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Modeling the major accident prevention legislation change process within Europe

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ABSTRACT

The factors giving impulse to changing major accident prevention legislation within Europe, the so-called Seveso Directive, have not been thoroughly studied and molded into an understandable model thus far. For example the exact relationship between major industrial accidents and an ever changing legislation is still unexplored. This paper thoroughly investigates the parameters having influenced the change of the 1996 Seveso II Directive into the 2003 Seveso Directive Amendment 2003/105/EC and develops the accompanying legislation change process. The official major accident reports of Baia Mare, Enschede and Toulouse are studied in-depth, as well as many other official EU documents. Furthermore, experts from academia, government and industry who witnessed and/or participated into the legislation change process were interviewed in-depth. More profound insights into the societal debate following a major accident may help private companies to adapt their safety management system and their prevention policies, and may aid the legislator to develop more efficient and effective regulations. This way, the societal demand to change legislation in an ad hoc manner may be unpressurized.

1. Introduction

A large amount of regulations within European Member States result from European Directives. For chemical industrial activities, the so-called Seveso Directive deals with the regulations to prevent major accidents where hazardous materials are involved. A 'major accident' in this Directive is defined as "*an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any establishment covered by this Directive, and leading to serious danger to human health and/or the environment, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances*" (Directive 96/82/EEC). This definition is used interchangeably throughout this article for the terms 'accident', 'major accident', 'disaster', and 'catastrophe'. According to Vérot (2002), the root cause of the existence of major accident regulations is actually an ancient societal problem, which is the cohabitation of hazardous industrial activities and people living close to these activities due to an ever expanding urbanization. Industrial development next to densely populated areas evidently leads to the possibility of accidents causing mass casualties.

In 1810 in France, the first decree on activities with major risks was published. The decree was caused by a huge dust explosion in 1794 at Grenelle (France) killing some 1000 people. Other European countries followed with their own major accident regulations, regretfully often inspired by major accidents which happened.

The first European Directive treating major accident prevention, 82/501/EEC or the so-called Seveso I Directive (Council of the European Communities, 1982), was issued in 1982. This first European-wide major accident prevention legislation was a direct consequence of two major accidents that had happened in Europe: Flixborough (UK) in 1974 and Seveso (Italy) in 1976. The mere fact that the legislation was named after one of the major accidents, indicates the importance of major accidents as an influential parameter for changing legislation.

The Directive has been changed several times since 1982. The Bhopal-accident in India in 1984 lead to a first Amendment (Council of the European Communities, 1987), whereas the Rhine pollution in Basel (Switzerland) in 1986 gave rise to a second Amendment (Council of the European Communities, 1988). Driven by several major accidents, including Bhopal (1984), Mexico City (1985) and Piper Alpha (1988), further refinement of the original 1982 Directive was deemed necessary to expand the area of application of the legislation and to enhance setting up improved safety management systems within chemical companies (Wettig et al., 1999). On 9 December 1996, Council Directive 96/82/EC or the so-called Seveso II Directive, was approved (Council of the European Communities, 1996). In 2003, the Seveso Directive was

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amended a fourth time. Amendment 2003/105/EC (Council of the European Communities, 2003) mentions three major accidents which have been taken into account during making the changes to the previous legislation: an environmental accident in Baia Mare (Romania) in 2000, a fireworks explosion in Enschede (the Netherlands) in 2000 and an ammonium nitrate explosion in Toulouse (France) in 2001. At present, a fifth amendment of the Seveso legislation is in full progress.

As can be remarked, legislation is very dynamic: old legislation is constantly being updated and new legislation is being generated. This continuing legislation change process requires a lot of time, as well as important human and financial resources from European and local governments. Moreover, in the case of major accident prevention legislation the adaptations are mostly steered by real accidents and are thus regularly driven by impulse. Hence, in order to comply, private companies subject to these ad hoc regulations need to be aware of their existence, they need to analyse them and to implement them. As a result, the administrative and financial burden for private organizations is sometimes huge and companies only comply because of the penalties of non-compliance.

Evidently, it would be more efficient if major accidents would be prevented by pro-active legislation which is well-considered and strongly supported by all stakeholders. Pro-active legislation implies taking into account not only past and present public and private concerns, but possible future public and private interests as well. For example, depressurizing societal demands for legislative changes through (European-wide strictly regulated) well-developed and defendable safety management systems in the chemical industry is one possible way forward. Another way forward is a (European-wide standardized and regulated) well-considered land-use planning policy. In any case, as a prerequisite, the change process driving and steering major accident prevention legislation needs to be well-understood.

2. Research question and methodology

Our aim in this research is to model the major accident prevention legislation change process within Europe. Although major accidents were mentioned as one of the contributing elements to drive the amendments of past Seveso regulations, the legislation change process itself and all its surrounding influential parameters have never been thoroughly and systematically modeled. This paper therefore investigates the factors which induce major accident prevention legislation changes.

An extensive literature study was carried out and information and data concerning past major accident cases and their contribution to new regulations were investigated. Based on this rather theoretical study, some assumptions and inducement factors were identified possibly leading to major accident legislation adaptation.

Directive 2003/105/EG was then studied as a case-study. In this Directive, items of concern are raised as main contributors to the change of mindset of politicians that have lead to the perceived need of adaptation of its predecessor (i.e. Directive 96/82/EEC). As already mentioned, the most cited reasons for change are the Baia Mare accident in Romania in 2000, the fireworks factory explosion in Enschede in The Netherlands in 2000, and the ammonium nitrate factory explosion in Toulouse in France in 2001. However, generalized as well as concrete legislation change inducement factors have not yet been investigated and put forward.

Official accident reports, document analyses, committee minutes and working reports, as well as all Seveso Amendments were thoroughly studied, and five in-depth interviews were carried out with people who were involved in changing Seveso regulations. The interviewees are linked with the chemical industry, academia, Belgian Federal inspection of chemical risks and Technical Working Groups of the European Parliament. The results of the interviews are subsequently validated by the literature study by using NVivo software. This computer-automated program allows to triangulate results from a qualitative investigation. Our analysis ultimately leads to validated legislation change inducement factors (Mortelmans, 2007) and a model of the major accident prevention legislation change process within Europe.

3. Literature study

3.1. Factors influencing legislation changes (in general)

Mitchison (1999) mentions several factors that have led to changes in the Seveso II Directive. He describes the Commission's technical working groups' activities following the appearance of the 1996 Seveso II Directive. A number of these groups is concerned with developing information and guidance for Directive users, while other working groups focus on further elaborating unresolved topics (so-called fine-tuning). A number of factors which may have lead to the introduction of changes in the Seveso II legislation can be mentioned. Between 1982 (publication of Seveso I Directive) and 1996 (publication of Seveso II Directive), the interest of the European public to environmental issues increased significantly. According to Mitchison (1999), prior to 1982, the consequences of major accidents on the environment were perceived as being indirectly harmful to humans. Between 1982 and 1996, this perception has thoroughly changed, and the public is very aware of potential adverse consequences for human health. The Seveso I list of chemicals being considered hazardous for human health has in fact indeed been extended in the Seveso II legislation with a list of substances directly affecting aquatic environments, and indirectly having an impact on human health. The chemicals have been added in Seveso II due to public pressure after a series of environmental catastrophes. The most well-known accident in this regard was the Schweizerhall accident of 1986 near Basel (Switzerland), which heavily polluted the Rhine. Mitchison further indicates that during the debates concerning the new substances, often no consensus on the tiers (amounts) of these chemicals was reached between the experts, due to insufficient scientific knowledge of their environmental impact. Ale (2003) and Fenzl and Brudermann (2009) indicate that lack of knowledge indeed leads to scientific uncertainty, which in turn triggers risk aversion.

Wester-Herber and Warg (2002) indicate that the adverse effects of an accident at a chemical site are usually assessed as being very high by local residents, even though the risks of production are unknown. Jonkman et al. (2003) also point out that strong risk aversion towards low frequency, high consequences accidents exists. Hence, the question whether an accident with exceptional consequences has a greater influence on legislation change inducement than an accident with 'statistically more frequent' consequences can be posed. For example, Ronza et al. (2006) investigated 975 accidents and retrieved an outlier for the Toulouse explosion. In this particular case, researchers found an unusually high rate of injuries compared to the number of fatalities. Ronza et al. (2009) also examined several major accidents in port areas with respect to the financial and social implications next to direct material damages or losses of life. To this end, they designated the following categories: damage to human health and life (deaths, injured people, evacuation costs), environmental damage (biosphere, air, water, soil), material damage (storage of gases, warehouses, land vehicles, process equipment, utilities, buildings and industrial areas, cranes and loading arms, ships), and profit loss (breakdown costs, loss of wages, indirect costs like loss of image etc.). As part of this study the question may be raised whether some categories are more sensitive than others to encourage changes in legislation. Hoegberg