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Benchmark of European Practices for Land-use Planning around Seveso Establishments

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The authorities in charge of Seveso establishments in the Walloon region of Belgium has organized a benchmark study to understand the practices for land-use planning around Seveso establishments in application of the article 13 of the European Directive 2012/18/UE of 4 July 2012, called Seveso III, concerning the control of major accident hazards involving dangerous substances.

The objectives of the study were to:

- Analyse the practical implementation of the land use planning (LUP) procedure according to the Seveso III directive in several member states
- Identify the legal basis and the explicit method & criteria for LUP
- Identify the measures to control the urbanization around hazardous establishments
- Understand the condition of revision of LUP documents in case of modifications of the installations or changes in the determination of the zones (thresholds, calculation software, databases for failure rates…).

The benchmark provides detailed information on the implementation of the land-use planning procedure, and it reveal the commonalities and differences in the approach among European countries and regions.

1. Method

The benchmark study reviewed the practices in 10 European Countries and in the 3 regions of Belgium, namely: Austria, Czech Republic, The Netherlands, France, Germany, Greece, Italy, Luxembourg, Slovenia, Spain, and the Regions of Belgium: Wallonia, Brussels Capital, and Flanders.
Among the methodological elements to be considered, it appeared particularly important to deal in detail with the mechanisms for the revision or updating of land use planning zones around hazardous sites.

- How is the transposition of hazard zones into urban planning zones organized?
- What are the origins and treatments of the modifications of the danger zones?
- Is there a criterion for a tolerable increase of the hazard zones without modification of the planning zones?

The analysis was conducted in 3 steps during:

- Identification & analyse of regulations, guides and reports describing the LUP procedure in the Members States and the regions of Belgium,
- Interviews with selected experts to understand the practical implementation and worries / issues related to LUP,
- Analyse and compare the practices.

The interviews enabled to collect information on practical implementation of the land-use planning approach. And the summaries of the interviews have been checked by the interviewees before the content has been exploited for the study. All together the study is the most recent overview of the current land-use planning practices around Seveso plants since the work carried out by Michalis Christou and al. (Christou, Gyenes,

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Struckl, 2011) in 2010 and 2011. The analysis and the comparison of the practices have been primarily based on what the experts said during the interviews.
This approach made it possible to quickly grasp field practices in application of regulatory texts and other reference documents, which are difficult to grasp in a short time.
The following issues have been addressed:

- General approach to urban planning
- Actors for the determination of the zones used as a basis for urban planning zones
- Decision to define the zoning around Seveso establishments
- Determination of urban planning zones
- Models, software and thresholds
- Updating of urban planning documents
- Management of urban planning areas
- Impact of software updates
- Public information and publication

2. Results

The following paragraphs present examples of comparison of the main practices of the countries and regions selected. The comparison is based on the criteria that have been defined to allow a certain comparison, find commonalities and point out some specificities as they were perceived based on the interviews.

2.1 General approach to urban planning

In most cases, the hazard zones estimated by the competent authorities in charge of Seveso establishments are transmitted to the authority in charge of urban planning for the preparation of land-use plans. Often these plans are prepared by municipalities or groups of municipalities (e.g. "Gemeinde" in Germany). Countries with a federal system or a high degree of regional autonomy have regulations for the control of urban planning around Seveso establishments that are specific to each region or province (Germany, Austria, Belgium, Spain, Italy). The other countries have an approach with national regulations applied at local level.
It also appears that the vast majority of countries and regions have formalized a guide or a publicly available doctrine document, which makes it possible to move towards a coherent general approach, including the choice of accident scenarios and their examination, if necessary.
The approaches in Flanders, the Netherlands and France are particularly well documented. In Slovenia, everything is stated in the law.

General approach to urban planning	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Centralized at the national level with national regulations							X	X	X	X	X	X
Decentralized to the regional or provincial level with local regulation	X	X	X	X	X	X						
Doctrine and method formalized in a publicly available document	X	X		X	X	X	X	X	X	X	X	X

Figure 1: Comparison of the general approach to urban planning

2.2 Actors for the determination of the zones used as a basis for urban planning zones

In the majority of the countries and regions studied, planning areas are determined at the local level, with the exception of Greece and Slovenia, which indicate that the dossiers are managed at the level of the ministries in charge of the environment and land use planning. However, in several countries, regional authorities consult with central authorities for important installations. In most countries, the accident scenarios considered for planning control are determined and evaluated under the responsibility of the local competent authorities without being predetermined or studied by the operator in the safety report. The local authorities can hire accredited experts or ask the operator to have the studies carried out by accredited experts, which allows a certain consistency in the choice and examination of scenarios.

In France, the process is formalized and supervised at the national level and implemented with regional/prefectural competencies. In Luxembourg, the consultants hired by the operators are approved by the competent authorities. In Spain, the calculations are made by consultants approved by the provincial authorities.

Actors for the determination of the zones used as a basis for urban planning zones	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Pre-determined areas under the responsibility of the operator		X					X	X	X	X		
Zones determined under the responsibility of the competent authority (Seveso) at a national level								X		X		X
Areas determined under the responsibility of the competent authority (Seveso) at a regional or provincial level	X	X	X	X	X	X	X		X		X	
Organizations or experts accredited by the authority			X	X	X	X			X	X	X	X

Figure 2: Comparison of the actors involved for the determination of the zones for urban planning

2.3 Decision process to define the zoning around Seveso establishments

The decision-making process for the determination of urban planning control zones is difficult to understand. In practice, it appears that the decision is the result of consultation or exchanges between the Seveso authorities and the authorities in charge of urban planning, although in most cases the Seveso authorities only provide a recommendation to the authorities in charge of urban planning.
In Italy, the use of a Regional Technical Committee for the examination of dossiers with representatives of several authorities and agencies is rather unusual. This committee concept does not appear in any other country.
In the Netherlands, it appears that the provincial authority can deviate from the recommendations by justifying its decision with additional calculations using other models or other hypotheses for the examination of scenarios.
In France, it is possible to call on a third-party expert (second opinion) to examine all or part of the hazard study. This third-party expert assessment requested by the competent authority is at the operator's expense. The Ministry of the Environment maintains a list of recognized third-party experts for this work. This approach is an alternative to accrediting organizations or experts to carry out studies that serve as a basis for urban planning.

Decision to define the zoning around Seveso establishments	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Decision by the same authorities that investigate the safety reports					X		X	X		X		
Decision by the authorities in charge of urban planning (receive a recommendation from the authorities in charge of Seveso establishments)	X	X	X	X		X					X	X
Collective decision with several agencies or authority representatives	X								X			
Possibility of having recourse to a third party expert (second opinion)							X					

Figure 3: Comparison of the decision process to define the zoning around Seveso establishments

2.4 Determination of urban planning zones

For the determination of the hazard zones that are used to define the land-use planning zones, for a majority of countries and regions, the approach is based on the evaluation of the consequences of accident scenarios (deterministic approach).
Some countries have an approach that combines a first estimation of the zones according to a deterministic approach to define a preliminary zone of consultation or attention, then within this zone, the estimation of the individual risk is taken as reference to establish the zones of urbanization control.
Three countries (Germany, Austria and Spain) show a mixed approach that combines lumped distances and a more refined estimation of accident scenarios to define urbanization zones.
In Spain, there is a strong diversity between the autonomous regions.
It should be noted that in France, for Seveso high threshold establishments, the individual risk is calculated by taking into account all the accident scenarios, their probability and their intensity (effect distances). The SIGALEA® software is used to represent the contours that serve as a basis for the establishment of Technological Risk Prevention Plans (PPRT) and the corresponding urban planning documents. This procedure for drawing up PPRTs is accompanied by formal consultation with the Site Monitoring Commissions (CSS).
The Netherlands has introduced the concept of a deterministic attention zone in a regulation that will come into force in January 2022, whereas the country was known for traditionally using only a probabilistic approach that takes into account individual and societal risk. The definition of attention zones in a first step has a pedagogical virtue in informing the populations potentially affected by major accidents, given that the Dutch expert indicated that the populations have difficulty understanding the probabilistic approach.

Determination of urban planning zones	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Fixed (distances not based on accident scenario modeling and probability calculations)	X	X										
Based on the evaluation of the consequences of accident scenarios (consequence-based approach)	X	X				X		X	X	X	X	X
Based on the evaluation of the individual risk at each point of the environment taking into account all or the most probable scenarios (probabilistic approach)			X	X	X	X	X				X	
Mixed approach (fixed distances and scenario-based)	X	X				X						

Figure 4: Comparison of the practices for the determination of urban planning zones

2.5 Models, software and thresholds

There is a wide variety of approaches to determining the zones on which LUP zones are based. Countries that do not centralize the examination of scenarios do not prescribe models or software. But in Spain, the autonomous region of Catalonia prescribes EFFECTS, RISK CURVES and ALOHA in the instruction 14/2008.
The Netherlands, which centralizes the calculations, uses a specific version of the DNV SAFETI tool which sets parameters to limit the variations due to the choice of certain assumptions. The SAFETI-NL tool is evaluated for each new version and the Ministry in charge of the Environment and Spatial Planning must give its approval to use the new version.
In France, there is no official evaluation of the software. However, INERIS can be asked to evaluate some software at the request of its supervisory ministry (it has done so in the past for PHAST, but not only). There is no prior approval for the use of software since the models or software are not prescribed. However, the use of CFD in hazard studies is supervised, it can be done if the configuration of the scenario requires it by relying on the good practice guide of atmospheric dispersion modeling with CFD.

In Germany, the UBA agency has developed and made available a specific tool, AUSTAL. A project in Baden-Württemberg is currently underway to evaluate the impact of software and its models in the estimation of the consequences of accident scenarios.
In Slovenia, a study was carried out two years ago to evaluate the variations between the calculations made by several organizations that are entrusted with the studies by the ministry in charge of the environment.
In Luxembourg, a benchmark is also in progress with the 3 engineering offices approved by the government to understand the variations that can exist between the German, Dutch and French approaches accepted in the country.
These recent or ongoing studies show that concerns about methods and practices are strong and that states are seeking to evolve their doctrine.

	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Models, software and thresholds												
Software or calculations centralized by the authority	X	X	X	X	X						X	X
Pre-assessment and decision to use or not use the software											X	
No prior assessment												
Software (strongly) recommended	X	X		X	X	X						
No prescription of tools			X				X	X	X	X		X

Figure 5: Comparison of the models, software and thresholds used for the determination of the LUP zones

2.6 Impact of software updates

The analysis and in particular the exchanges with the national experts show that most of the modifications due to changes in software or thresholds are taken into account at the time of the five-yearly revision of the safety report. If there are changes in the hazard areas, then they are considered at that time. No country or region has indicated that safety reports or planning zones have to be updated immediately after a new software or threshold is introduced. The expert from Austria states that he has dealt with threshold changes and does not identify any particular problems.

	Germany	Austria	BE-BRU	BE-Flanders	BE-Wallonia	Spain	France	Greece	Italy	Luxembourg	Netherlands	Slovenia
Impact of software updates												
No immediate impact, five-yearly update of the safety report	X	X	X	X			X	X	X	X		X
Verification of changes to distances before approval of updates					X	X	X				X	
Immediate consideration of new zones including software updates or thresholds.												

Figure 4: Comparison of the impact of software updates

3. Conclusions

The working method was influenced by the short time frame of the study and the summer period, which forced us to conduct interviews with the experts at the beginning of the study. Moreover, the subject is very vast, and the material collected can be deepened, if necessary, to better understand certain practices and to draw inspiration from them.
In terms of the collection of regulatory texts, it appears that the subject of LUP is complex and difficult to understand solely from a regulatory and legal perspective. The study highlighted the importance of doctrinal documents, good practice guides and their sharing with the stakeholders and the public.

In terms of the organization of LUP explained through interviews with the experts, it emerged that practices are very diverse and are the result of a regulatory, industrial and cultural heritage. That said, several countries have begun to reform their practices, such the Netherlands, which introduced the notion of attention zones independent of the probability of occurrence. This shows that there is no single, immutable answer, and that given the diversity and contexts, the search for harmonization is not obvious, as the MAHB of the Joint Research Centre has already noted in previous studies.
The key words of the approaches seem to be transparency, rational justification and traceability.
Regarding the update of LUP zones based on updates of software, it appears that few countries are dependent on software changes, and none of the countries studied reported major problems with software updates or thresholds. For the majority of countries that have encountered similar situations, the new safety distances have been introduced in new versions of urban planning documents or measures have been taken to impose a reduction of risks at source so that the distances do not change.
The benchmark provides new inspiration to review the current practices in each country for land-use planning practices and might offer a background to reinforce the harmonization of the implementation of the Seveso Directive in Europe.

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