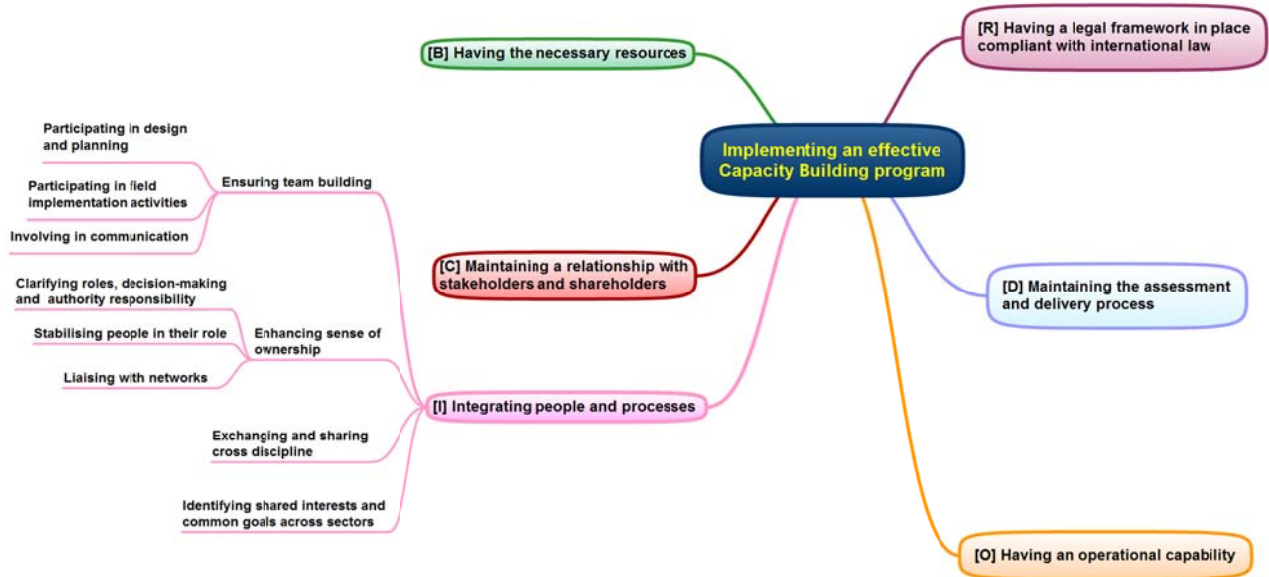


Figure 3.5 A draft mind-map highlighting the Integration process

3.5 PROVIDING THE OPERATIONAL IMPLEMENTATION ENVIRONMENT

This process can be seen as embedding all of the necessary and sufficient technical and non- technical processes necessary to enable the country building and strengthening its capacity. Typical sub-processes belonging under this heading are shown in Figure 3.6.

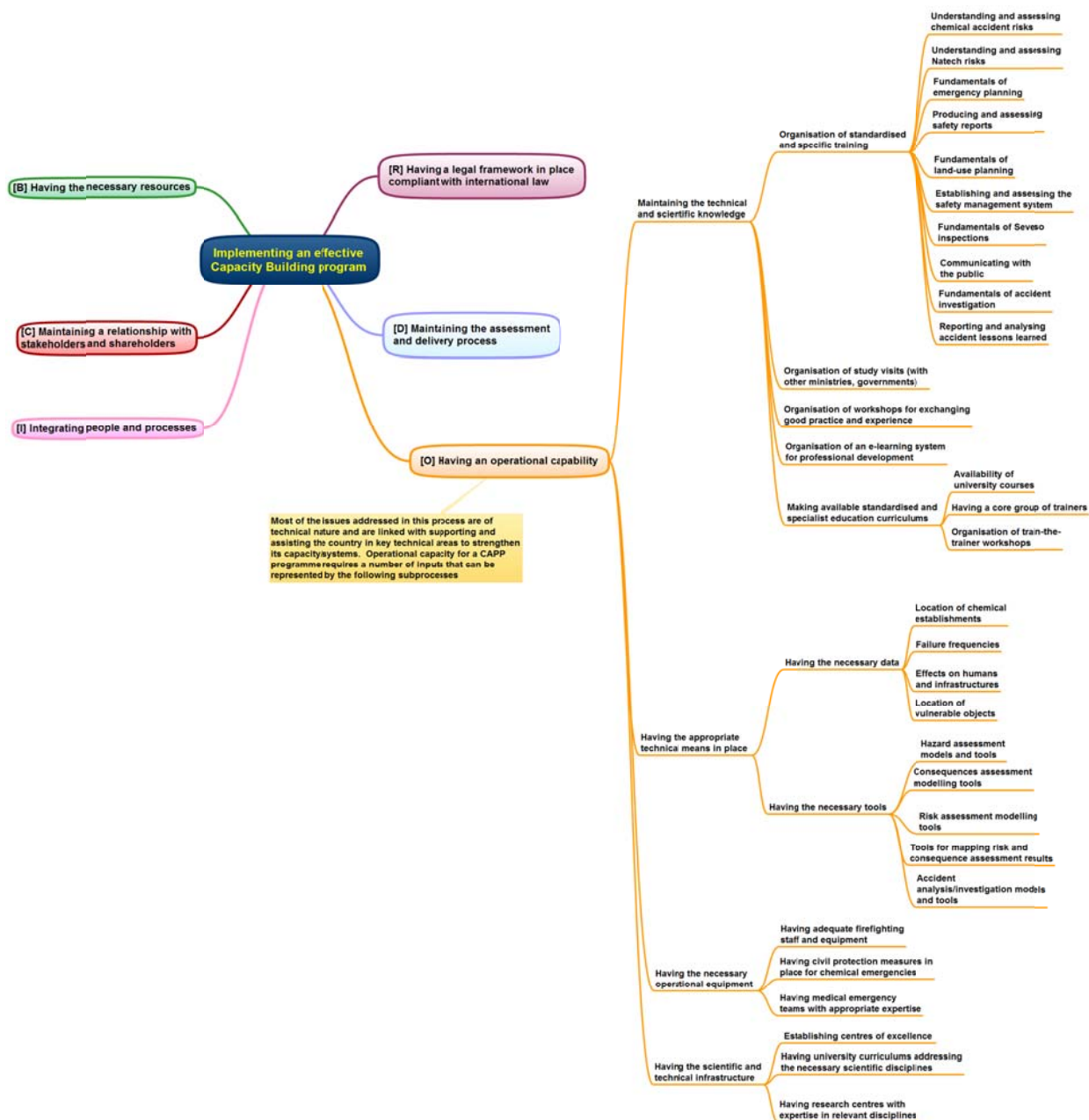


Figure 3.6 A draft mind-map highlighting the Operational process

3.6 MAINTAINING THE DELIVERY PROCESS

This process is necessary for maintaining that all the means are put in place by the country to keep the capacity building activities running as expected. This process consists of structural elements that provide

ongoing monitoring and improvement of the process. In particular, these processes establish feedback and follow-up mechanisms (both internal and external) to detect potential weaknesses in the system and also, conversely identify areas that can be improved and expanded to benefit the process. The sub-processes selected for this heading are shown in Figure 3.7.

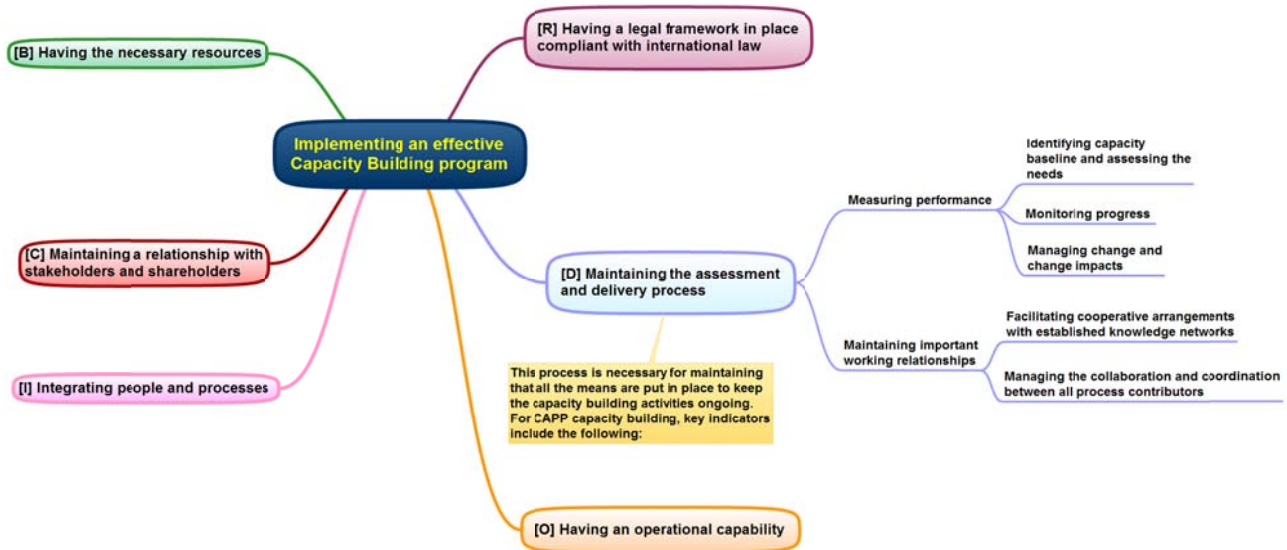


Figure 3.7 A draft mind-map highlighting the Delivery process

3.7 HAVING A LEGAL FRAMEWORK IN PLACE COMPLIANT WITH INTERNATIONAL LAW

This process is necessary for addressing all of the key legal and regulatory issues, including international law, necessary for the country to justify and support a capacity building program in chemical accident prevention. Typical sub-processes identified for this heading are shown in Figure 3.8.

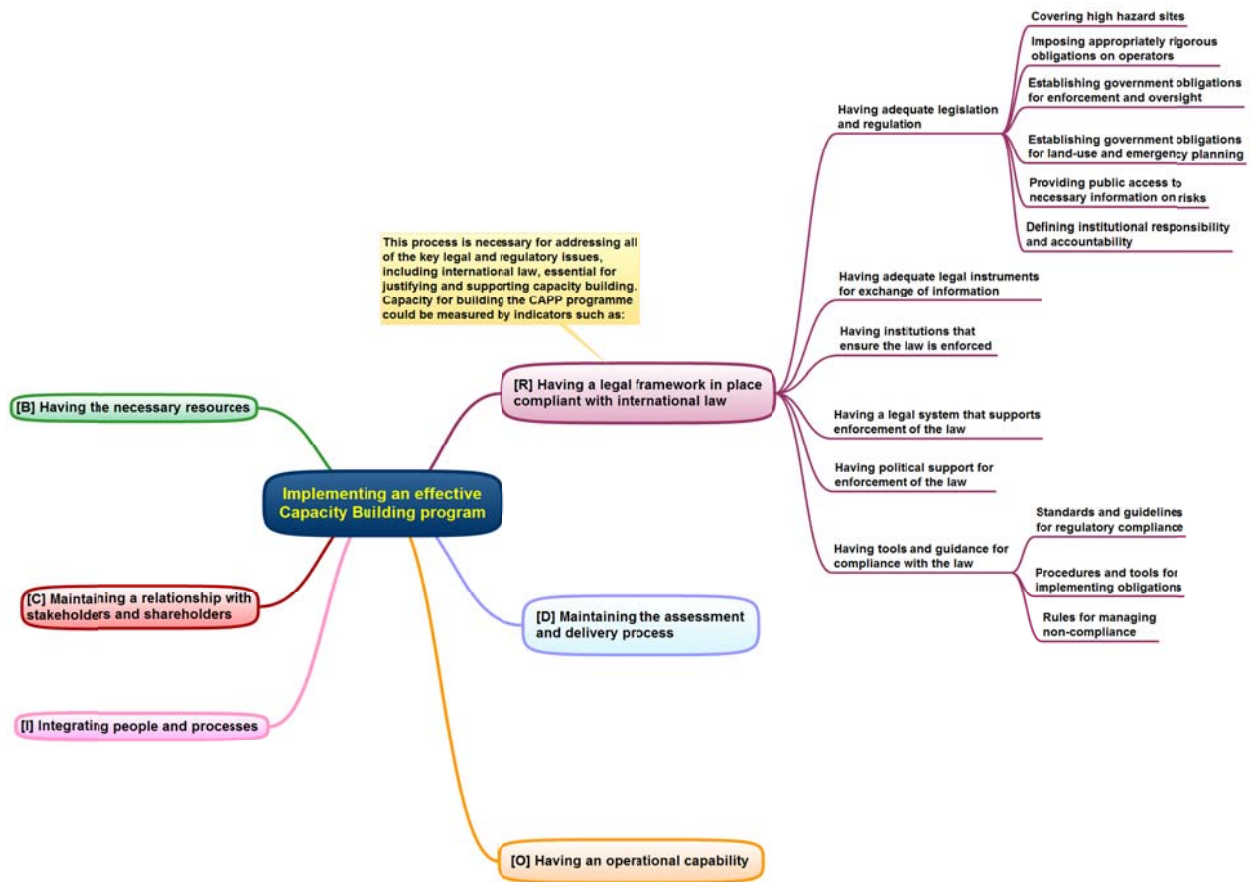


Figure 3.8 A draft mind-map highlighting the Regulatory process

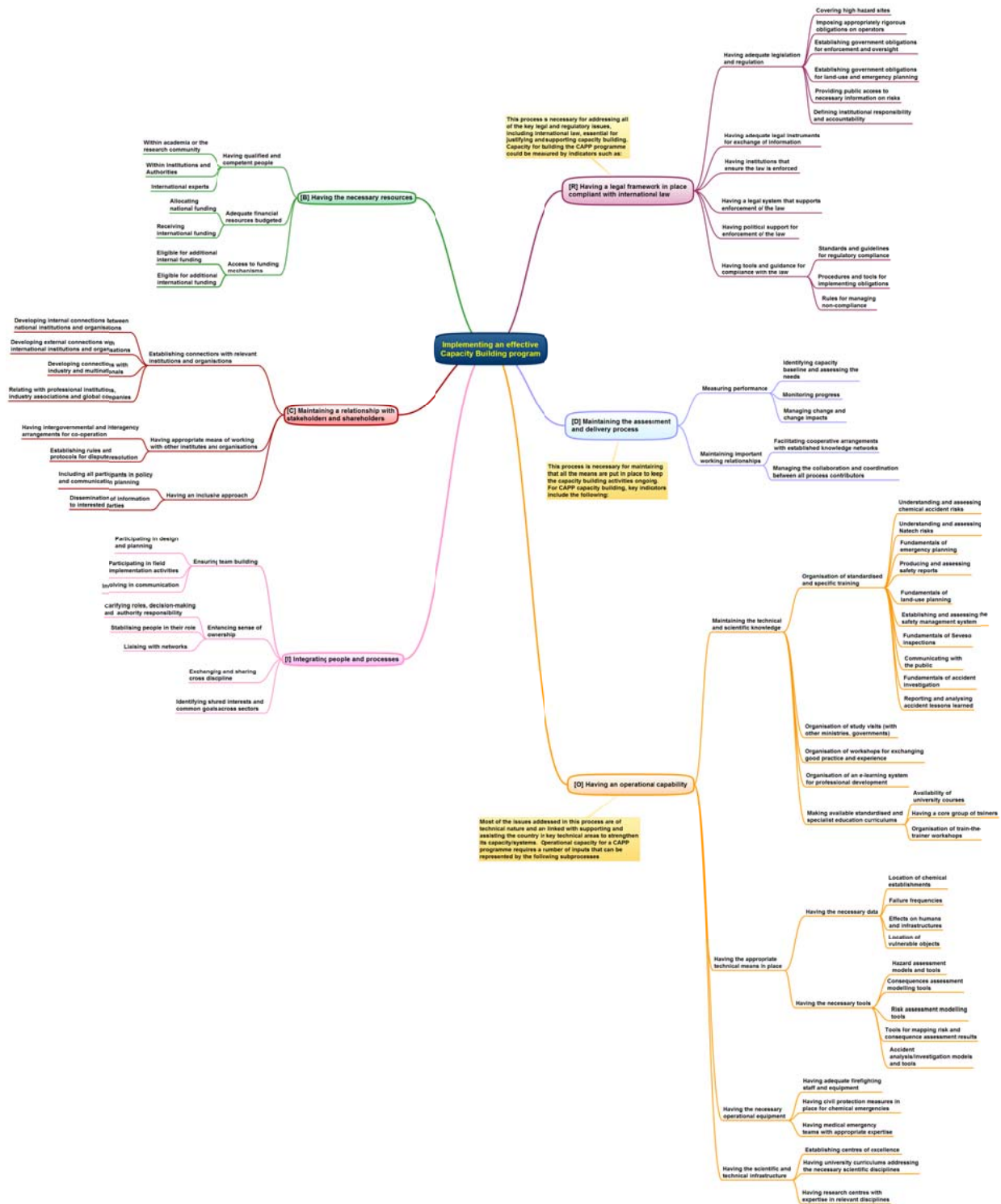


Figure 3.9 A proposed mind map of elements suggested by experts and the JRC-MAHB methodology

3.8 LISTING ALL THE PROCESSES

The proposed capacity building hierarchical model with all associated sub-processes is listed in the form of a tree structure due to the practical difficulty of visualising the whole process model as a graph on a single page. In the listing below each name of the process is preceded by a coloured folder which indicates the level of depth (or granularity) in the model. An open folder indicates that the process contains more processes whereas a closed folder implies that the process has not been developed further. This means that the deepest level of definition has been reached or that not enough information was available to do so.























Level of definition					
0	1	2	3	4	5
					
					

Table 4.1 Coloured folders representing the level of depth of the process

Implementing an effective Capacity Building program


[B] Having the necessary resources











-  Having qualified and competent people
 -  Within academia or the research community
 -  Within Institutions and Authorities
 -  International experts
-  Adequate financial resources budgeted
 -  Allocating national funding
 -  Receiving international funding
-  Access to funding mechanisms
 -  Eligible for additional internal funding


 Eligible for additional international funding

 **[C] Maintaining a relationship with stakeholders and shareholders**

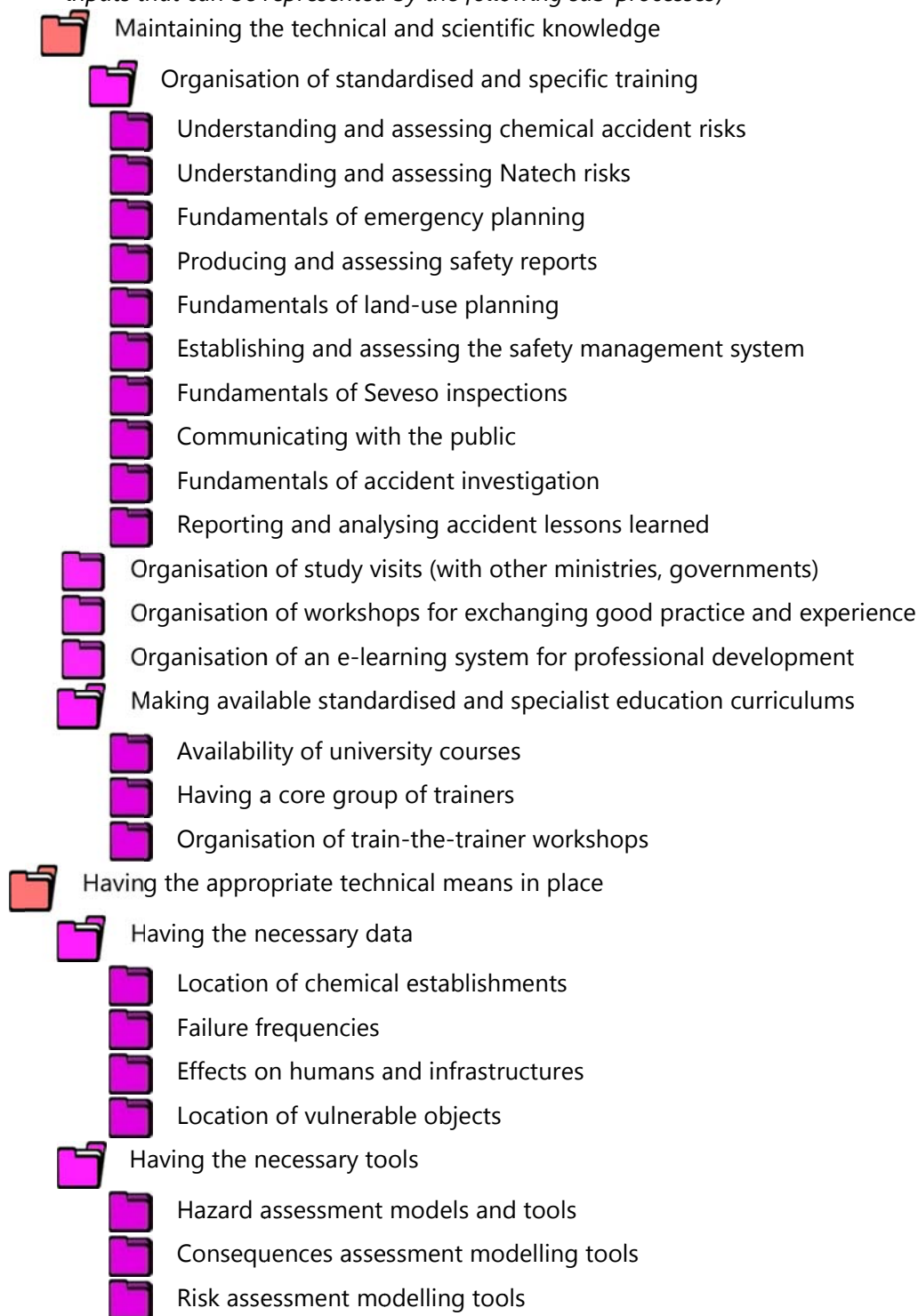
-  Establishing connections with relevant institutions and organisations
 -  Developing internal connections between national institutions and organisations
 -  Developing external connections with international institutions and organisations
 -  Developing connections with industry and multinationals
 -  Relating with professional institutions, industry associations and global companies
-  Having appropriate means of working with other institutes and organisations
 -  Having intergovernmental and interagency arrangements for co-operation
 -  Establishing rules and protocols for dispute resolution
-  Having an inclusive approach
 -  Including all participants in policy and communication planning
 -  Dissemination of information to interested parties

























 **[I] Integrating people and processes**











-  Ensuring team building
 -  Participating in design and planning
 -  Participating in field implementation activities
 -  Involving in communication
-  Enhancing sense of ownership
 -  Clarifying roles, decision-making and authority responsibility
 -  Stabilising people in their role
 -  Liaising with networks
-  Exchanging and sharing cross discipline
-  Identifying shared interests and common goals across sectors

 **[O] Having an operational capability**
(Most of the issues addressed in this process are of technical nature and are linked with supporting and assisting the country in key technical areas to strengthen its

capacity/systems. Operational capacity for a CAPP programme requires a number of inputs that can be represented by the following sub-processes)



-  Tools for mapping risk and consequence assessment results
-  Accident analysis/investigation models and tools
-  Having the necessary operational equipment
 -  Having adequate firefighting staff and equipment
 -  Having civil protection measures in place for chemical emergencies
 -  Having medical emergency teams with appropriate expertise
-  Having the scientific and technical infrastructure
 -  Establishing centres of excellence
 -  Having university curriculums addressing the necessary scientific disciplines
 -  Having research centres with expertise in relevant disciplines
-  [D] Maintaining the assessment and delivery process
(This process is necessary for maintaining that all the means are put in place to keep the capacity building activities ongoing. For CAPP capacity building, key indicators include the following)
 -  Measuring performance
 -  Identifying capacity baseline and assessing the needs
 -  Monitoring progress
 -  Managing change and change impacts
 -  Maintaining important working relationships
 -  Facilitating cooperative arrangements with established knowledge networks
 -  Managing the collaboration and coordination between all process contributors
-  [R] Having a legal framework in place compliant with international law
(This process is necessary for addressing all of the key legal and regulatory issues, including international law, essential for justifying and supporting capacity building. Capacity for building the CAPP programme could be measured by indicators such as:)
 -  Having adequate legislation and regulation
 -  Covering high hazard sites
 -  Imposing appropriately rigorous obligations on operators
 -  Establishing government obligations for enforcement and oversight
 -  Establishing government obligations for land-use and emergency planning

-  Providing public access to necessary information on risks
-  Defining institutional responsibility and accountability
-  Having adequate legal instruments for exchange of information
-  Having institutions that ensure the law is enforced
-  Having a legal system that supports enforcement of the law
-  Having political support for enforcement of the law
-  Having tools and guidance for compliance with the law
-  Standards and guidelines for regulatory compliance
-  Procedures and tools for implementing obligations
-  Rules for managing non-compliance

3.9 APPLICATION OF THE CB HIERARCHICAL PROCESS MODEL WITHIN THE PROJECT

The JRC proposes to apply the model presented above as a basis for establishing a baseline for the country at the start of the project in the context of a capacity building index. The survey responses will in the first instance serve as surrogate indicators of the robustness of the different processes identified within the CB hierarchical process. In initial dialogues the country situation in comparison to the model may be modified as survey responses are clarified and gaps in knowledge, due to limitations of the survey approach are addressed.

The model itself is expected to evolve and change with input from the workshop experts and the countries themselves and from experience accumulated in the project over time. Application of the model will undergo a first test of robustness in analysis of the survey responses for each country. Countries can comment as to whether the outcome of the survey for their country is representative or if the model could be elaborated and changed to generate a better reflection of its circumstances. A peer review of the model may also be separately conducted

At various intervals of each country project, the JRC intends to conduct one or more evaluations using a mechanism (e.g., another survey, country interviews, case studies of industry sectors, or other means) on the basis of the model. In preparation for this exercise, the model may be re-evaluated to confirm that it remains reflective of the general experience of the project, including the country stakeholders as well as external experts involved.

4 CONCLUSIONS AND RECOMMENDATIONS

This report contains a number of conclusions and recommendations associated with individual report chapters, in particular, Chapters 1-3 form the main body of information providing input on different aspects of the initiative. It is envisioned that there will be a number of different country projects starting at different times, each of them with unique starting points, advantages, disadvantages and needs. Each project will have its own dynamic and influences that will drive the pace and outcomes. Keeping track of progress and responding to new inputs will require a constant monitoring of strategic options and both a proactive and interactive approach to overall implementation. As such, it is important that the initiative, and each project within the initiative, can refer to main principles to follow to keep projects on track and moving forward and to help analyse and address challenges that may arise.

For this reason, several main principles have been identified along with some initial recommendations on how they might be achieved. It must be emphasized that as the initiative evolves new recommendations may also evolve from experience in working with countries on an individual basis. These principles are outlined below as follows:

1. Bringing a diversity of expertise to the project

Capacity building is essentially an exercise in putting processes in motion that can lead to positive change. Process modelling and agreeing upon the processes is a matter of judgement. Multidisciplinary team working and exchange of views between experts with different backgrounds can help in reaching consensus and agreeing upon the structure. A team approach is an interactive activity where all the players discuss and agree on the different processes that are considered being representative for the purpose. Participants of diverse expertise and background can bring a better understanding of how the process works to contribute to the overall project success. A team approach will enhance communication and information flow between different domains and will promote building consensus among the players.

Recommendations

- 1.1. Establish an advisory group of experts for the Seveso ENPI initiative to assist the JRC in developing and maintaining a successful CAPP strategy in project countries.
- 1.2. Establish a country coordinating committee for each project consisting of internal leaders in government and industry to guide the project's strategy and implementation.

2. Establishing a baseline for improvement/Measuring tangible and intangible capacity/Evaluating progress

Implementing the Seveso Directive is a long process which should be monitored against a set of goals on a regular basis and eventually act upon the findings. Measurement and monitoring mechanisms also

provide an opportunity for all of the players and stakeholders involved, to discuss, elicit, evaluate and update parts of the capacity building model itself.

Recommendations

- 2.1. Develop an index to measure the capacity building progress over time achieved by the project and the countries, using the Capacity Building Hierarchical Process Model in Chapter 3 as the reference model.
- 2.2. Apply the index to each country's survey responses to establish an initial reference point.

3. Verifying the level of political commitment, national vision and cooperation between ministries.

A key issue is always whether the country has a national chemical accident prevention policy that is shared by the key government and industry stakeholders. Political commitment is needed to establish a national vision and high level cooperation in government is necessary to implement the vision. The lack of political commitment creates an obstacle to the country's ability to make any project results sustainable. The lack of a unified national vision creates a risk that key stakeholders to improving chemical accident prevention in the country are excluded from the project. If there is political commitment and a national vision, but no cooperation then there is a risk that implementation will be fragmented, contradictory and perform well below expectations.

Recommendations

- 3.1. Follow-up on the survey to build a picture of the country's current perception and risk tolerance, its political commitment and policy vision for controlling chemical accident risks.
- 3.2. Establish initial project expectations based on these inputs. Where there is no political commitment, no policy vision, or intergovernmental co-operation, these aspects may need to be addressed first.

4. Identifying and building motivation/ Promoting national leadership

The principle that good safety systems protecting both human and environmental safety is good sustainable business for all stakeholders. The involvement of all parties (business, public and regulators) working together will motivate a reasonable and practicable CAPP system.

Recommendations

- 4.1. Identify which parties have a leadership role in the country early in the capacity building project in order to initiate and bring the different elements forward necessary for establishing a chemical accident prevention capacity.
- 4.2. Initiate pilot projects with a few countries with strong political commitment that can serve as potential models of bilateral collaboration for additional projects.

5. Involving the right people / Multi-sector engagement/ Ensuring sustainability through giving ownership

It is paramount that people who will implement and represent end-users of the project results are involved from the beginning. Countries should look at their own sources of expertise with an encompassing view. Elaborating the range of internal expertise and sectors (e. g., scientists, regulators, industry etc.) engaged within a project is particularly important in countries that have a robust CAPP system. For less advanced CAPP countries, having a diverse internal network of experts should be identified as an important objective and a measure of sustainability.

Recommendations

- 5.1. Encourage the country to establish a central coordinating body to improve the openness of communications and exchange information and experience. The coordinating body can play a critical role in leveraging available competences and resources and prioritising needs and opportunities for intervention.
- 5.2. Involve qualified and experienced government and industry experts in the discussions about the ways tools, procedures and regulations can be adapted to address deficiencies and gaps in the country's approach and infrastructure for chemical accident prevention.

6. Ensuring industry involvement

While the government is often the first entry point for change, industry has the means and is responsible for keeping sites safe. Each project needs to involve representatives of leading industries, promoting active input and exchange of views. Indeed, there must be a no risk environment for information exchange to obtain their positive involvement. There must also be the possibility of a confidential exchange of information.

Recommendations

- 6.1. Invited industry representatives to participate in meetings of the coordinator group and input should be explored for improving government approaches.
- 6.2. Engage industry in specific technical approaches aimed at boosting industry capacity, for example, establishing training and guidance for hazard identification, or developing a checklist for storage sites.

7. Involvement of the public

Fostering engagement of the general public as well as special interests is an additional investment in the sustainability of the CAPP programme. Approaches vary with individual country needs but can, for example, take the form of education and awareness-building, representation on an advisory committee, or active consultation on specific decisions. The public in the vicinity of major hazard plants are critical stakeholders. If this section of the public does not have a feeling of ownership of the risks and benefits of the installations, there will be a risk to sustainability.

Recommendations

- 7.1. Invite the country to consider involving the media to build an understanding of chemical accident risks and relevant terminology.
- 7.2. Facilitate inclusion of representatives of local government, local fire protection services and plant communities in the coordinating committee or in specific meetings, training or other exchanges.
- 7.3. Bring awareness of available resources and tools for promoting local community involvement such as the UNEP APELL programme.

8. Promoting sustainability by promoting sustainable training options

The results and outputs of a project are sustainable when these (1) are effectively maintained or can be further developed within the country after the end of the project and (2) create opportunities for developing new relationships as well as enlarging the cooperation in CAPP.

Recommendations

- 8.1. Offer adequate training materials and programmes that the country can use for its future internal training.
- 8.2. Establish a stable core group of qualified national experts and skilled trainers who are capable of disseminating their acquired specific in-depth knowledge and expertise through trainings and workshops continuously over the long term.
- 8.3. Develop a suite of toolkits and standards under the form of software, website, guidelines and handbooks designed for sharing and disseminating materials, developing inspection strategies or for selecting risk control measures.

9. Extending EU networks and tools in support of Neighbourhood countries

In particular, the JRC-MAHB has access to large amounts of experience reported by Member States and has extensive networks of experts in government and industry. Expert knowledge and expert systems held by JRC-MAHB itself, as well as that offered by EU Member States, are a credible and valuable point of reference and information for third countries. In point of fact, the EU continues to exhibit a staunch commitment to the Seveso regime despite the great political, legal, historical, cultural and economic diversity of the EU Member States. They also have numerous experts with experience in training inspectors and industry professionals in technical aspects of Seveso implementation. Many have also been engaged in solving some of the unique technical problems that Seveso may raise in such areas as enforcement, land-use and emergency planning, process design and operations, and human and organisational behaviour.

Recommendations

- 9.1. Make available JRC tools and products and adapt as appropriate and necessary for project countries.

- 9.2. Recruit qualified EU, internal or international experts as necessary to train trainers in project countries and maintain a level of ongoing support to bolster the retention of trained trainers. Criteria may include expertise for specific training, tools development and general consultation on specific projects. Country-specific knowledge would be an added value when available.
- 9.3. Actively seek to bring and retain the country in the international community's network of experts as a source of ongoing support.
- 9.4. Enhance the JRC's Minerva website to maximize access to knowledge, tools, advice and experience in the expert community and foster collaboration.

10. Building on relevant experiences and tools from international projects

The EU and international organisations have engaged for many years in capacity building in chemical accident prevention and preparedness as well as in related emergency response activities. The nature of the topic is vast and hence, the focus of these initiatives varies considerably and is by nature often fragmented. This collective effort has resulted in quite a number of useful tools and guidance for countries and companies seeking solutions to various policy and implementation challenges.

Recommendations

- 10.1. Build on the resources and activities of international organisations in the country to give project momentum and leverage experience and successes.
- 10.2. Take advantage of specialised tools and products for CAPP capacity building in leading international organisations, particularly UNEP, UNEP-OCHA and UNECE.

11. Adapting to country realities/Defining context-specific expectations and objectives, i.e., to match resource, competence, culture and logistical practicalities

Capacity building has the greatest chance of success when it builds on existing efforts and resources. The existing institutional frameworks should be used as the basis for improvement whenever possible. A change that foresees additional or different resources may need to be implemented incrementally and/or find creative alternatives. It is important that the providers of tools and systems make a commitment to listen to the receiving country and attempt to adjust tools and systems to the level most usable by the country concerned.

Recommendations

- 11.1. Identifying needs and opportunities and feasible options for implementation from a top-down perspective.
- 11.2. Soliciting bottom-up input from relevant stakeholders, such as operational staff, industry representatives both formally (e.g., in meetings or via surveys or written comments) and informally (e.g., at training workshops)

11.3. Identifying small improvements that can be implemented in a short time frame, providing motivation for working on greater challenges over the long term.

12. Learning from experience/ Benchmarking existing practice

Benchmarking against established systems in other countries can help identify areas where maximum gain can be achieved for an achievable investment. Exchange of tools, practice and experience between countries and companies is also a widespread practice in the EU and elsewhere that has proven effective in transferring knowledge between different actors. The complexity of CAPP implementation makes this method particularly powerful for making progress in improving chemical accident prevention at national and local level. Moreover, smaller and less-resourced countries and companies benefit significantly from the investments in CAPP implementation of larger countries and companies. This effort could potentially foster a belief in the attainability of practical objectives.

Recommendations

- 12.1. Initiate the development of relations with national and international actors in the CAPP field.
- 12.2. Foster and maintain cooperation between national and regional institutions and international governmental institutions and organisations in other domains or new activities.
- 12.3. Exploiting synergies with activities of international organisations may also lead to new relationships and opportunities for benchmarking and stimulating ongoing improvement.
- 12.4. Share experiences from other similar CAPP projects, e.g., the UNEP Flexible Framework Case Studies [10] and the JRC Enlargement Project from 2001-2003 on Seveso Implementation in pre-Accession countries [<https://minerva.jrc.ec.europa.eu> under "Publications"].

13. Periodic review and adjustment of strategy and implementation approaches

Capacity building is not a straightforward one-step activity but a process. The process itself needs periodic evaluation to ensure that the approach is having an impact in the right direction. This assessment should take place at a relatively early stage (e.g., following a year of activity) so that remaining time is sufficient for subsequent changes to have an impact.

Recommendations

- 13.1. Engage the Seveso ENPI advisory team in defining an interim process for measuring progress for the initiative.
- 13.2. Engage the project coordinating committee to provide the necessary information to measure progress at an interim stage.

A COUNTRY PROFILE REPORT

This Annex contains a short overview of selected EU Neighbourhood Countries' profiles in particular regarding the current situation in relation to their industrial accident risks and chemical accident prevention and preparedness programmes.

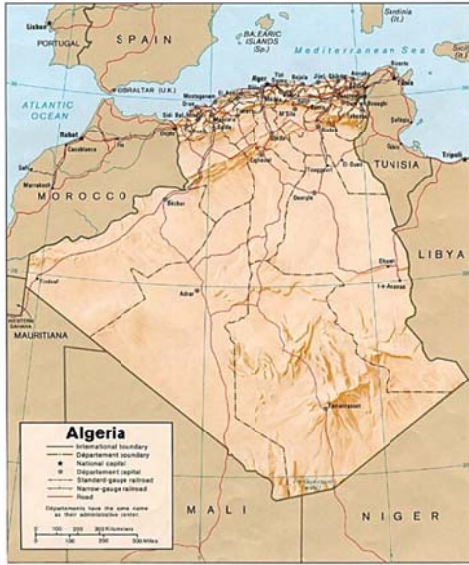
The information was retrieved mainly from the following three websites:

- <http://www.eia.gov/beta/international/> [23]
- <http://www.mbendi.com/land/p0005.htm> [24]
- <http://www.ciaworldfact.org> [25]

Whilst every care was taken in selecting the information published on these websites, the EC and MAHB cannot guarantee the accuracy or reliability of such content and cannot be held responsible for any errors or omissions and accepts no liability whatsoever.

Therefore, the presented country profiles are by no means a thorough and complete assessment of the country needs which can be used for planning an action for chemical accident prevention. To develop an effective program targeting the countries more information is needed and relevant inputs can be provided by other bodies of the EC such as EEAS and DG DEVCO EuropeAid.

A.1 ALGERIA



Official Name: People's Democratic Republic of Algeria

Languages: Literary Arabic, Algerian Arabic, Dzayer, French

Population: 39.2 million

Area: 2,381,741 square kilometres

Capital city: Algiers (1,977,663 inhabitants)

Other major cities (population)

Boumerdes (786,499)

Oran (645,984)

Tébessa (634,332)

Constantine (450,097)

Biskra (307,987)

Sétif (288,461)

Alger (275,630)

Annaba (206,570)

Topography

About half of Algeria is 900 m or more above sea level, and about 70% of the area is from 760 to 1,680 m in elevation. The highest point is Mount Tahat (3,003 m), in the Ahaggar Range of the Sahara. Only the main rivers of the Tell have water all year round, and even then the summer flow is small. None of the rivers are navigable. The mountainous areas of the High Plateaus are poorly watered; most of the rivers and streams (oueds) flow irregularly, since they depend for water upon an erratic rainfall. In the High Plateaus are many salt marshes and dry or shallow salt lakes (sebkhas or shotts). Farther South, the land becomes increasingly arid, merging into the completely dry desert. Algeria lies on the African Tectonic Plate with the North-western part of the country being in a seismically active area.

Climate

Northern Algeria lies within the temperate zone, and its climate is similar to that of other Mediterranean countries, although the diversity of the relief provides sharp contrasts in temperature. Farther inland, the climate changes; winters average 4 °C to 6 °C, with little or no rainfall in the summer months. In the Sahara Desert, temperatures range from -10 °C to 34 °C, with extreme highs of 49 °C. Rainfall is irregular and unevenly distributed.

Presence of industries processing or using dangerous substances

Oil and Gas

Algeria is the leading natural gas producer in Africa, the second-largest natural gas supplier to Europe, and is among the top three oil producers in Africa. Algeria is also estimated to hold the third-largest amount of shale gas resources in the world. One source identifies 37 sites in Algeria associated with oil and gas production. Of these, there are four "simple" and five "complex" refineries (in Algiers, Oran, Hassi Massaoud, Maison Carrée, and Skikda), two sites are gas fields, 15 are oil fields, 11 are "onshore concessions" (potential areas for future exploitation).

The Algerian national oil company is Sonatrach (Entreprise Nationale Sonatrach) and it plays a key role in both upstream and downstream oil and gas industries. It is responsible for exploration and production, transport, refining, processing, marketing and distribution. Algeria's national oil and natural gas company, Sonatrach, dominates the country's hydrocarbon sector, owning roughly 80% of all hydrocarbon production, while international oil companies account for the remaining 20%, based on data from Rystad Energy. By law, Sonatrach is given majority ownership of oil and natural gas projects in Algeria. Through its subsidiaries, the company has a domestic monopoly on oil production, refining, and transportation. Algeria's oil sector, though, is not completely open to foreign companies. All foreign operators must work in partnership with Sonatrach, with Sonatrach usually holding majority ownership in these production-sharing agreements.

International oil companies with notable stakes in oil and gas fields in Algeria are: Cepsa (Spain), BP (United Kingdom), Eni (Italy), Repsol (Spain), Total (France), Statoil (Norway), and Anadarko (United States). Sonatrach's substantial assets in Algeria make it the largest oil and gas company not only in the country, but also in Africa.

Companies listed in Algeria as various oil and gas service providers, including:

- Anadarko Petroleum Corporation
- Corprot DZ
- Gulf Keystone Petroleum Ltd
- BP Algeria
- Entreprise Nationale d'Industrie Petrochimique*
- Entreprise Nationale de Commercialisation et de Distribution des Produits Petroliers*

- Entreprise Nationale de Geophysique*
- Entreprise Nationale de Raffinage et de Distribution des Produits Petroliers*
- Entreprise Nationale des Grands Travaux Petroliers*
- Hyproc Shipping Company *
- Naftal*
- Naftec *

* subsidiary of Sonatrech

Important highlights:

- Algeria uses seven coastal terminals for the export crude oil, refined products, liquefied petroleum gas (LPG) and natural gas liquids (NGL). There are facilities located at Arzew (Algeria's largest crude oil export port), Skikda (Algeria's second largest crude oil export port), Algiers, Annaba, Oran, Bejaia, and La Skhirra in Tunisia. Arzew handles about 40% of Algeria's total hydrocarbon exports, including all of its NGL, LPG, and oil condensate exports.
- Sonatrach operates over 2,400 miles of crude oil pipelines in the country. The most important pipelines carry crude oil from the Hassi Messaoud field to export terminals.
- Algeria operates one crude oil pipeline connection to a foreign country. The 160-mile, 304,000-bbl/d OT1 pipeline connects the In Amenas oil field in the southeastern part of the country to the export terminal in La Skhira, Tunisia.
- Algeria is a major natural gas exporter, mostly to Europe.

Chemical industry

Algeria's chemical and plastics industries have been developed using the hydrocarbon feedstock from its well-developed oil industry. The country aims to produce an integrated, broad-based petrochemical industry to reduce Algeria's dependence on imports and increase the volume of petrochemicals and fertilisers available for export. The industry contributes substantially to the country's economy.

The Algerian chemical industry is dominated by Sonatrach, the Algerian national oil company. This includes an important role in the chemicals industry where its chemicals subsidiary, Entreprise Nationale d'Industrie Petrochimique (ENIP) is active. Through its subsidiary activities, Sonatrach owns petrochemical facilities and fertiliser plants.

Companies listed in Algeria in association with chemical manufacturing:

Company	Location
LC Process and Water Services sarl	Alger, Algeria
Société Nationale de l'Electricite et du Gaz {Sonelgaz}	Algiers and Alger, Algeria
Enterprise Nationale de Peinture {ENAP}	Lakhdaria, Tizi Ouzou, Algeria
Helios SPA	Algeria
Saidal	Algeria
Société de Peintures de L'Ouest Algerian {SPOA}	Oran, Algeria
Unite Industrielle Souk-Ahras	Algeria
Unite Peinture Cheraga	Cheraga, Algeria
Unite Peinture d'Oran	Oran, Algeria
Unite Peinture Lakhdaria	Lakhdaria, Tizi Ouzou, Algeria
Unite Peinture Oued Smart	Algeria
Unite Peinture SIG	Mascara, Algeria

Important highlights

- Algeria produces both nitrogenous and phosphatic fertilisers mainly for the domestic market. Nitrogenous fertilisers are produced at a plant in Arzew using natural gas as feedstock.
- There is a second fertiliser complex at Annaba. This site produces ammonium phosphate, sulphuric acid phosphoric acid and diammonium phosphate Sodium tripolyphosphate.
- Algeria produces a number of different kinds of polymer, including PVC, LDPE and HDPE. There are also a number of plastics converters in the country.
- Algeria has plans to develop the manufacture of pharmaceuticals by means of joint ventures with various international partners. Plans include the construction of a plant near Algiers to manufacture a range of drugs, a joint venture between Novo-Nordisk Pharmaceuticals (Denmark) and Enterprise Nationale d'Approvisionnement en Produits Pharmaceutiques. Other joint ventures, with Pfizer (USA) and Rhône-Poulenc Rohrer (France) are also in the pipeline. (Not sure how updated this information is.
- ENIP has an integrated chlor-alkali/petrochemical complex at Skikda. Products produced at Skikda include, ethylene, chlorine & caustic soda, hydrochloric acid, Vinyl chloride monomer (VCM), Polyvinyl chloride (PVC), LDPE, and HDPE.
- The Arzew refinery complex is the source of methanol and associated products. The range of products and capacities are methanol, phenol resin, melamine resins, and urea resins

Industrial disaster history and potential

- One study indicates that Algeria has an inventory of nearly 4,000 industrial sites at high risk, including 11 in the city of Algiers (the Barki refinery, the major pipeline supplying gas to the city, and the Bab Ezouar electric power plant).
- According to a study of refinery accidents in Algeria, there were 38 accidents causing 32 fatalities during the period from 2002 to 2013.
- An explosion of an LNG plant at Skikda refinery in 2004 caused 27 people to lose their lives.

History and potential for natural disasters

According to the World Bank hotspot study 2005, 5 of the most disaster prone countries of the world are located in the Arab Region: Jordan, Tunisia, Algeria, Morocco and Lebanon.

- Most recently in 2008, Algeria and Morocco were hit by the worst flooding for decades affecting more than 12,000 families. Additionally, the region contains active sea-floor spreading in the Mediterranean, Red Sea and the Gulf of Eden, posing a threat of a tsunami as well as an active tectonics in the Atlas Mountains of the Maghreb countries.
- The 2003 Boumerdès earthquake occurred with a moment magnitude of 6.8 on May 21 in northern Algeria. The quake was the strongest to hit Algeria in more than twenty years. Approximately 2,266 people were killed, 10,261 injured, and 200,000 left homeless as a result of the earthquake
- Earthquakes on 10 October 1980 in a rural area southwest of Algiers left over 2,500 persons dead and almost 100,000 homeless.
- The North African countries were hit by 82 major disasters between 1975 and 2001 (table 8) that affected Algeria most severely (36 events, 4,124 fatalities and 1,154,355 affected persons), followed by Egypt (14 events, 1,286 fatalities and 289,342 affected persons) and Morocco (23 events, 919 deaths, and 442,973 affected persons).

Studies and projects related to chemicals management

- Project POPS. Plan National de Mise en œuvre (PNM) - ALGERIE – Convention de Stockholm.
<http://www.mate.gov.dz/doc/DPEI/Plan%20National%20de%20Mise%20en%20oeuvre%20%28PNM%29-Stockholm.pdf>
- La Question du Risque Industriel et le Développement Durable en Algérie: Cas de la Wilaya de Skikda (la Zone Pétrochimique et la Cimenterie de Hadjar Assoud)
<http://bu.umc.edu.dz/theses/amenagement/BOU5982.pdf>

A.2 ARMENIA



Official Name: Republic of Armenia

Languages: Armenian (official) 97.9%, Kurdish (spoken by Yezidi minority) 1%, other 1% (2011 est.)

Population: 3,060,631 million

Area: 29,743 square kilometres

Capital city: Yerevan – inhabitants 1,049,000 (2014)

Other major cities (population)

Topography: Armenia lies between the Black and the Caspian seas, landlocked between Iran to the south east, Turkey along the south western corner, Georgia to the north and Azerbaijan to the east. The country features a high Armenian Plateau, mountains (the highest point is Mt Aragats with its peak at 4090 m) with many peaks above 10,000 feet), low forest land, fast flowing rivers, and the Aras River Valley, which is an extremely fertile area and forms most of the country's agricultural wealth. The Araks River forms most of Armenia's border with Iran, and part of the border with Turkey.

Climate: Armenian climate ranges from subtropical to alpine-like in the mountains. The mean temperature in midsummer is 25 °C and 0 °C in midwinter. Rainfall is infrequent. The capital city receives annually 33 cm of rain whereas more rainfall occurs in the mountains. In general the climate of Armenia is highland continental with hot summers and cold winters.

Presence of industries processing or using dangerous substances

Oil and gas: Armenia is completely dependent on imports of refined products as it has neither known reserves nor oil and gas production or refineries. Armenia imports all of its petroleum product by rail or truck with most of it coming from the Georgian Batumi refinery.

Important highlights:

- Armenia has one gas pipeline of 2,233 km (2013).
- Economic blockades organised by Turkey and Azerbaijan as part of the continuing dispute over Nagorno-Karabakh have cut Armenia off from an old direct gas pipeline from Azerbaijan.
- However there is a gas pipeline from Iran delivering gas from Turkmenistan. In December 1997 the Korpezehe-Kurt-Kwi pipeline transferring natural gas from Turkmenistan directly into the

Iranian pipeline was opened. In December 2001 agreement was reached on a route that bypassed the Azeri exclave of Nakhichevan, running from Kadzharan to the southern border at Megri.

Chemical industry:

During the Soviet period the chemical industry was one of the main industries in Armenia. The following are the main Armenian chemical industry:

- acetylene production complex (production of chloroprene rubber and latexes, production sites for hydrate of sodium, hydrochloric, acetic, formic, and propionic acids, vinyl acetate, polyvinyl alcohol, acetyl cellulose, mechanical rubber goods);
- production complex of calcium cyanamide, ammonia for nitrous fertilizers, melamine, carbamide;
- industrial complex based on utilization of sulphur dioxide of coppers melting production (production of sulphuric acid)

Major chemical plants are:

- "Nairit CJSC",
- "Polyvinylacetate",
- Chemical reagents plant,
- Vitamins plant,
- Plant of lacquers and dyes/paints,
- Plant of mechanical rubber goods, and
- Tires plant

Important highlights:

- Mineral resources in Armenia are concentrated in the southern region, where several operating copper and molybdenum mines were located. Copper mines were located at Kapan, Kadzharan, Agarak, Shamlugh, and Akht'ala; the latter two were not in operation in 2000. Kadzharan and Agarak also had molybdenum mines. Despite relative proximity to rail and port facilities that supplied European markets, the mineral sector's ability to compete on the world market was inhibited by infrastructure problems. Perlite was mined southeast of Yerevan; Armenia was the FSU's largest perlite producer in 2000, producing 35,000 tons.
- In 2000, Armenia produced industrial minerals such as clays, diatomite, dimension stone, limestone (1.7 million tons), salt (30,000 tons), and semiprecious stones. It mined copper (14,000 tons copper concentrate), copper-zinc, and native gold deposits. The Zod and Megradzor gold mines ceased operations in 1997. The Government hoped to revive the gold industry through the recovery of gold tailings at the Cuarat gold mill. Significant byproduct constituents in the

nonferrous ores in 2000 included barite, gold (estimated 400 kg, down from 2,000 in 1991), lead, rhenium, selenium, silver (1,300 kg), tellurium, and zinc.

- Armenia reported a 66% increase in mining and metallurgical output between 1994 and 1995, reversing the trend in which production of all mineral commodities had fallen since the 1991 breakup of the Soviet Union. The rise in mineral production was partly attributed to shipments from Iran of chemicals necessary to produce copper and molybdenum concentrates. In 1996, minerals and mineral products were Armenia's main export commodities. In 1995, the country started attracting foreign investment in its mineral industry by collecting open bids for the rights to mine 33 deposits, including deposits of gold; ferrous and non-ferrous metals; perlite; semiprecious, decorative, and facing stones; tuffs; and zeolite.
- Hydropower is Armenia's only indigenous source of energy. Armenia has several hydroelectric plants on the Razdan River. Nuclear power and thermal power also contributing to the country's energy supplies. The state electric utility is Armenergo.

Industrial disaster history and potential:

- Armenia suffered from numerous technological disasters. There were reportedly three major transport accidents, one major industrial accident and two major miscellaneous accidents. These events reportedly killed 119 people and affected 810 others.
- The country is also exposed to chemical hazards coming from pipelines and chemical plants as well as radiation hazard originating from the nuclear plant at Metsamor. This plant is considered as dangerous by the International Atomic Energy Agency (IAEA) because built in a seismic zone as well as of the type of nuclear reactor.

History and potential for natural disasters:

Earthquakes are the dominant natural hazards in Armenia, with an economic AAL of \$680 million, followed by droughts (\$6 million) and floods (\$0.7 million). The 20-year return period loss for all hazards is \$3.94 billion (43 per cent of GDP), while the 200-year return period loss is \$12.16 billion (132.5 per cent of GDP).

- The most devastating, the 7 December 1988 Spitak earthquake, had a magnitude of 6.9 and killed 25,000 people, affecting more than 1.6 million others. Direct economic loss was estimated at \$14.2 billion.
- The July 1997 Noyemberyan city earthquake affected 15,000 people and caused an economic loss of \$33.33 million.
- The 2000 drought severely affected 297,000 people and reportedly caused damage of \$100 million
- The single flood event of June 1997 affected 7,000 people and caused an economic loss of \$8 million.

Studies related to chemicals management:

- Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI), Risk Assessment for Central Asia and Caucasus Desk Study Review http://www.unisdr.org/files/11641_CentralAsiaCaucasusDRManagementInit.pdf
- National Profile of Chemicals and waste management UNITAR http://www2.unitar.org/cwm/publications/cw/np/np_pdf/ARMENIA_National_Profile.pdf

A.3 AZERBAIJAN



Official Name: Republic of Azerbaijan

Languages: Azerbaijani (Azeri) (official) 92.5%, Russian 1.4%, Armenian 1.4%, other 4.7% (2009 est.)

Population: 9,686,210 (July 2014 est.)

Area: 86,600 square kilometres

Capital city: BAKU 2.317 million (2014)

Other major cities (population)

Topography: The Republic of Azerbaijan is located partially both in Western Asia and Eastern Europe. The country is bounded by the Caspian Sea to the east, Armenia to the west, Russia to the north, Georgia to the north-west and Iran to the south. Forty per cent of the country is mountainous. The highest and lowest elevations in Azerbaijan are 4,466 metres (Mount Bazardüzü) and -28 metres (in the Caspian Sea), with respect to mean sea level.

Climate: The climate in Azerbaijan is subtropical on most of the country's foothills and plains, due to the presence of the Greater Caucasus mountain range in the north. It protects the country from the direct influences of cold air masses from the north. The plains and foothills are characterized by high solar radiation rates. The maximum and minimum temperature variation is very large, from +46° C to -33° C.

Oil and gas: Azerbaijan is among the oldest oil producers in the world. Oil and natural gas production and export are central to Azerbaijan's economic growth. According to the International Monetary Fund oil and gas exports account more than 90% of total exports making Azerbaijan's economy heavily dependent on its energy exports. Although traditionally it has been a prolific oil producer, Azerbaijan's importance as a natural gas supplier will grow in the future as field development and export infrastructure expand.

The country is one of the Caspian region's most important strategic export routes to the European markets. Oil exports through the Baku-Tbilisi-Ceyhan Pipeline, the Baku-Novorossiysk, and the Baku-

Supsa pipelines remain the main economic driver, but efforts to boost Azerbaijan's gas production are underway. The eventual completion of the geopolitically important Southern Gas Corridor between Azerbaijan and Europe will open up another, albeit, smaller source of revenue from gas exports.

Important highlights:

- Pipeline: condensate 89 km; gas 3,890 km; oil 2,446 km (2013)
- Virtually all natural gas is produced from offshore fields.
- Azerbaijan's proven gas reserves are estimated at about 30 trillion cubic feet
- The Azerineftya Refinery and Baku Oil Refinery were built during the Soviet era.

Chemical industry: Chemistry and petrochemical industry based on oil and gas processing plays an important role in the economy of the country. Enterprises involved in this sector are located close to raw material sources like Baku and Sumgait, but also Ganja, Salyan and Neftchala. Oil and gas, salt, iodine-bromide mine water, waste of ferrous metals are the basic materials used in chemical industry.

Important highlights:

- The first chemical plant was built in Baku in 1879.
- In the 20th century Sumgait became the centre of chemical industry of Azerbaijan.
- The main chemical products are: synthetic rubber, car tires, polymers like polyethylene, propylene, isopropylene, plastics, synthetic fibre and mineral fertilizers, soda, chlorine, iodine, washing powder, soap, medicines etc.
- A new project on commissioning the brand new Oil Gas Processing and Petrochemical Complex in Azerbaijan has been launched recently. The complex will consist of 4 production sites: a refinery (to be commissioned at the end of 2020), a gas processing plant (to be commissioned in 2017), a petrochemical plant (to be commissioned in 2018) and a thermal power centre (to be commissioned early 2017).
- The main chemical factories are: "Organic Synthesis" (1960), "Superphosphate" (1961), "Household Chemistry" (1978), "Synthesis Rubber" (1935) plants in Sumgait and "Baku Car Tire" (1959), "Baku Iodine" (1930), "Baku Chemistry and Pharmaceuticals", "Baku Rubber Products" (1929) plants in Baku, "Industrial Rubber" (1970), "glass Fiber" (1965) plants in Mingechevir, "Iodine-Bromide" plant in Neftchala (1972) and "Plastic Mass" (1972) plant in Salyan.

Industrial disaster history and potential: The country faces a possible nuclear radiation hazard originating from the nuclear plant at Metsamor, in Armenia. This plant is considered dangerous by the IAEA because of its location in an earthquake zone and its reactor type.

- Lost radiation source, Baku, Azerbaijan, 5 October 1982. And 13 injuries

- There were reportedly 11 major transport accidents along with one major industrial accident between 1988 and 2007. These accidents killed 700 people and affected 357 others.

History and potential for natural disasters: Azerbaijan lies in a region with moderate to very high seismic hazard.

- A magnitude 6.3 earthquake in the Baku region in November 2000 killed 31 people, affected 3,294 others and incurred a reported economic loss of \$10 million.
- An earthquake in July 1998 reportedly killed one person, affected a large number of people and damaged hundreds of houses.

Azerbaijan is susceptible to heavy flooding because of its topography and the water-related fluctuations in the Caspian Sea.

- The April 2003 flood in the Ismayilli-Gobustan region alone affected 31,500 people and caused an economic loss of \$55 million.
- In June 1997, a flood in the Tovuz-Khanlar region affected 75,000 people and caused an economic loss of \$25 million.

Occurrences of landslides during heavy rains cause significant damage to human settlements, industry, farms and roads.

- The only reported disaster event due to a landslide was in April 2000. A total of 11 people were killed and economic loss amounted to \$4 million.

Studies related to chemicals management:

- Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI), Risk Assessment for Central Asia and Caucasus Desk Study Review http://www.unisdr.org/files/11641_CentralAsiaCaucasusDRManagementInit.pdf

A.4 BELARUS



Official Name: Republic of Belarus

Languages: Belarusian (official) 23.4%, Russian (official) 70.2%, other 3.1% (includes small Polish- and Ukrainian-speaking minorities), unspecified 3.3% (2009 est.)

Population: 9,608,058 (July 2014 est.)

Area: 207,600 sq km

Capital city: Minsk 1.905 million (2014)

Other major cities (population)

Brest (300,715) all 2009

Homyel' (480,951)

Hrodna (317,365)

Mahilyow (369,200)

Vitsyebsk (342,700)

Topography: Belarus is located in Eastern Europe, east of Poland. Generally flat and contains much marshland

Climate: Climate of Belarus is moderately continental and has warm summers with mild and humid winters. Winter and summer periods last 105–145 and about 150 days respectively. Average temperatures in January and February, the coldest months range from 18°F to 25°F (–8°C to –4°C), while temperatures in July and August are around 65°F 18°C). In generally cold winters, cool and moist summers; transitional between continental and maritime

Presence of industries processing or using dangerous substances

Oil and Gas: Belarus has only small reserves of crude oil, though it imports most of its crude oil and natural gas from Russia.

- Pipeline: gas 5,386 km; oil 1,589 km; refined products 1,730 km (2013)

Important highlights:

- More than 80 oil deposits have been explored in Belarus and most of them are located in the Gomel region, in the northern part of the Pripyat downwarp.

- If oil production is maintained at the level of 2010 (1.7 million tons), its reserves in Belarus will be enough for 30 years.

Chemical industry: Chemical and petrochemical industries are the largest ones in the Republic of Belarus.

Important highlights:

- Major chemical industries are chemical fibre industry potassium salts mining and processing industry and oil processing industry.

Industrial disaster history and potential: The Chernobyl nuclear power plant accident that took place on 26 April 1986 in Ukraine released massive amounts of radiation, contaminating large amounts of agricultural land in Belarus. An estimated 150,000 inhabitants had to move, and many people needed medical help. Chernobyl caused the government to take more than 23 percent of the country's agricultural land and 20 percent of forest land out of production. Reports from Soviet and western scientists indicate that Belarus received about 60 percent of the contamination that fell on the former Soviet Union.

History and potential for natural disasters: No information found yet

Studies related to chemicals management:

No information found yet

A.5 EGYPT



Official Name: Arab Republic of Egypt

Languages: Arabic (official), English and French widely understood by educated classes

Population: 86,895,099 (July 2014 est.)

Area: 1,001,450 square kilometres

Capital city: CAIRO (capital) 18.419 million; and other major city is Alexandria 4.694 million (2014)

Topography: Egypt is located in Northern Africa, bordering the Mediterranean Sea, between Libya and the Gaza Strip, and the Red Sea north of Sudan, and includes the Asian Sinai Peninsula. It is vastly desert plateau interrupted by Nile valley and delta.

Climate: desert; hot, dry summers with moderate winters

Presence of industries processing or using dangerous substances

Oil and Gas: Egyptian production of crude oil was approximately 600, 000 barrels per day in 2012. Egyptian gas production was approximately 61.26 billion cubic meters in 2011 and Egyptian gas reserves are expected to increase by roughly 1.2 trillion cubic meters in 2013 after the latest gas discovery.

Important highlights:

- Pipeline: condensate 486 km; condensate/gas 74 km; gas 7,986 km; liquid petroleum gas 957 km; oil 5,225 km; oil/gas/water 37 km; refined products 895 km; water 65 km (2013)
- Oil/gas terminal(s): Ain Sukhna terminal, Sidi Kerir terminal and LNG terminal(s) (export): Damietta, Idku (Abu Qir Bay)
- Egypt's proven oil reserves are almost 4.4bn barrels.

Chemical industry: Key chemical industry sectors include fertilisers, petrochemicals, polymers and other chemicals.

Important highlights:

Major fertiliser companies in Egypt are:

- Societe El-Nasr d'Engrais et d'Industries Chimiques (Semadco)
- Abu Qir Fertiliser and Chemical Industry Company
- Abu-Zaabal Fertiliser and Chemical Company
- Societe Financiere et Industrielle d'Egypte
- El-Nasr Company for Manufacturing Coke and Chemicals

The Egyptian petrochemical industry is based around the petrochemical complex at Amerya. Products and production capabilities are the following:

- Ethylene
- Paraxylene
- Purified Terephthalic acid
- Linear alkyl benzene
- Chlorine/caustic soda
- Vinyl chloride monomer
- Polyvinyl chloride
- HDPE/LDPE

Other chemical companies include:

- Inorganic salts
- Pharmaceutical companies

Industrial disaster history and potential:

- 10/05/1998 Ras Gharib, Fire, oil
- 11/02/1994 Donca, Fire, 410 people dead, involved substance is oil
- The Jebel al Zayt oil spill occurred in the north of the Red Sea on June 16, 2010. It is considered to be the largest offshore spill
- The explosion of liquefied petroleum gas (LPG) during its transport on the Nile river kills 317 people

History and potential for natural disasters:

Egypt is prone to the earthquake, landslides, and flash floods.

- The earthquake 1992 killed 561 people 9929 people injured and 40 000 became homeless.
- The flash flood occurred in Upper Egypt in 1994 killed 253 people and 302 injured.
- There were earthquakes in 1955, 1969, 1981, 1983, 1992, 1995, and 2002.
- Flash flood occurred in 1972, 1979, 1991, and 1998 with fewer losses.
- Landslides occurred in Thebe plateau and in the Za'afarana region of South Suez.

Studies related to chemicals management:

- Efthimia K. Mihailidou, Konstantinos D. Antoniadis, Marc J. The 319 Major Industrial Accidents Since 1917,
http://www.hristov.com/jordan/pdfs/The%20319%20Major%20Industrial%20Accidents%20Since%201917-IRECHE_VOL_4_N_6.pdf
- Government of Egypt, National Report and Information on Disaster Reduction,
<http://www.unisdr.org/2005/mdgs-drr/national-reports/Egypt-report.pdf>

A.6 GEORGIA**Official Name:** Georgia**Languages:** Georgian (official) 71%, Russian 9%, Armenian 7%, Azeri 6%, other 7%**Population:** 4,935,880 (July 2014 est.)**Area:** 69,700 sq km**Capital city:** TBILISI (capital) 1.15 million (2014)

Topography: The Republic of Georgia is a transcontinental country, along the dividing lines of Asia and Europe and in the southern Caucasus, situated between the Black Sea to the west and the Caucasus mountains to the north. The country is bordered by Russia to the north, Azerbaijan to the east, Armenia to the south and Turkey to the southwest. Eighty per cent of the territory of Georgia is mountainous, with highest and lowest elevations of 5,201 metres (Mount Shkhara) and zero metres (Black Sea) above mean sea level. The Mtkvari and the Rioni are the two main rivers of Georgia, with lengths of 1,564 kilometres and 527 kilometres, respectively.

Climate: The climate is extremely diverse and there are two main climatic regions. The western part is humid and warm, and the eastern part has a moderately warm continental climate. The summers are

humid and warm, with an average temperature of 23° C in July, whereas winters are mild, with an average temperature of -5° C in January.

Presence of industries processing or using dangerous substances

Oil and Gas: Construction of the Baku-T'bilisi-Ceyhan oil pipeline, the South Caucasus gas pipeline, and the Kars-Akhalkalaki Railroad are part of a strategy to capitalize on Georgia's strategic location between Europe and Asia and develop its role as a transit point for gas, oil, and other goods. The expansion of the South Caucasus pipeline, as part of the Shah Deniz II Southern Gas Corridor project, will result in a \$2 billion foreign investment in Georgia, the largest ever in the country. Gas from Shah Deniz II is expected to begin flowing in 2019.

Important highlights:

- Pipeline: gas 1,596 km; oil 1,175 km (2013)

Chemical industry: The chemical industry of Georgia produces mineral fertilizers, synthetic materials and fibres, and pharmaceutical products. The building industry, using local raw materials, supplies the country with cement, slate, and many prefabricated reinforced-concrete structures and parts.

Industrial disaster history and potential: No information found yet.

History and potential for natural disasters: Georgia is vulnerable to natural hazards including floods, earthquakes, droughts, landslides, avalanches, debris flows and mud flows. Georgia lies in a region with moderate to very high seismic hazard.

- During March to April 1989, landslides killed 98 people, affected 2,500 others and incurred a reported economic loss of \$423 million.
- An earthquake in the Tbilisi region on 25 April 2002 killed 6 people, affected 19,156 others and caused an economic loss of \$350 million.
- A magnitude 7 earthquake in the Racha-Imereti region on 29 April 1991 killed 100 people, affected 100,000 others and caused an economic loss of \$10 million. This was followed by a magnitude 6.5 earthquake on 15 June 1991 in the Dzhava-Tskhinvali region, which killed 8 people and affected 3,740 others.
- The February 1987 flood in the Tbilisi region alone killed 110 people, affected 36,000 others and caused an economic loss of \$546 million.

Studies related to chemicals management:

- Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI), Risk Assessment for Central Asia and Caucasus Desk Study Review http://www.unisdr.org/files/11641_CentralAsiaCaucasusDRManagementInit.pdf
- European neighbourhood and partnership instrument – Shared environmental information system, Georgia country report, http://www.zoinet.org/web/sites/default/files/publications/SEIS/enpi-seis-country-report_georgia_final.pdf

A.7 ISRAEL



Official Name: State of Israel

Languages: Hebrew (official), Arabic (used officially for Arab minority), English (most commonly used foreign language)

Population: 7,821,850 (includes populations of the Golan Heights of Golan Sub-District and East Jerusalem, which was annexed by Israel after 1967) (July 2014 est.)

Area: 20,770 sq km

Capital city: JERUSALEM (capital) 829,000 (2014)

Major urban cities: Tel Aviv-Yafo 3.559 million; Haifa 1.09 million;

Topography: Israel is located in Middle East, bordering the Mediterranean Sea, between Egypt and Lebanon. Negev desert in the south; low coastal plain; central mountains; Jordan Rift Valley.

Climate: Temperate; hot and dry in southern and eastern desert areas.

Presence of industries processing or using dangerous substances

Oil and Gas: Israeli energy resources for natural gas and oil needed to have come almost exclusively from other places. Massive natural gas fields have been discovered recently and the potential for producible onshore oil. The Tamar Reservoir lies within Israel's maritime borders.

Important highlights:

- In 2009 of the 'Tamar' gas field was discovered and followed by an additional discovery at 'Leviathan', which turned to be one of the largest deepwater discoveries of gas. There are an estimated 122 trillion cubic feet of undiscovered, recoverable natural gas in the Levant Basin Province in the Eastern Mediterranean region. Additionally, the Levant Basin Province holds an estimated 1.7 billion barrels of undiscovered, recoverable oil.
- Pipeline: gas 763 km; oil 442 km; refined products 261 km (2013)

Chemical industry: Israel's chemical industry is the second largest industry after the high-tech and electronics sector by turnover and number of employees. It employs about 26,000 people. The industry includes exploitation of Israel's natural mineral resources, and the manufacture of basic raw materials, intermediates for various industries including agriculture, and manufacture of consumer products such as pharmaceuticals, cosmetics, and cleaning products. In the field of pharmaceuticals and plant-protection chemicals, Israeli companies are the world's leading generic manufacturers. The basic chemical industry in Israel is engaged, among other things, in the production of minerals from the Dead Sea such as: potash, bromine, magnesia and metal magnesium. The industry also processes a range of raw materials and manufactures intermediates with high added value for various industries.

Important highlights:⁶

- The Israeli chemical industry can be divided into several subsectors: minerals and fertilizers; bromine, refined oils and petrochemicals; pharmaceuticals; and cosmetics.
- Mineral and fertilizer:
 - ∴ Dead Sea Works produces approximately 3.5 tons of potash annually in Israel.
 - ∴ Israel is one of the world leaders in the production of white phosphoric acid.
 - ∴ Haifa Chemicals, with two production facilities, generates 30% of the world's "green" fertilizer, potassium nitrate.
 - ∴ The Timna valley near Eilat, home to Timna Mines, served as Israel's primary copper mining area from 1958 to 1985. In recent years, there have been renewed efforts to

⁶

<http://www.epicos.com/AdminTool/Pages/Blob/ViewDocument.aspx?ID=P4GvanMIAft4MMHGNNu5jFpegsNWTP%2F6JK3i3z%2Friidot4mGT6VtiAGv5G4bXpP0>

- continue copper mining at this historical mining site that is also known as King Solomon's Mines with a goal of producing over 20,000 tons of pure copper annually.
- Bromine, Refined Oils and Petrochemicals:
 - ∴ Bromine, produced in the Dead Sea area, is the cheapest source of bromine available worldwide. There are also plants for the production of bromine compounds for plastics, electronics, furniture and textiles, as well as products based on bromine which used for soil fumigation, water treatment and drilling equipment.
 - ∴ ICL's bromine production plant at the Dead Sea in Sodom has a production capacity of about 250,000 metric tons of bromine a year.
 - ∴ There are currently two oil refineries in Israel producing refined products for local and foreign consumption. Petrochemical production, based on these refineries, produce raw materials for export and the local plastics industry. Oil Refineries (Bazan), the larger of the two refineries located in Haifa, completed the construction of a \$500 million hydrocracker to transform crude into diesel and jet fuel more efficiently in 2012.
 - ∴ Other petrochemical facilities produce aromatic products and intermediates for the chemical industry
 - Pharmaceuticals:
 - ∴ Teva Industries is one of the world's largest manufacturers of generic pharmaceuticals.
 - ∴ Other companies include Dexxon, Taro and Perrigo.
 - ∴ In the area of biotechnology, Israel has small companies working on a wide variety of products in different stages of development.
 - Cosmetic industry:
 - ∴ There are more than 100 cosmetic manufacturers in Israel certified by the Ministry of Health, about half of which use Dead Sea minerals.

Industrial disaster history and potential:

- On Dec. 3, 2014 an oil pipeline in southern Israel ruptured, leaking nearly five million litres of crude into a nature reserve. The leak, near the village of Be'er Ora, was caused due to damage to the Trans-Israel pipeline, a major oil conduit between the Mediterranean and Red seas that runs from Eilat to Ashkelon. At least three people were treated by paramedics after they inhaled poisonous gases.
- 1991 July 9, There was fire in Haifa, Israeli. Economic loss was estimated 17 million €. ⁷

⁷ http://www.hristov.com/jordan/pdfs/The%20319%20Major%20Industrial%20Accidents%20Since%201917-IRECHE_VOL_4_N_6.pdf

History and potential for natural disasters: Sandstorms may occur during spring and summer; droughts; periodic earthquakes

- The Mount Carmel forest fire "The Carmel Disaster") was a deadly forest fire that started on Mount Carmel in northern Israel, just south of Haifa. The fire began at about 11:00 local time on 2 December 2010, and spread quickly, consuming much of the Mediterranean forest covering the region. The fire claimed 44 lives, making it the deadliest in Israeli history.
- The Neot HaKikar disaster, which occurred on 30 December 1970, was until the Mount Carmel forest fire of 2010 the worst natural disaster in the history of the State of Israel. Heavy rains caused rocks to detach from an overhanging cliff and crush a dining room in an Israel Defence Forces base. 19 soldiers and one civilian were killed and ten soldiers were injured (three of them severely).
- According to the government, an estimated 7,000 people could be killed, tens of thousands injured and a further 200,000 left homeless if a powerful earthquake struck Israel.

Studies related to chemicals management:

No information found yet.

A.8 JORDAN



Official Name: Hashemite Kingdom of Jordan

Languages: Arabic (official), English (widely understood among upper and middle classes)

Population: 7,930,491

Area: 89,342 sq km

Capital city: Amman - 1.148 million (2014)

Topography: Jordan is located in Middle East, northwest of Saudi Arabia, between Israel (to the west) and Iraq. Mostly desert plateau in east, highland area in west; Great Rift Valley separates East and West Banks of the Jordan River

Climate: Mostly arid desert; rainy season in west (November to April). Generally, the country has warm, dry summers and mild, wet winters, with annual average temperatures ranging from 12 to 25° C and summertime highs reaching the 40°C in the desert regions. Rainfall averages vary from 50 mm annually in the desert to as much as 800 mm in the northern hills, some of which falls as snow.

Presence of industries processing or using dangerous substances

Oil and Gas:⁸ As of 2012, Jordan was ranked as the 100th in the world in respect of proven oil reserves at approximately 1 million bbl of oil and 88th in respect of proven natural gas reserves at approximately 6,031 billion cu m.

Pipeline: gas 473 km; oil 49 km (2013)

Important highlights:

- There is no oil and gas activities conducted offshore, and onshore upstream activities are spread over the divided eight blocks , the Risha Block, the Dead Sea Block, the Azraq Block, the West Safawi Block, the East Safawi Block, the North Highlands Block, the Jafer & Central Jordan Block and the Sirhan Block.
- The majority of Jordan's oil and gas resources are concentrated in the Risha gas field in the northeast of Jordan and the Hamzeh oil field in the Azraq block which have cumulatively been producing an average of 30 mmscf/day and 40 bbl/day respectively since the late 80s.
- Jordan does not export any oil and gas and its energy security is highly dependent on imports.
- Oil and gas are imported to Jordan via tankers and the Arab Gas Pipeline ("AGP"). Despite the previously used Trans-Arabian Pipeline ("TAPLINE") and the older Mosul-Haifa oil pipeline, oil is imported overland by tanker trucks to Jordan's refinery in Zarqa.

Chemical industry: The manufacturing sector had two tiers. On one level were the large-scale, wholly or partially state-owned industrial establishments that produced chemicals, petrochemicals, fertilizers, and mineral products. These manufacturing entities included the "big five" companies that constituted the

⁸ http://www.academia.edu/3784334/The_Oil_and_Gas_Sector_in_Jordan_-_An_Overview

pillars of the industrial base: the Jordan Phosphate Mines Company, the Jordan Fertilizer Industries Company, the Arab Potash Company, Intermediate Petrochemical Industries, the Jordan Cement Factories Company, and also a recently enlarged oil refinery at Az Zarqa that employed about 3,000 persons. The chemical products sector employed about 4,000 workers at about seventy facilities.

Important highlights:

- Petroleum refining contributed 39 percent to gross output manufacturing; fertilizers, potash, and other non-metallic minerals, 13 percent; industrial chemicals, about 8 percent; and iron, steel, and fabricated metal products, about 10 percent. Thus, about 70 percent of total manufacturing output was closely linked to the mining and extractive sector.

Industrial disaster history and potential: The National Disaster Response Master Plan (NDRMP) of Jordan (2004) identifies the following man made hazards as potential threats to Jordan such as fires, chemical dangers (industrial releases, hazardous materials transportation accidents, etc.), chemical, biological, and radioactive contamination, armed conflict, and mass population migration.

History and potential for natural disasters: The National Disaster Response Master Plan (NDRMP) of Jordan (2004) identifies the following main hazards as potential threats to Jordan: earthquakes, flash floods, drought, locusts, and weather emergencies (snowstorms, frost).

Jordan, as well as the surrounding nations is vulnerable to strong earthquakes due to the existence to a deep seated transform fault, which marks the boundary between the Arabian and African plates.

- Earthquake on 11th July 1927, magnitude 6.2 killed 242 people. Epicentre was in Amman.
- 31 March 1969, magnitude 6.1 (Northern Red Sea), 22 November 1995, magnitude 7.1 located within the Gulf of Aqaba, 90 Km to the SSW from the city of Aqaba, and the 11th February 2004 earthquake epicentre was 45 Km from the capital Amman. The final earthquake occurred at a shallow depth of 25.8 km and was strongly felt in Amman and the northern area of Jordan.

In the past half century incidents of flash flooding in Jordan have claimed the lives of 345 persons and affected 24,321 lives.

- Flooding in 1963 killed 25 people.
- Flooding in 1965 affected 500 people.
- Flooding in 1966 affected 5792 people and killed 295.
- Flooding in 1987 killed 9 people.
- Flooding in 1991 affected 18 000 people and killed 8.
- Flooding in 2006 injured 25 and killed 6.

Jordan is currently one of the world's four water poorest nations with more than 90% of the country classified as desert to arid (semi-desert) areas.

- Drought in 1966 affected 180 000 people.

Studies related to chemicals management:

None found yet

A.9 LEBANON



Official Name: Lebanese Republic

Languages: Arabic (official), French, English, Armenian

Population: 5,882,562 (July 2014 est.)

Area: 10,400 sq km

Capital city: BEIRUT (capital) 2.179 million (2014)

Topography: Lebanon is located in Middle East, bordering the Mediterranean Sea, between Israel and Syria. Narrow coastal plain; El Beqaa (Bekaa Valley) separates Lebanon and Anti-Lebanon Mountains.

Climate: Mediterranean; mild to cool, wet winters with hot, dry summers; Lebanon mountains experience heavy winter snows.

Presence of industries processing or using dangerous substances

Oil and Gas: Lebanon currently imports all of the oil it consumes, approximately 101,000 bbl/d of oil. Lebanon is not an oil producing country.

Pipeline: gas 88 km (2013)

Important highlights:

- According to the US geological survey, the undiscovered oil and gas resources of the Levant Basin Province to be around 1.7 billion barrels of recoverable oil and 122 trillion cubic feet (tcf) of recoverable gas.
- The Lebanese State has the exclusive right to own and manage petroleum resources in Lebanon.
- Recent results of a seismic survey conducted by Spectrum (a British company) in Lebanese territorial waters - 12 miles (19 kilometers) according to international law -- indicated that there are thirty-one sites containing oil reservoirs.
- As a result of its geographic location, Lebanon was once considered a refinery centre for crude oil that was exported from Iraq and Saudi Arabia by pipelines to two Lebanese coastal refineries, Zahrani in the south, and Tripoli in the north.
- The Levantine basin within the Eastern Mediterranean region is considered today as a new frontier hydrocarbon province, being constantly re-assessed through advances in seismic technology. It covers approximately 83,000 square kilometers (km²) of the eastern Mediterranean area. It is bounded to the east by the Levant Transform Zone, to the north by the Tartus Fault, to the northwest by the Eratosthenes Seamount, to the west and southwest by the Nile Delta Cone Province boundary, and to the south by the limit of compressional structures in the Sinai. It includes the territorial waters of Lebanon, Israel, Syria and Cyprus.

Chemical industry: The Lebanese chemical industry is 5th largest industrial sector in the country in terms of output, providing everything from basic chemicals to soaps, detergents, and paints.

Important highlights:⁹

- It has a total workforce of around 4,000 concentrated in 180 companies.
- 36% of all companies operating in the chemicals sector produce soaps & detergents, and 32% produce paints. Few companies (less than 4%) focus on the production of basic chemicals.
- The industry is largely dominated by small-to-medium-size enterprises, which form the bulk of the sector: 70% of companies engaged in the chemical sector employ less than 20 employees.

⁹ file:///C:/Documents%20and%20Settings/vanwijk/My%20Documents/Downloads/lebanon_baseline_information_october_2013.pdf

- Lebanon imported 6,978,954 tons of chemical products (organic and inorganic chemicals, pharmaceutical products, fertilizers, tanning or dyeing extracts, essential oils and resinoids, soap, organic surface active agents, dental waxes, photographic and cinematographic goods), while exports of chemical products reached 153,814 tons (2004).

Industrial disaster history and potential:

- July 15, 2006 Beirut, Lebanon: The Israeli navy bombs the Jieh coast power station, and between three million and ten million gallons of oil leaks into the sea, affecting nearly 100 miles of coastline.

History and potential for natural disasters:¹⁰ Lebanon is subject to a wide range of natural hazards; the biggest threat being of a severe earthquake and/or an associated Tsunami. A new underwater survey has revealed that Lebanon lies dangerously close to a fault that could generate a catastrophic tsunami -- the same fault caused a tsunami-generating earthquake that destroyed Beirut in 551 AD.

- Earthquakes: Lebanon lies along the 1,000 km-long left-lateral Levant fault system (LFS) that is responsible for a significant number of seismic events. The fault line lies along the coastal area where most of Lebanon's population, cities and capital investments are concentrated. 20% of buildings across Lebanon risk collapse should an earthquake occur. Early in 2008, part of South Lebanon was shaken by a series of earthquakes, the largest of which on 15 February measured 5.1 on the Richter scale.
- Floods are common in Lebanon, particularly in the Bekaa valley and are key to agricultural production as they replenish minerals in the soil. However, above average floods regularly cause a loss of agricultural production and population movements. The last major flood in 2003 affected 17,000 people.
- Wild fires: Wild fires occur on a regular basis, primarily in Mount Lebanon and the North. Between 2004 and 2006, 390 fires occurred.

Studies related to chemicals management:

- UNEP, National Profile on Management of Chemicals in Lebanon <http://test.moe.gov.lb/pdf/Pops/National%20Profile%20on%20Chemicals%20Management%20in%20Lebanon.pdf>

¹⁰ file:///C:/Documents%20and%20Settings/vanwijk/My%20Documents/Downloads/lebanon_baseline_information_october_2013.pdf

A.10 MOLDOVA



Official Name: Republic of Moldova

Languages: Moldovan 58.8% (official; virtually the same as the Romanian language), Romanian 16.4%, Russian 16%, Ukrainian 3.8%, Gagauz 3.1% (a Turkish language), Bulgarian 1.1%, other 0.3%, unspecified 0.4%

Population: 3,583,288 (July 2014 est.)

Area: 33,851 sq km

Capital city: CHISINAU (capital) 721,000 (2014)

Topography: Moldova is located in Eastern Europe, northeast of Romania. Rolling steppe, gradual slope south to Black Sea.

Climate: The geographic location of Moldova determines the moderate continental climate, which transitions from an Atlantic Ocean climate to an East-European continental one. Moderate winters, warm summers.

Presence of industries processing or using dangerous substances

Oil and Gas: Moldova is a net oil importer, depending primarily on Russia for most of its supply. Moldova has no natural gas resources and is entirely dependent on Russia to meet its consumption. Moldova's dependence on Russian energy is underscored by an estimated \$4.3 billion debt to Russian natural gas supplier Gazprom due largely to unreimbursed natural gas consumption in the separatist Transnistria region.

Important highlights:

- Pipeline: gas 1,906 km (2013)
- Since 2003 activities of natural gas reserve exploration have been initiated in the south of the country, v. Valeni, r. Cahul

- In October 2004, the Moldovan government announced plans to build a \$220 million refinery linked to the Ukraine's 180,000-bbl/d Brody-Odesa oil pipeline. The refinery will allow Moldova to import crude oil and process it domestically.
- In February 2005, Azerbaijan's AzPetrol Moldova Company purchased the unfinished Giurgiulesti Oil Terminal in southern Moldova on the Danube River. Plans include the construction of a sea/river port and another oil refinery for completion within seven years.

Chemical industry: Moldova produces a narrow range of chemicals, largely oriented towards the domestic market, namely pharmaceuticals, dyes, paints and varnishes, and perfumery products.

Important highlights:

- Currently, there are 187 enterprises specializing in the manufacture of rubber and plastic products.
- There are 69 chemicals industry enterprises (19 pharmaceutical and medicine factories, 12 factories producing soap, detergents, perfumery and cosmetic products, etc).
- The majority of the country's needs for chemical substances is covered by imports into the country. The main chemical substances imported into the country were: petroleum products, fertilizers, pesticides, diverse raw materials, products and substances for the manufacturing industry and for other industries.
- The Republic of Moldova does not have any mineral resources for the production of chemicals, except the extraction of raw materials used in building material industry, including gypsum stone and sand.

Industrial disaster history and potential: Hydro-meteorological phenomena (hail storms, early frost onset, droughts, and floods), landslides and seismic hazards (earthquakes).

- Nine severe droughts occurred in the country during the period 1990-2007. The droughts of 1990, 1992 and 2003 each lasted for the whole vegetation period of four to nine months.
- Historic earthquake records report a severe earthquake of magnitude 7.3 in Chisinau in 1940. Moldova is in close proximity to the Vrancea seismic zone in Romania.
- March 04, 1977 7.2 magnitude earthquake
- August 30, 1986. 7.0 magnitude earthquake 2 people died and 15020 people affected by it. Economic loss 680 million USD

Studies related to chemicals management:

- UNEP, National Profile for Chemicals Management in the Republic of Moldova
<http://www.moldovapops.md/app/includes/files/NPCM%20Moldova%20Eng.pdf>
- PPRD East civil protection operational guidebook,
<http://euroeastcp.eu/assets/files/Publications/CPO%20Guidebook.pdf>
- http://www.unisdr.org/files/1741_SouthEasternEuropeDRMitigation.pdf

A.11 MOROCCO



Official Name: Kingdom of Morocco

Languages: Arabic (official), Berber languages (Tamazight (official), Tachelhit, Tarifit), French (often the language of business, Government, and diplomacy)

Population: 32,987,206 (July 2014 est.)

Area: 446,550 square kilometres

Capital city: Casablanca 3.491 million; RABAT (capital) 1.932 million; Fes 1.149 million; Marrakech 1.1 million; Tangier 948,000 (2014)

Topography: Morocco is located in Northern Africa, bordering the North Atlantic Ocean and the Mediterranean Sea, between Algeria and Western Sahara. The Northern coast and interior are mountainous with large areas of bordering plateaus, intermountain valleys, and rich coastal plains.

Climate: It is Mediterranean, becoming more extreme in the interior

Presence of industries processing or using dangerous substances

Oil and Gas:

Morocco is a net hydrocarbon importer. The country produces marginal amounts of oil, natural gas, and refined petroleum products, which is mainly consumed domestically. Morocco has two refineries with a total crude oil distillation capacity of about 155,000 barrels per day (bbl/d), according to Oil & Gas Journal.

Production of petroleum and other liquids in Morocco was 5,100 bbl/d in 2013, while total petroleum consumption stood at 209,000 bbl/d. Likewise, natural gas production falls well below consumption, totaling 2 Bcf in 2012, while consumption was 38 Bcf.

Important highlights:

- Pipeline: gas 944 km; oil 270 km; refined products 175 km (2013)

- Exploration for oil in Morocco first began in 1929 and by 1939, production was 5,000 tons/year (100 b/d) of oil.
- The country's current proven reserves are estimated at 60,000 tonnes of oil, 1,020 million cu. m. of natural gas and 160,000 tonnes of gas condensate.
- Morocco also has oil shale deposits at Timahdit and Tafaya in the Atlas Mountains.
- The most important oil and gas fields currently in production are the Essaouira Basin on the coast producing oil and natural gas, and the Gharb Basin in the north producing natural gas.
- A considerable gas field has also been discovered at Meskala just north of Essaouira.
- Morocco has a well-developed downstream industry. Refineries owned and operated by Opil are located at Sidi Kacem and at Mohammedia near Casablanca and have 7 million ton capacity. They annually deliver about 4 million tons.
- The Maghreb-Europe gas (MEG) pipeline has been operating since November 1, 1996.
- The country has 2 oil refineries with a total refining capacity of 150,000 barrels per day. The Société Anonyme Marocaine de l'Industrie Raffinage (Samir) Refinery is a 125,000 b/d facility at the port of Mohammedia and the Société Chérifiennedes Pétroles (SCP) is a 25 000 b/d plant at Sidi Kacem.
- French company Vitogaz is building an LPG import terminal and tank farm near Casablanca with a capacity of 40,000 ton pa. Somas, which is owned by Elf, Afriquia, Shell, Total and Sodipi has an underground gas tank farm at Sidi Larbi with a capacity of 110,000 tons.

Chemical industry:

The Moroccan chemical industries occupy an important place with 1.602 establishments (21% of the industrial plants). These industries contributed to a total value of 19% in the industrial production and to 19% of the GDP, using 14% of the total staff complement of labour, with the drainage of 17% of the investments and 22% of exports. Morocco's chemical industry is dominated by its downstream phosphate chemicals, as a result of Morocco owning about two thirds of the world's reserves of phosphate rock. The main products manufactured are phosphoric acids and phosphate based fertilisers.

Important highlights:

The chemical and para-chemical industry enjoys a privileged position in the Moroccan industrial fabric. The chemical and para-chemical industry is composed of eight branches:

- Wood work
- Paper and paperboard
- Publishing, printing and reproduction
- Coking, refining and nuclear industries
- Chemical Industry
- Rubber and plastic products
- Other non-metallic mineral products

- Furniture and miscellaneous industries

There are a number of phosphate-based chemical plants in Morocco:

- Maroc Chimie I, at Safi (phosphoric acid and fertilisers)
- Maroc Chimie II, at Safi (phosphoric acid)
- Maroc Phosphore I, at Safi (phosphoric acid and mono-ammonium sulphate).
- Maroc Phosphore II, at Safi (sulphuric acid and phosphoric acid). This is one of the largest phosphoric acid complexes in the world. The complex uses local phosphates and sulphur imported from Saudi Arabia, Poland and Canada.

Industrial disaster history and potential: In March 1984, a serious radiation accident in Morocco occurred where eight people died from overexposure to radiation from a lost iridium-192 source.

History and potential for natural disasters: Morocco's rainy season extends from October through April, often resulting in devastating floods. Within the past decade (2002-2011), nine out of the top ten natural disasters in Morocco were floods. Droughts rank on top of the list of natural disasters in terms of the number of people affected and associated economic losses. Droughts affect water supplies in rural areas and have negative impacts on rainfed agriculture. Fire incidents have been on the increase causing estimated losses in forest products (timber and non-timber forest products) of 18 million DH (dirham) per year (approx. US\$1.8 million). The northeastern part of Morocco is highly susceptible to landslides resulting from both precipitation events, as well as earthquakes.

Important highlights:

- The 1960 Agadir earthquake occurred on February 29. Agadir is located in western Morocco on the shore of the Atlantic Ocean. Magnitude of 5.7 on Richter scale earthquake killed around 12,000 people (about a third of the city's population of the time) and another 12,000 injured with at least 35,000 people left homeless, making it the most destructive and deadliest earthquake in Moroccan history.
- The 1969 Portugal earthquake struck western Portugal and Morocco on February 28. Originating west of the Strait of Gibraltar, the earthquake registered a magnitude of 7.8 on Richter scale. In total, thirteen (11 in Morocco) people died.
- The 2004 Al Hoceima earthquake occurred on 24 February near the coast of northern Morocco. The earthquake measured 6.4 on Richter scale. At least 629 people were killed, 926 injured, 2,539 homes destroyed and more than 15,000 people were made homeless in the Al Hoceima-Imzourene-Beni Abdallah area.
- The 2007 Iberian Peninsula earthquake (also known as the 2007 Horseshoe earthquake) occurred on February 12 with its epicentre in the eastern Atlantic Ocean, off the coasts of Portugal and Morocco. The earthquake had a moment magnitude of 6.1. The shock was

widely felt in Portugal, Spain, and Morocco, but did not cause any damage due to its distance from the shore.

- The landslide of April 1982 affected over 12,216 people.

Studies related to chemicals management:

No information found yet.

A.12 PALESTINIAN AUTHORITY



Official Name: State of Palestine

Languages: Arabic, Hebrew (spoken by Israeli settlers and many Palestinians), English (widely understood)

Population: 4,3 million (2012)

Area: 6,220 sq km

Capital city: Ramallah (West Bank), East Jerusalem has been proclaimed as the capital of Palestine

Topography: Gaza--sand- and dune-covered coastal plain; West Bank--mostly rugged dissected upland, some vegetation in west.

Climate: A Mediterranean climate prevails in Palestine. Summers are hot and dry. Winters are rainy and cold

Presence of industries processing or using dangerous substances

Oil and Gas:¹¹ In March 2010, the U.S Geological Survey published a Fact Sheet on the Assessment of Undiscovered Oil and Gas Resources of the Levant Basin Province, Eastern Mediterranean estimating that there was "a mean of 1.7 billion barrels of recoverable oil and a means of 122 trillion cubic feet of recoverable gas in the Levant Basin Province" making the region one of the most important sources of natural gas in the world.

The Levant Basin Province spans from the Nile Delta Cone below the south west of Israel and the occupied Gaza Strip of Palestine, to the Tartus Fault north of Lebanon, and the Eratosthanes Seamount in

¹¹ <http://www.alhaq.org/publications/Gas-report-web.pdf>

the northwest, off Cyprus in the Mediterranean sea, and the Levant Transform Zone, bordering the West Bank, Israel, Jordan and Lebanon and Syria.

There are potentially eight gas fields off the coast of Gaza, one gas field on the border of the West Bank, and potentially two or more oil fields bordering the northern and southern boundaries of the Gaza Strip and a cluster of gas and oil deposits around the Dead Sea.

Important highlights:

- The Gaza Marine field is probably the only viable natural gas field in the offshore Gaza area

Chemical industry: ¹²**Important highlights:**

- The estimated number of regulated companies working in the industry is 60, five in producing cosmetics, five in the production of paints and inks and the remaining are working in the detergents production. The actual number of producers (un-regulated) is much more than that. Some factories produce both detergents and cosmetics.
- The average number of workers is estimated at 15, and the total employment is estimated at 900 workers. The actual number is greater than this because of the non-regulated manufacturers. The industry is spread all over the West Bank.
- This sector is comprised of three major categories; paints and ink, detergents and cosmetics. Traditional olive oil soap products are sometimes categorized as traditional industries.
- There is an overlapping in industries which produce both detergents and cosmetics and companies which produce medicines, veterinary products, detergents and cosmetics.

Industrial disaster history and potential: No information found yet

History and potential for natural disasters: ¹³The State of Palestine is vulnerable to natural hazards including earthquakes, floods, droughts and landslides. The whole region around the State of Palestine faces ongoing small to mid-scale disaster risks, and there is also significant potential for a large scale urban disaster.

¹² http://www.pfi.ps/Portals/_default/Reports/1.pdf

¹³ https://www.ochaopt.org/documents/undac_mission_report.pdf

- The earthquake risk is associated with the tectonic plate boundary in the Jordan Valley known as the Dead Sea Transform (DST). Historical records show that major earthquakes have caused severe damage and many hundreds, and sometimes thousands, of fatalities.
- Flash flooding is also a natural hazard as a result of heavy rains.
- Water shortage and drought are chronic problems in the region due to its arid conditions.

Studies related to chemicals management:

No information found yet.

A.13 TUNISIA



Official Name: Republic of Tunisia

Languages: Arabic (official, one of the languages of commerce), French (commerce), Berber (Tamazight)

Population: 10,937,521 (July 2014 est.)

Area: 163,610 sq km

Capital city: TUNIS (capital) 1.978 million (2014)

Topography: Tunisia is located in Northern Africa, bordering the Mediterranean Sea, between Algeria and Libya. Mountains in north; hot, dry central plain; semiarid south merges into the Sahara.

Climate: Temperate in north with mild, rainy winters and hot, dry summers; desert in south

Presence of industries processing or using dangerous substances

Oil and Gas: According to the 2012 BP Statistical Energy Survey, Tunisia had proved oil reserves of 0.425 billion barrels at the end of 2011, equivalent to 15 years of current production while Tunisia produced an average of 77.6 thousand barrels of crude oil per day in 2011, 0.09% of the world and a change of -2.5 % compared to 2010.

Pipeline: condensate 68 km; gas 3,111 km; oil 1,381 km; refined products 453 km (2013)

Important highlights:

- Tunisia's first oil field, El Borma, was discovered in the southern region near its frontier with Algeria. Tunisia's main oil producing fields are El Borma, Ashtart and Sidi el Kilani while the principal gas fields are the El Borma field where associated gas is produced, and the offshore Miskar field. Tunisia produces heavy crude types, its best known being El Borma and Ashtart.

- Twenty-eight Tunisian and foreign companies are currently engaged in hydrocarbon operations.
- A network of oil and gas pipelines covers the country, linking fields with ports and urban centres. Crude oil from the Saharan oil fields of Tunisia, including El Borma, Chouech Es Skhira, Adam, and Makhrouga / Larich / Debech, is delivered to the La Skhira terminal, in the Gulf of Gabes, through a 24-inch pipeline. Since 1972, gas has also been delivered from the El Borma field to the Gulf of Gabes via a 10.75 inch pipeline. Additionally, two 48-inch Trans-Mediterranean pipelines transect the country and transport gas from Algeria to Italy via Tunisia.
- The new Hydrocarbons Code became effective on 20 February 2000 and applies to all future exploration and production contracts. The Law introduces some new incentives as Tunisia aims to further develop oil exports.

Chemical industry: Tunisia's chemical industry is dominated by its phosphates and phosphate based fertilisers, which are its second largest export earnings source. The country is the world's fourth largest producer of calcium phosphates, and the world's third largest fertiliser exporter.

Important highlights:

- The State-owned Groupe Chimique Tunisien has the capacity to produce 700 ktpa phosphoric acid, 1 000 ktpa triple superphosphate (TSP), 600 ktpa diammonium phosphate, 300 ktpa NPK (nitrogen-phosphate-potash) and 100 ktpa mono-ammonium phosphate.
- Société des Engrais de Gabes (SAEPA), an operating company of Groupe Chimique Tunisien, has the capacity to produce 330 ktpa phosphoric acid, 330 ktpa DAP and 300 ktpa ammonitrate, largely from imported ammonia, although there are plans to produce ammonia locally, probably at La Skirrha, using Algerian gas.
- Industries Chimiques Maghrébines (ICM) has plants at Gabès; Industries Chimiques de Gafsa operates the Gafsa fertiliser complex; and Societe Industrielle d'Acide Phosphorique et d'Engrais (SIAPE) has plants at Sfax and La Skirrha.
- Paint, glue and detergents are also manufactured in the country, and two wet lime works (each producing 650 ton/day wet lime) are being built at Thala and Mezuna.

Industrial disaster history and potential:

- 07/07/1978, Manouba, explosion, 150 people injured, 3 people dead involved ammonium nitrate.

History and potential for natural disasters: No information found yet

Studies related to chemicals management:

No information found yet.

A.14 UKRAINE



Official Name: Ukraine

Languages: Ukrainian (official) 67.5%, Russian (regional language) 29.6%, other (includes small Crimean Tatar-, Moldavian-, and Hungarian-speaking minorities) 2.9% (2001 est.)

Population: 44,291,413 (July 2014 est.)

Area: 603,550 sq km

Capital city: KYIV 2.917 million;

Major urban cities: Kharkiv 1.444 million; Odesa 1.011 million; Dnipropetrovsk 966,000; Donetsk 941,000; Zaporizhzhya 758,000 (2014)

Topography: Ukraine is located in Eastern Europe, bordering the Black Sea, between Poland, Romania, and Moldova in the west and Russia in the east.

Most of Ukraine consists of fertile plains (steppes) and plateaus, mountains being found only in the west (the Carpathians), and in the Crimean Peninsula in the extreme south.

Climate: Temperate continental; Mediterranean only on the southern Crimean coast; precipitation disproportionately distributed, highest in west and north, lesser in east and southeast; winters vary from cool along the Black Sea to cold farther inland; summers are warm across the greater part of the country, hot in the south.

Presence of industries processing or using dangerous substances

Oil and Gas: The Ukraine has 395 million barrels of proven oil reserves, the majority of which are located in the eastern Dnieper-Donetsk basin. Ukraine's geographic location makes it an important corridor for oil and natural gas to transit from Russia and the Caspian Sea region to Europe. During 2006 Ukraine pipelines carried 22 percent of Russia's exports to Ukraine refineries and Europe.

Ukraine's aging natural gas infrastructure is of concern both to European consumers and Russian producers.

Important highlights:

- Pipeline: gas 36,720 km; oil 4,514 km; refined products 4,363 km (2013)
- Ukraine has six crude oil refineries, with a combined throughput capacity of approximately 880,000 bbl/d.
- Proven and probable reserves are estimated to 133 million tons of oil, 66 million tons of condensate and 1 trillion cubic meters of natural gas
- In 2011, production reached 2.4 million tonnes of oil, 0.9 million tonnes of condensate, and 20.6 billion cubic meters of natural gas.
- Ukraine is the sixth largest consumer of gas in the world.
- There is an offshore gas extraction facility (Black Sea) and two old offshore jackup rigs in Black Sea which have been operating for over 15 and 20 years

Chemical industry: Chemical industry is one of the principal sectors of the Ukrainian economy. It has more than 200 associations and enterprises, producing more than 20 thousand major and 100 thousand auxiliary chemical products.

Important highlights:

Main chemical sectors are:

- Fertilizer production. Leading enterprises in this field are: Azot, Rivneazot, Odesa port-side chemical plant, Severodonetsk Azot, Dniproazot and Stirol Concern
- Petrochemistry. Leading producers of primary petrochemical products are: Karpatneftekhim (part of Russian Lukor-Neftekhim), Rivneazot (is a part of International Holding, OstChem AG (Austria), Azot (OstChem AG).
- Pulp and paper industry. Leading producers are Rubezhnoye Cardboard and Packaging Mill, and Kyiv Cardboard and Paper Mill
- Plastic packaging. Leading producers are HEKRO PET (PET-preforms), Retal-Dnepr (PET-preforms) (a part of Russian Retail Industries Ltd.), UniPlast Ltd (PET-preforms), UKRPLASTIC (polymer films, membranes from aluminium foil, etc.), DPA (flexible roll packaging, brand and serial shopping bags, secondary granules), LENBUD (polymer films).
- Other chemical production such as titanium dioxide production, pharmaceutical production, production of soap, washing and surface-active organic matters, paint & varnish materials production, production of photo and cinema articles, tires, etc. Main local producers are Arterium Corporation (Kyivmedpreparat, Galychpharm), Farmak, Borshchahivskiy Chemical Pharmaceutical Plant, Pharmaceutical Firm Darnitsa, Yuria-Pharm.

Industrial disaster history and potential:

- The 1986 accident at the Chernobyl nuclear power plant in Ukraine, then part of the former Soviet Union, is the only accident in the history of commercial nuclear power to cause fatalities from radiation. It was the product of a severely flawed Soviet-era reactor design combined with human error.
- Also in 1991, Ukraine's nuclear power industry suffered when a serious fire at Chernobyl-2 disabled the unit and prevented its further operation.
- Explosion (methane) at the mine of Donetsk in 1998 killed 63 people.
- Explosion (methane) at the mine of Zasyadko in 1999 killed 50 people.
- Explosion (methane) at the mine of Donetsk in 2000 killed 81 people.
- Explosion (coal dust and methane) at the mine of Donetsk in 1998 killed 36 people.
- Explosion (methane) at the mine of Donetsk in 2002 killed 35 people.
- 15 Sep 1983 Stebnik, Ukraine 1.2 million m³ of brine was released in Dnestr river polluted for hundreds of km, damaging the fish resources and biodiversity of the river.

History and potential for natural disasters: Ukraine is prone to natural and technical calamities.

Studies related to chemicals management:

No information found yet.

B CURRENT AND PAST CAPACITY BUILDING ACTIVITIES IN EU NEIGHBOURHOOD COUNTRIES

Sources: [26] [27] or websites sited in the entry

Table B.1 Capacity building activities in the six EU Neighbour Countries to the East

Country	Organisation	Assistance Programme Activities
Armenia	UNECE	Fact -finding mission (Yerevan, 2006) (see http://www.unece.org/env/teia/preparatory2.html)
	UNECE	Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)
	UNECE	Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)
	UNECE	Training of trainers on Investigation and Evaluation of the Condition of Industrial Plants (Yerevan, 2012) (see http://www.unece.org/index.php?id=30066)
	UNECE	International workshop on the project "Assistance to Raising Knowledge on Industrial Safety at Universities" (Yerevan, 2013) (see http://www.unece.org/env/teia/mtgs/yerevan2013.html)
	UNDP	Support to National Disaster Planning (2003 - ?)
Azerbaijan	UNECE	Fact-finding mission (Baku, 2006) (see http://www.unece.org/env/teia/preparatory2.html) Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional

Country	Organisation	Assistance Programme Activities
		<p>frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)</p> <p>Hands-on training session on identification of hazardous activities (Minsk, 2008) (see http://www.unece.org/env/teia/implementation6.html)</p> <p>Training session on integrated approaches to major hazard prevention (Prague, 2009) (see http://www.unece.org/env/teia/implementation5.html)</p> <p>National training session on identification of hazardous activities (Baku, 2010) (http://www.unece.org/index.php?id=25492)</p> <p>Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)</p> <p>Project of Risk Assessment of Industrial Accidents and Enforcement of Cross-Border Obligations (RIECO) (VadulLuiVoda, Republic of Moldova, 2013) (see UNECE http://www.unece.org/index.php?id=33243) http://www.unece.org/index.php?id=33243)</p>
Georgia	UNECE	Fact -finding mission (Tbilisi, 2006) (see http://www.unece.org/env/teia/preparatory2.html)
Georgia	UNECE	Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)
Georgia	UNECE	Hands-on training session on identification of hazardous activities (Minsk, 2008) (see

Country	Organisation	Assistance Programme Activities
		http://www.unece.org/env/teia/implementation6.html
Georgia	UNECE	Training session on integrated approaches to major hazard prevention (Prague, 2009) (see http://www.unece.org/env/teia/implementation5.html)
Georgia	UNECE	Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)
Georgia	UNECE	High level awareness raising mission and experts meeting toward the implementation of the Strategic Approach within the ECE Convention on the Transboundary Effects of Industrial Accidents (Tbilisi, Georgia, 2013) (see http://www.unece.org/index.php?id=34225)
Georgia	UNECE	Project of Risk Assessment of Industrial Accidents and Enforcement of Cross-Border Obligations (RIECO) (VadulLuiVoda, Republic of Moldova, 2013)(see http://www.unece.org/index.php?id=33243) http://www.unece.org/index.php?id=33243)
Georgia	UNDP	Continue advocacy/promotion of DRR in Georgia in continuation of phase 1 and 2 of DRR projects and CADRI Supported Capacity Assessment findings (2014-2016)
Belarus	UNECE	Fact--finding mission (Minsk, 2006) (see http://www.unece.org/env/teia/preparatory2.html)
Belarus	UNECE	Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)
Belarus	UNECE	Hands-on training session on identification of hazardous activities (Minsk, 2008) (see http://www.unece.org/env/teia/implementation6.html)

Country	Organisation	Assistance Programme Activities
		ECE/CP.TEIA/2014/525
Belarus	UNECE	Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)
Belarus	UNECE	Project of Risk Assessment of Industrial Accidents and Enforcement of Cross-Border Obligations (RIECO) (VadulLuiVoda, Republic of Moldova, 2013)(see http://www.unece.org/index.php?id=33243) http://www.unece.org/index.php?id=33243)
Republic of Moldova	UNECE	Fact-finding mission (Chisinau, 2006)(see http://www.unece.org/env/teia/preparatory2.html)
Republic of Moldova	UNECE	Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)
Republic of Moldova	UNECE	Workshop on strengthening the safety measures at hazardous activities (VadulLuiVoda, Republic of Moldova, 2007) (see http://www.unece.org/env/teia/implementation7.html)
Republic of Moldova	UNECE	National training session on identification of hazardous activities (Chisinau, 2010) (see http://www.unece.org/env/teia/implementation2.html)
Republic of Moldova	UNECE	Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)
Republic of Moldova	UNECE	Danube Delta Project (Republic of Moldova, Romania, Ukraine, 2011onwards) (see http://www.unece.org/environmental-policy/treaties/industrial-accidents/areas-of-work/assistance-programme/envteiaapimplementation/envteiaapddp.html)

Country	Organisation	Assistance Programme Activities
Republic of Moldova	UNECE	Project of Risk Assessment of Industrial Accidents and Enforcement of Cross-Border Obligations (RIECO) (VadulLuiVoda, Republic of Moldova, 2013)(see http://www.unece.org/index.php?id=33243) http://www.unece.org/index.php?id=33243)
Republic of Moldova	UNDP	The project seeks to increase national ownership and leadership for disaster resilience through improved coordination capacities, awareness and knowledge and innovative technology transfer.
Ukraine	UNECE	Fact-finding mission (Kyiv, 2006)(see http://www.unece.org/env/teia/preparatory2.html)
Ukraine	UNECE	Workshop on capacity-building with the aim to initiate a process to further strengthen the legal and institutional frameworks under the Convention in the countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia (Kyiv, 2007) (see http://www.unece.org/env/teia/implementation8.html)
Ukraine	UNECE	Workshop on strengthening the safety measures at hazardous activities (VadulLuiVoda, Republic of Moldova, 2007) (see http://www.unece.org/env/teia/implementation7.html)
Ukraine	UNECE	Hands-on training session on identification of hazardous activities (Minsk, 2008) (see http://www.unece.org/env/teia/implementation6.html)
Ukraine	UNECE	Training session on integrated approaches to major hazard prevention (Prague, 2009) (see http://www.unece.org/env/teia/implementation5.html)
Ukraine	UNECE	Workshop on the use of indicators and criteria for the implementation of the Strategic Approach (Bratislava, 2011) (see http://www.unece.org/index.php?id=25618)
Ukraine	UNECE	Danube Delta Project (Republic of Moldova, Romania, Ukraine, 2011onwards) (see http://www.unece.org/environmental-

Country	Organisation	Assistance Programme Activities
		policy/treaties/industrial-accidents/areas-of-work/assistance-programme/envteiaapimplementation/envteiaapddp.html
Ukraine	UNECE	Project of Risk Assessment of Industrial Accidents and Enforcement of Cross-Border Obligations (RIECO) (VadulLuiVoda, Republic of Moldova, 2013)(see http://www.unece.org/index.php?id=33243) http://www.unece.org/index.php?id=33243)

Sources: [27] or websites cited in the entry.

Table B.2 Capacity building activities in the six EU Neighbourhood Countries to the East

Country	Organisation	Assistance Programme Activities
Algeria	UNITAR Switzerland	Préparer un Profil national, établir des priorités et renforcer l'échange d'informations pour une gestion rationnelle des produits chimiques (2004-2006).
Algeria	DG ECHO PPRD South	Disaster risk reduction initiative for South-Europe (DRR-SEE) (2012)
Algeria	EU CBRN CoE ¹⁴	PROJECT 42. Chemical Safety and Security in the Central and Eastern African Region
Egypt	UNEP	Responsible Production Pilot Project. http://www.unep.org/resourceefficiency/Portals/24147/Safe%20Production%20%28Web%20uploads%29/LessonsLearned-v0.22WEB.pdf
Jordan	EuropeAid	Safety Assessment Capacity building for Jordan –Nuclear (2012-2013)
Jordan	UNDP	Enhancing Institutional Capacities to reduce Disaster Risk and to integrate Climate Change in the Hashemite Kingdom of Jordan (2011-2015)
Lebanon	UNDP	Disaster Risk Management (Year?)
Morocco	DG DEVCO	High risk chemical facilities and risk mitigation in the African Atlantic Façade (AAF) Region (http://www.cbrncoe41.eu/)

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