REVIEW ON ACTIVITIES OF THE EUROPEAN WORKING GROUP ON LAND USE PLANNING, IN THE CONTEST OF ARTICLE 12 OF DIRECTIVE 96/82/EC, AS AMENDED BY DIRECTIVE 2003/105/EC

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SUMMARY

Following the accidents in Enschede (13 May 2000) and Toulouse (21 September 2001), in the context of Art.12 of the Seveso II Directive, the European Commission decided to re-establish, in 2002, the Working Group on Land Use Planning, primarily based on nominations from the Competent Authorities of the Member States and representatives of Major Accidents Hazard Bureau (MAHB). Moreover, Art.1, paragraph 7b of the Amendment Directive 2003/105/EC invites the Commission in close collaboration with the Member States to draw up by 31 December 2006 "*guidelines defining a technical database with risk data and risk scenarios, to be used for assessing the compatibility between Seveso establishments and residential and other sensitive areas listed in Art. 12*". This work, according to the international opening of the 5th "VGR Conference", in order to exchange experience and knowledge on lessons learned from accidents and risk analysis, intends to point out the state of the art of the work plan carried out by the European Working Group on Land Use Planning, underlining the technical contribution provided by the Italian delegation, coordinated by Ministry of the Environment and Land Protection, and made up of representatives of National Agency for the Environmental Protection and Technical Services, Ministry of Interior, Italian Authority for Health and Safety at Work, Institute for the Atmospheric Pollution of the National Council of the Researches. The scope of this article is to describe the following European Working Group on Land Use Planning's products: "*Land Use Planning Guidelines"* [1], "*Implementing art. 12 of the Seveso II directive: Overview of procedures In selected member states & "roadmap" proposals*" [2] and "*RAHD – Risk/Hazard Assessment Database*" [3].

1 INTRODUCTION

The work of the European Working Group on Land Use Planning (EWGLUP, hereafter called the "Group") was defined by objectives with outcome structured into three main products (Figure 1):

- a guidelines document for clarification of the legal requirements of Article 12 and for setting principles of implementation. The Group produced a a draft version that has to be discussed and eventually adopted by the Committee of Competent Authorities ;

- a so-called "roadmap" document, a supporting document that explains in more detail the various options for complying with the requirements of Article 12 of Seveso II Directive and how to achieve principles with basic decisions of the overall approach. A draft version has been presented to the Group, it has to be discussed and concluded by the Group;

- a database (Risk Hazard Assessment Database – RHAD) for risk data and risk scenarios, more exactly an internet-based tool for the systematic selection of reference scenarios according to

the main approaches used in the different member States. A preliminary working version has been produced, it still needs to be concluded by ad hoc subgroup of the Group.

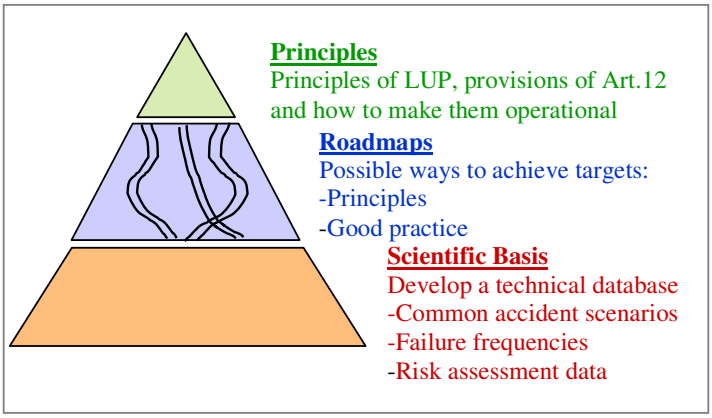


Figure 1. Work plan structure of the European Working Group on Land Use Planning

2 "LAND USE PLANNING GUIDELINES" DOCUMENT

The "*Land Use Planning Guidelines"* (hereafter called the "Guidelines") represents existing best practice drawn from the cumulative knowledge of experts in this field. It identifies a range of approaches which may be used for land use planning aspects under the Seveso II Directive. Its use is not mandatory, but it can be used by Member States to achieve compliance with the legislation.

The document is intended to give guidance for risk assessment in land use planning in general as far as the major accident potential of industrial establishments is concerned. The main aim in this respect was to provide, in a quick, coherent and comprehensive way, useful information on risk assessment in industrial plants to land use planners which are not necessarily familiar with these issues.

The document should also assist with the use of "*Risk Hazard Assessment Database – RHAD*" which the Major Accident Hazards Bureau was assigned to develop and which shall provide proposals for key factors in this respect. By defining best practice of risk assessment in land use planning, the underlying principles of the risk/hazard assessment database are described.

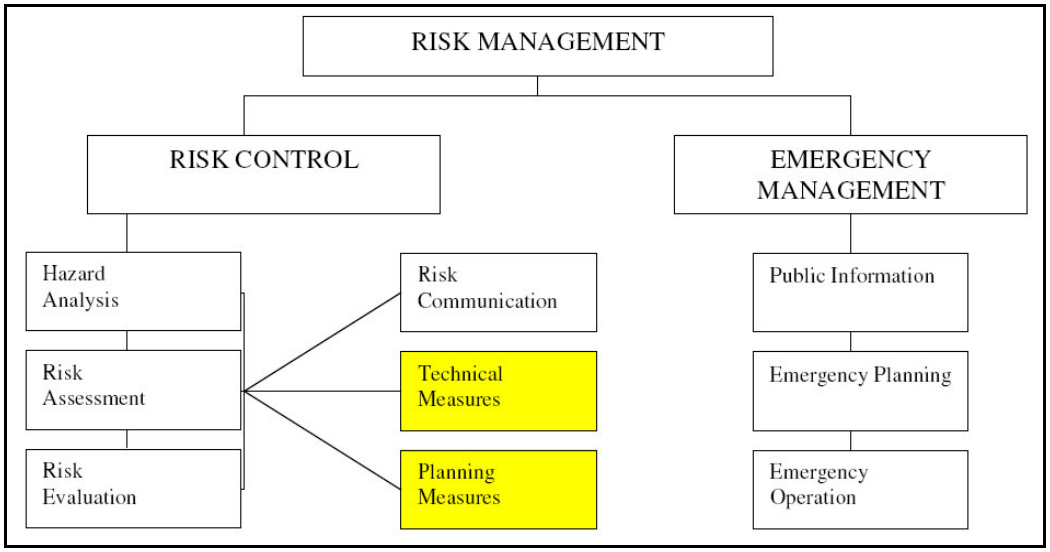
The document is made up of three sections. The first part deals with land use planning aspects and describes the obligations of Article 12 in operational terms through a number of main and supporting principles, whose fulfillment actually represents best LUP practice; the second part presents technical and methodological aspects of the evaluation of major accident hazards and the third part focuses on Environmental aspects, summarizing the corresponding European Union legislation and making reference to tools and methodologies aiming at addressing the environmental risk of major accidents.

2.1 Land Use Planning Aspects

Land use planning (hereafter indicated "LUP") activities, as part of risk management in the context of Article 12 of Seveso II Directive, are:

- planning measures (land allocation, zoning, spacing safeguards etc.)
- technical measures (prevention or mitigation measures imposed in permit procedure etc.).

This relationship between the planning process and the overall risk management system is shown in the diagram below:



In general LUP is only one of the mechanisms to evaluate and limit the potential consequences of either intrinsic hazard factors (natural hazards etc.) or manmade developments.

For the purpose of the Guidelines, "Risk Assessment" means only risk assessment with regard to impacts caused by major accidents as defined by the Seveso II Directive.

Best Practice – General Principles

According to *"UN-HABITAT – Guidelines for Good Urban Policies and Enabling Legislation"*, a proper land use planning policy shall provide:

- clear definition and assignment of roles and responsibilities including appropriate institutional framework and administrative structures
- availability and accessibility of data and information
- participation of all stakeholders
- simplicity and clarity
- realistic concepts in terms of scope and implementation
- assessment of impacts

To comply with these targets, an important land use planning principle is *robustness*. *Robustness means that limiting conditions and real impacts may undergo changes to a certain extent without altering the previous decision*.

A robust land use planning in the context of risk management exists if it follows these elements:

1. *Consistency*: Outcomes from broadly similar situations are broadly the same under similar conditions.

2. *Proportionality*: The constraint should be proportional to level of risk.

3. *Transparency*: Clear understanding of the decision-making process.

The following *best practice - general principles* to achieve this in the context of risk assessment in LUP can be listed in the table below.

Table 1. *Best practice - general principles*

General Principles	Explanations	Outcomes & Comments
Consistency		
Hazard/Risk Assessment methods should exist	Can be based on hazard and/or risk; generic adoptions may be used	A systematic[1] approach to LUP advice will be used
Inputs should include a representative set of major accident scenarios	A credible and/or evaluated range of scenarios should be defined to provide information on the potential extent of consequences	Distances or zones are determined within which LUP controls should apply
Planning decisions should be broadly similar	In similar situations for similar hazard or risk conditions the planning decisions reached should be broadly similar	Avoidance of undesirable development and promotion of activity which meets socio-economic requirements
Proportionality (also: reasonableness)		
Criteria exist for desirable limits or boundaries of the level of harm and risk control requirements	Support decision making on land use development by providing comparative measures, analysing them and justifying	Subjectivity in decision making is reduced
Development types are characterised	Types of land use in the vicinity of MA establishments and their population to be established	Optimisation of land use.
Judgment frameworks are described	A set of benchmarks is provided within which decision makers can exercise their discretion	Land Use Planning is determined having regard to public safety as well as socio-economic considerations
Transparency		
An understandable, clear and well-described system exists	A coherent explanation of the LUP system is possible/assured for all interested people/persons	The LUP system is practicable in all parts of the MS
Responsibilities for key actors are described	All key actors know their role and the limits within which they exercise their responsibilities	Everybody within the system knows what to do and the limits of his discretion
Mechanisms for independent control exist	Land use decisions must be coherent with regional and national policies	Potential undesirable land use decisions are subject to review and may be prevented
Decisions can be understood at the time they are made and later.	Decision factors are laid down and the decision-making process can be retraced and decisions are recorded	Decision flow is made transparent and can be reproduced

Supporting Principles of Article 12 - Obligations

"*Best Practice*" of risk assessment in land use planning in the context of Seveso II is influenced by the obligations of Article 12; to meet the objective it is necessary to define these obligations in more operational terms.

[1] "systematic" means in general that the limiting conditions of an analysis, a survey etc. are identical and pre-defined for all steps or all single parts of the process

The obligations of Article 12 of the Seveso II Directive may be expressed in the form of principles that support the general ones listed above. By following these principles, the attached explanations and the outcomes the application of the obligations are described in a more practical way.

All the principles listed in the table below must be understood under the precondition that the development of Seveso II land use planning policies by member states for the siting of new Seveso establishments, significant modifications to existing establishments and developments in the vicinity of existing Seveso establishments are mandatory.

Table 2. Supporting Principles of Land Use Planning (in the context of Article 12 of the Seveso II Directive)

Supporting Principle	Explanation	Outcomes & Comments
LUP process has a role in the prevention and mitigation[2] of major accident hazards over time.	Can be up to 30 years to achieve its impact (50 years in cases of large scale strategic planning)	Not always immediate effect of LUP for the consequences of a major accident (MA)
Risks to public should not increase significantly and over time be maintained or reduced where necessary	MS need to develop approaches to define what is "significant" (baseline)	Risk communication may be necessary
The residual risks arising from a Major Hazard (MH) establishment to individuals and to society should not exceed a desirable level.	• Residual risk is the risk that remains after having relevant safety measures in place. • MS need to establish approaches to define desirable levels	There must be LUP-related policies that mitigate the risk. . These LUP policies should be such that can be implemented and able to reduce off-site risk at all times
Manage population/community development over long term	Long term strategic planning of the use of land in the vicinity of a MH establishment	• Authorities must define the area around Seveso establishments where safety issues have to be considered; • balance land use to control public risk where necessary
Equity balance should be achieved between major hazard establishment operators and community	Operators and community should share the constraints, benefits, opportunities, etc.	Possible need for further proportionate measures on-site or off-site (includes design and lay-out of the planned development)
Mitigation can be achieved through LUP in combination with emergency planning	LUP should have a stronger influence in mitigation near to the establishment compared to emergency plans (e.g. in case of risks from explosions)	• Necessary cooperation of LUP and emergency planning and mutual consideration • Possibly different scenarios for LUP and emergency planning.
Public safety and socio-economic considerations are both significant factors, the balance of which may change	• Risks do not have a zero value but usually diminish with distance • Some development should be	• Proper proportionality will be achieved • Different patterns of land use are possible

[2] The terms "prevention" and "mitigation" in the context of Article 12 Seveso II may be understood partly as synonyms. "Prevention" – without any broadly accepted definition - refers to any action taken reduce a potential risk or hazard, "mitigation" is defined by ISO/IEC 73 as the "limitation of any negative consequence of a particular event". Whereas the distinction is more evident for measures, LUP may serve in both roles: a "major accident" has this qualification because of the potential consequences (number of victims etc.), so LUP can avoid an accident to become a "major" one because it reduces the potential extent pro-actively or – when the accident has already happened – it limits the consequences; here LUP acts only in mitigation.

with distance	allowed near to MA establishments provided the risks are at a desirable level.	
LUP considerations that prevent or mitigate the consequences of MA should be given more weight in choosing the location of a new MH establishment.	"New" means "greenfield" or new[3] because of change of operation to bring into the Seveso II Directive. New MH installations should be considered undesirable where there already exist developments which would be considered incompatible if the MH establishment were constructed.	MS authorities should seek to achieve appropriate distances from those areas listed in Article 12 (= seek not to replace them by additional technical measures)

To manage, regulate and coordinate the use of land, LUP policies must consider various economic factors, like:

- regional disparities,
- excessive costs for infrastructure,
- waste of resources,
- need for growth or
- need of economy for long term sound and predictable conditions

Because of this the protection of the consequences of major accidents provided by LUP in most cases will not come into effect immediately or on short term but within a typically longer LUP timeframe.

Existing Situations Supporting principles

The table 3, below, lists supporting principles for existing situations of Seveso II sites.

Table 3. Existing situations supporting principles

Supporting Principle	Explanations	Outcomes & Comments
Information on the location of the site	The LUP-deciding authority has to know the location of the Seveso II establishments and the details of the risk/hazard potential	Provides basis for risk assessment
Identification of the land use around the site	The LUP-deciding authority has to identify the land use patterns of concern and rank them according to risk levels	Provides basis for risk/consequence assessment
Pro-active provision of distances or zones	Calculate/assess the area which requires Land Use Planning	Facilitates consideration when new developments are planned/proposed
Socio-economic aspect consideration	The LUP policy should consider the socio-economic consequences for the limitation of future developments, the	Potential need for specific processes

[3] Existing sites are also establishments that use dangerous substances brought into the scope of the Directive later by either a change of classification of the substances they use or an amendment to the Directive. An existing site remains an existing site following a change of name or ownership – see also chapter 5.

	viability of industry and the community	
Definition of compatibility indices	The LUP policy has to take account of and evaluate existing situations of concern indices	Need for continuously updated information (population density etc.)
3 way approach to deal with existing situations: • prevention and mitigation on – site • LUP • off-site (emergency planning)	Optimization of level of safety + (qualitative) cost-benefit considerations	Combination of approaches may vary over time, balance of measures may have regard to existing permitted operator rights
Give consideration to the technical standard when the plant was set up[4]	New plants must follow more rigorous standards	For existing plants off-site measures may have more relevance

Additional Technical Measures - Principles

"*Additional technical measures (ATM)*" in the context of Article 12 of the Seveso II – Directive are measures that reduce the likelihood and/or mitigate the consequences of a major accident as effective as the establishing of a distance to the relevant vulnerable recipient. This involves consideration of whether there are measures at or outside the establishment in addition to those already in place.

The table 4, below, lists supporting principles for the selection of ATM.

Table 4 supporting principles for the selection of ATM

Supporting Principle	Explanations	Outcomes & Comments
ATM must provide a solid and over-time effective basis for LUP-related decisions	ATMs must have an auditable basis that can be measured and verified over a time period consistent with LUP methods	ATMS shall provide means of reducing risk in averifiable manner
ATM must be proportionate to the aspired level of risk	A significant and relevant increase of risk justifies ATM	"Over –designing" of ATM is avoided
ATM must be enforceable	Certain types of measures e.g. such that rely entirely on a behavioural basis are not enforceable	ATM must be demonstrated
The design of ATM must allow assessment of their effectiveness	Conclusions on the assessment must be reached within a reasonable time	The effectiveness of many ATMs may be evident, e.g. firewalls
Preconditions for the assessment of the effectiveness and reliability of ATM are good basic standards and efficient inspection systems	ATM are not intended to address substandard levels of risk control. Therefore before considering any ATM relevant standards must be achieved	Member State authorities must have a clear perception on what is the basic standard
Necessity and appropriateness of ATM shall be decided by national approaches	Need for a scaling of ATM, see also the supporting principles in chapter 4.1	National criteria like individual/societal risk level or severity of consequences are required
ATM may be on-site and/or off-site decision	Link with the overall principle that states a sharing of advantages	The most cost-effective risk-reduction is achieved

[4] However, in certain legal obligations a continuous adaptation according to latest standards is required, e.g. in the IPPC Directive

	and constraints	
There are boundaries for the role of ATM on-site[5]	Some MH establishments may have already the best standard of technology and the risk is still not at a desirable level	In such cases only measures off-site (technical[6] or land use management) are possible

2.2 Technical Aspects

The purpose of this part of the Guidelines is to provide information on technical aspects with regard to the Guidance topic. There is a range of hazard and risk assessment techniques which may be used in isolation or combination to achieve broadly consistent outcomes. These techniques can produce the best possible results, give the state of technical knowledge and can indicate the scale of uncertainty that exists.

Risk Assessment Methodologies/Approaches

The target of the Guidance is to enhance consistency of risk assessment in LUP in the Member States. Together with the database it shall enable benchmarking of risk assessment results for LUP by MS. This consistency of outcomes may be achieved by various approaches and methods.

Risk assessment methods in principle may consist of the following four elements, in various combinations:

Qualitative	Quantitative	Deterministic	Probabilistic
Non - Numerical Assessment	Numerical Assessment	Safety defined as a discrete value	Safety defined as a distribution function

The most common methods name, currently used for risk assessment in LUP, are derived from the form of presentation of the results from the risk assessment procedure:

- "*consequence-based*" Method
- "*risk-based*" Methods
- *Hybrid* Methods

This section of the guidance also describes risk tolerance/acceptance, scenarios definition, selection principles for scenarios, critical event frequencies, available data sources for generic frequencies, evaluation of the available generic data, modelling and endpoints, additional technical measures, technical considerations.

2.3 Environmental Aspects

Within the EU environmental framework there are specific Directives addressing environmental issues where the impact of such large projects and programmes has to be assessed before their realization.

This section of the Guidelines describes existing tools for the assessment of the effects on the environment of certain activities (including projects, plans and programmes) which may be relevant to the consideration or risk of environmental damage at the planning level.

[5] However, certain evident measures like the reduction of the quantities present may always be taken
[6] "Technical" with the meaning of design of constructions or physical barriers outside the establishment

In particular, as the guidance should advise on good practice which could be applied, it has been presented the two main pieces of European legislation on Environmental Impact, the Directive on Strategic Environmental Assessment (SEA - Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment) and that on the Environmental Impact Assessment (Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment and its amendments).

3. IMPLEMENTING ART. 12 OF THE SEVESO II DIRECTIVE: OVERVIEW OF PROCEDURES IN SELECTED MEMBER STATES & "ROADMAP" PROPOSALS"

The document should explain in more detail the various options for complying with the requirements of Article 12 of Seveso II Directive and how to achieve principles with basic decisions of the overall approach. A preliminary draft document has been proposed to the Group but still need to be discussed and finalized.

The draft document is based on the elaboration of the results of a recent survey, based on the submission of a new questionnaire to all the 25 Competent Authorities, specifically focusing on the implementation of the requirements of Art 12 ("Control of urbanization"). It has been launched in the first half of 2004 by the Major Hazard Accident Bureau of the Joint Research Centre (JRC) of the European Commission.

The new questionnaire comprised both a methodological and a procedural survey on the state-of-art of the implementation of art 12 of Seveso II Directive. Hence, besides the adopted risk prevention policy, the questionnaire tried to shed light on the "bridge" each Country developed between the two banks of risk analysts and planners and, in the last part, between these institutional actors and the citizens.

The questionnaire was divided in three parts. Part A was concerned the methodology for LUP in place, counted 17 questions ranging from the description of the risk assessment procedure to the endpoints values in use. Part B was concerned with the implementation of Art 12 and the legal and procedural instruments enforcing its requirements in all the cases covered by Seveso II. Part C, in which MS have been called to express their opinion concerning the properties of "good practice", was divided in 2 questions.

The questions aimed at exploring the different aspects of the implementation of Art 12 in Member State from legislative to operational level. Art 12 - prescribing precise requirements in terms of external safety for the a) siting of new establishments, b) modification of existing establishments and c) new developments in their vicinity – is a legislative tool and the result of the assumption of several principles, needing to be translated in operational terms. As defined in the new Guidelines, these principles are, for instance, the key role of LUP in the prevention and mitigation of major accidents; the need maintaining and eventually decreasing a tolerable level of risk and, in this respect, the need of developing reliable instruments for its assessment.

A suitable definition for the expected output of this analysis seemed that of "*Roadmaps*". This definition wants to underline the dynamic aspect of the risk prevention policy that, according with the Seveso II and with the current version of the Guidelines, starts with the definition of the reference scenarios up to the evaluation of compatibility of a specific urban/environmental target. The use of the plural ("Roadmaps") underlines the fact that there are several options for a proper procedure in the given context.

This analysis, complementary to that of the new Guidelines, should complete the tools the Commission will furnish to Member States – particularly new ones - in order to have general adoptable guiding principles for risk in land-use planning as well as a representative overview of the National policies and experiences from which the principles have been abstract.

After a first general comparison, five Member State questionnaires were selected for further investigation, one of them is the Italian one. The selection has been based on the representativeness of each country method, worthy of a deeper analysis.

4 RISK/HAZARD ASSESSMENT DATABASE – RHAD

4.1 Framework

The target of the Risk/Hazard Assessment Database is a systematic collection of consistent data (scenarios, failure frequencies, consequence endpoints, technical measures, etc..) that may be help, as reference, in risk/hazard assessment approaches for land use planning purposes as required by Article 12 of the Seveso II Directive, to assess the compatibility between the establishments covered and the sensitive areas listed in Article 2 of the same Directive.

The RHAD now is still in a demonstration version and is intended as a working proposal to the attention of a specific subgroup of the Group. It can be found at the url http://mahbsrv4.jrc.it/rhadnew-v3 (figure 2).

Figure 2. Home page of Risk/Hazard Assessment Database

As far as the scenarios selection is concerning, inputs should include a representative set of major accident scenarios and a credible and/or evaluated range of scenarios should be defined to provide information on the potential extent of consequences. The selection can be done either by quantitative or qualitative criteria, as the Guidance reads: *"…hazard/risk assessment methods… can be based on hazard and/or risk*".

The conclusion therefore is a selection of recommended scenarios that may serve for consequence assessment. Included in the selection process are broad categories of scenario conditions that may reduce the scenario likelihood, categories of scenario causes that comprise individual initiating events leading to the scenario and possible measures related to these cause categories that may reduce the scenario likelihood.

The following Figure provides a schematic representation of the procedure for using the Database.

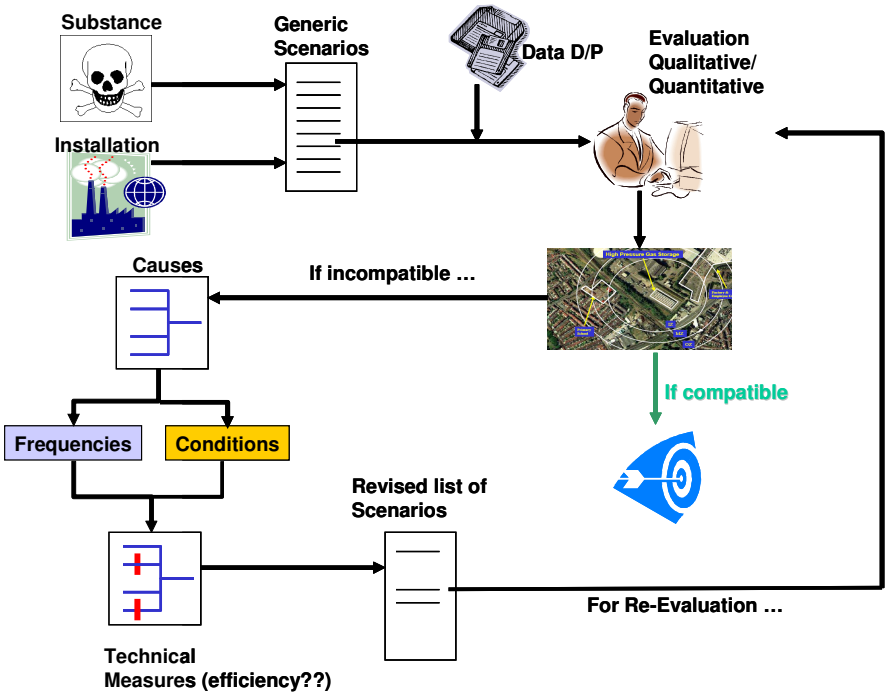


Figure 3. Schematic representation of the structure of the LUP Scenarios Database

The RHAD contains for the moment only a limited number of substances or substance groups which are of particular relevance. The values in the database shall be regarded as examples.

4.1 Italian contribution

In Italy, three Ministries, through their technical support institutions, have been involved collecting data and information in the field of prevention and control of accidents.

In particular, data related to accident scenarios, acceptable risk measures, event frequencies have been taken from the Ministerial Decree of 15th May 1996, Ministerial Decree of 20th October 1998 and from the Ministerial Decree of 9th May 2001, that sets the minimum safety requirements for land use planning of areas, where upper and lower tier establishments according to the Seveso Directive, are located, and deals with use and destination of these areas to limit consequences of major accident to people and environment.

Afterwards, in order to have a complete sets of information, also the Regional Technical Committees, the technical authorities responsible at the regional level for upper-tier establishments, subjected to Safety report presentation, have been involved. The determination of impact areas is conducted by the operator and the Safety Report is subjected to the detailed examination by the competent authority, which validates the determined impact distances.

The collection of information has been extended to all upper-tier establishments with Safety Report examined by the competent authority (Regional Technical Committee), and grouped according to categories of activities.

Moreover, a contribution has been provided to define a suitable scheme for revising/updating information in RHAD database.

REFERENCES

1. EWG on Land Use Planning. "*Land Use Planning Guidelines in the context of Article 12 of the Seveso II Directive 96/82/EC, as amended by Directive 105/2003/EC, also defining a technical database with risk data and risk scenarios, to be used for assessing the compatibility between Seveso establishments and residential and other sensitive areas listed in Article – Draft*" (version June 2006).

2. EWG on Land Use Planning. "*Implementing art.12 of the Seveso ii directive: Overview of procedures In selected member states & "roadmap" proposals*" (Draft version).

3. EWG on Land Use Planning. *RISK/HAZARD ASSESSMENT DATABASE – RHAD* (Draft version).