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Whitepaper

SAFETY-SECURITY INTEGRATION IN RISK ASSESSMENT AND MANAGEMENT OF SEVESO SITES

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SAFETY-SECURITY INTEGRATION IN RISK ASSESSMENT AND MANAGEMENT OF SEVESO SITES

Abstract

This report provides an overview of the implementation of the most relevant legislative frameworks for safety and security regulation for industrial sites that are applicable to the LIFE SECURDOMINO locations (Italy and the Netherlands): the consecutive EU Seveso directives since the 1980s and the European Programme for critical Infrastructure protection (EPCIP) regulation. To assess the integration of safety and security regulation of industrial sites, we first reviewed the policy at EU level and then the differences in Italy and the Netherlands.

We discussed the implications of similar and new risks, integration gaps between safety and security regulation, and differences between the countries regulatory and response approaches. The key aspect is that the safety regulation for Seveso facilities does not imply any specific assessment of major accidents triggered by external acts of interference, i.e., security-related threats. In addition, regulation dealing with security protection of critical infrastructures does not explicitly cover the determination and assessment of risks induced by the detention of relevant quantities of hazardous materials. Another important finding is the difference in the approach for evaluating the risks around Seveso establishments in Italy and the Netherlands. In Italy, a deterministic approach was adopted since the introduction of the Seveso. In the Netherlands, a purely probabilistic approach was adopted. However, the recent introduction of the Dutch Environmental and Planning Act (Omgevingswet) (01/01/2024) introduced a deterministic evaluation of hazards and risks around Seveso establishments more similar to the Italian one.

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1. Introduction

The so-called Seveso disaster represented a pivotal turning point in the legislative framework of the European Community. This huge chemical industry disaster paved the way for a communitarian response for the safeguard of citizens. Therefore, the Council of the European Community issued the Directive 82/501/EEC of 24 June 1982 regarding the major-accident hazards of certain industrial activities, also known as Seveso Directive. Following the occurrence of severe events during the following decades, the Directive was revised and two revisions were issued. The second revision (Seveso II Directive) of 1996 introduced land-use planning as a pivotal factor of risk management, to guarantee protection for residential areas, nature, and areas of public use (Dir. 96/82/EC, preamble). Seveso II also increased the management responsibilities for manufacturers to ensure on-site safety. Later, Directive 2012/18/EU issued by the European Parliament and the Council on 4 July 2012 (Seveso III) represented the final addition to the Seveso legal framework, with new provisions, such as for instance more transparency and public communication requirements, for the improvement of human safety and environmental protection.

Beside the industrial safety framework, the Seveso disaster and other incidents inspired the EU council to adopt a solidarity clause (article 222) in the Lisbon Treaty and it prompted the EU commission to build the Civil Protection Mechanism—organizational capacity coordinated by the EU to provide swift cooperation between EU members states in response to disasters on EU territory (Boin et al, 2013). At the EU level, efforts to increase risk prevention and management (Seveso directives) and build capacity for crisis and disaster response (civil protection) continued on different paths. The early drivers to increase the EU role in civil protection moved from DG Environment to DG ECHO (European Community Humanitarian Aid Office) in 2008. Meanwhile, risk and safety regulation with respect to hazardous industries and materials remained within the environmental and health domains. The move of crisis and disaster management responsibilities to DG ECHO consolidated the EU's response-orientation towards civil protection as opposed to the more anticipatory orientation in the safety risk and environment regulation domain (ibid).
In addition, and particularly in the wake of the terrorist attacks on September 11, 2001 in New York, EU security policy developed along yet another trajectory, a stronghold of the foreign affairs, justice and defense policy domains. The increasing awareness of security threats inspired the European Programme for Critical Infrastructure Protection, which promotes the prevention, preparedness and response to terrorist attacks on energy and transport installations – which in turn have implications for Seveso sites and environmental risks.

This report provides an overview of the implementation of the aforementioned legislative frameworks for safety and security regulation for industrial sites and explains the implementation in the LIFE SECURDOMINO locations: Italy and the Netherlands. Limitation both at policy level as well as in the national implementation are explained in order to improve the protection of citizens and the environment.

[1] On the morning of 10 July 1976 in Seveso (Lombardia, Italy) a tetrachloro-dibenzodioxin (TCDD) toxic cloud spread after the loss of control of a chemical reactor owned by the Swiss company ICMESA. Poultry and domestic animals died, while many children began to manifest symptoms of chloracne due to the circulation of the toxin. Long-term effects are also experienced (increase rate of cancer) in the zone.

2. Need of "safety" and "security" policy integration for chemical and process facilities

Chemical and process facilities, where relevant quantities of hazardous chemicals are stored or processed, may become possible targets for acts of interference and terroristic attacks. Security concerns for chemical facilities revolve around both physical and cyber-attacks, as demonstrated by available analyses of intentional attacks occurred in recent years, see Figure 1.

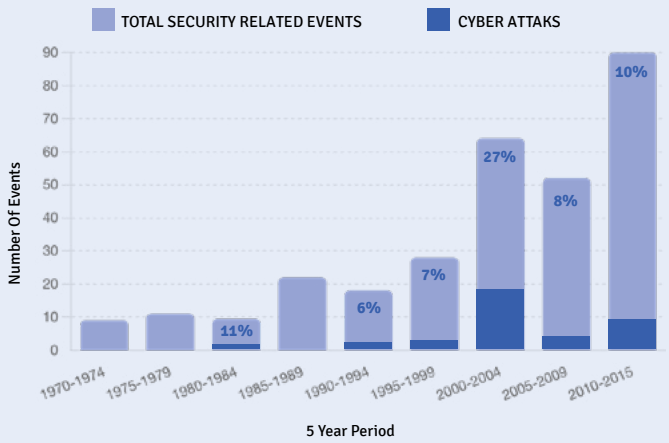

Figure 1 Trend of security attacks to chemical and process facilities grouped by a 5 years period, also illustrating the share of cyberattacks. Adapted from (Landucci et al., 2020).

A number of global and regional measures address security issues in relation to chemical and process facilities. The CBRN (chemical, biological, radiological and nuclear) Risk Mitigation and Security Governance Programme was launched by the United Nations Crime and Justice Research Institute in 2004 to promote the co-operation and co-ordination between countries, international and regional organizations. In Europe, the directive 2018/114/EC was established as a result of the "European Programme for Critical Infrastructure Protection" (EPCIP) and regulates the prevention, protection and response to terroristic attacks involving the energy and transport sector; the regulation EC No 725/2004 enhances the security of international ports and shipping facilities.
However, the European Seveso Directive III concerning major accidents hazard for chemical and process installations does not address the need for a security-related analysis or countermeasures. In fact, in the preamble of the Directive, natural disasters are explicitly mentioned as elements to be included in the safety analysis as they could increase the risk of major accidents, while security-related events (like terrorism, sabotage, war, etc.) are not mentioned:

(15) [...] The risk of a major accident could be increased by the probability of natural disasters associated with the location of the establishment. This should be considered during the preparation of major-accident scenarios.

Moreover, Article 9 covering "domino effects" only considers interaction among neighboring plants that can contribute to the escalation of multiple accidents:

1. [...] establishments or groups of establishments where the risk or consequences of a major accident may be increased because of the geographical position and the proximity of such establishments, and their inventories of dangerous substances.

The risk of increasing consequences due to malicious acts of interference is not mentioned nor analyzed. In other words, the integration of the Seveso III policy into the EPCIP is not explicit. In addition, the requirements for the preparation of the Safety report with the risk assessment are developed in different way depending on the national implementation of the regulation, as explained in Section 3.

3. Safety legislation and implementation in and process facilities

3.1 Implementation of Seveso III in Italy

The implementation of Directive 2012/18/EU has been transposed with the legislative decree 26 June 2015, n. 105 (D.Lgs 105/2015), which is currently in force. The goals of Seveso III were acknowledged, being in fact measures for preventing relevant accidents with hazardous materials and limiting the consequences of accidents on people's lives and physical environment reiterated in the preamble.

The operator of the Seveso facility must adopt all necessary measures to avoid incidents and limit their consequences on people and the environment. Major accident hazards and relevant accident scenarios are analyzed and the necessary measures to prevent and limit them and their consequences on people and the environment have already been taken.

The prevention of relevant accidents and the limitation of their consequences is regulated through land-use planning accordingly to the provisions of Article 22. In obedience to Seveso III, the legislative decree pays attention to the intended use of lands close to territories with a high concentration of establishments. In the development of land-use planning measures, local authorities must assure: 1) safety distance between establishments, residential areas, areas of public interest; 2) protection of areas of natural interest; 3) reducing hazards for humans and nature. To implement Article 22, the ministerial decree of May 9, 2001 (DM 9/5/2001) was introduced since the Seveso II, governing the minimum standards of urban and environmental planning in areas exposed at major accident risk due to their proximity to Seveso establishments. An essentially deterministic approach is adopted to quantify damage distance and territorial vulnerability in order to establish the land use planning and support urban development around Seveso sites.

3.2 Implementation of Seveso III in the Netherlands

The Dutch risk regulation on industrial disasters by means of the BRZO (Besluit Risico's Zware Ongevallen) decree currently in force has been promulgated in 2015 by the Ministry of Infrastructure and Water Management. The legislative framework enabled through BRZO determine the scope of the decree in accordance with the goals of the Directive 2012/18/EU, and establishes the coordination among the Ministries of Infrastructure and Water Management, of Social Affairs and Employment, and of Justice and Security for the enforcement of the requirements set out by the decree.

The management of risks of major accidents on site is delegated to operators, who must ensure the safeguard of the environment and human health by enabling a management policy that must be proportionated to major accidents hazards. The competent authorities are responsible to pay attention on possible domino effects, especially in case of proximity between Seveso establishments and non-Seveso ones that can provoke a worsening in the event of an accident. The Safety Regions Act of 2010, issued by the Ministry of the Interior and Kingdom Relations, stipulates the provisions for disaster management and crisis management. However, even if the responsibility of the disaster response plan lies within the competence of Safety Regions, the industrial site's safety report remains the operator's responsibility. It includes risk-based evaluations adopting quantitative probabilistic criteria. The individual risk acceptance criterion was set to 10-6 1/y, which represents the tolerable frequency of fatalities around Seveso plants.
Along with the Safety Regions Act and the BRZO decree, the Dutch Environmental and Planning Act (Omgevingswet) is the other tool for the implementation of Seveso III directive. The Omgevingswet, which came into force January 1st, 2024, reunites all the previous legislation about spatial planning and allocates competences to water boards, municipalities and citizens in a more clear way. The new law is conceived to develop strategies to improve the quality of air, soil, water and, in a broader sense, of both the physical and

the public environment.
The Omgevingswet has a pivotal role in the management of land-use planning in areas subjected to the risk of hazardous accidents. It identifies the so-called focus areas, namely the physical space around an establishment containing hazardous materials where the risk of dangerous accidents is high. Focus areas are determined with a similar approach to the one adopted in Italy for land use planning (DM 9/5/2001, see Section 2.1), thus calculating damage distance for fire and heat radiation, explosion and pressure wave or radiation, and poison clouds around an industrial site. In other words, when designing the environment in proximity of a BRZO establishment, municipalities have the duty to protect citizens from any possible risk by enabling specific protective measures, such as placing barriers or build collection channels for flammable liquids. Additional safety requirements can be made compulsory, especially for new buildings, while, for what concerns existing housing units or building for vulnerable groups, municipalities can choose to designate focus areas.

4. Security legislation and implementation in SECURDOMINO locations

4.1 Critical infrastructure protection in Italy

The overall goal of the Directive Decree 2008/114/EC is establishing a common procedure for the identification and the protection of European Critical Infrastructures (ECIs), in order to guarantee a better protection of the people. The Italian government enforced the Decree 2008/114/EC with the Legislative Decree no. 61 of 11 April 2011 (D.Lgs 61/2011, art. 1). The identification and designation of ECIs was delegated to NISP (Nucleo Interministeriale Situazione e Pianificazione), an inter-ministerial body comanaged by the Ministries of Economic Development and Infrastructures and Transportation, which was subjected to the approval of the Department of Civil Protection. ECIs are designated by NISP and the responsible structure in accordance with specific criteria that follow the inter-sectorial evaluation on critical issues. Those criteria refer to the potential number of wounded and/or dead people in case of an accident, the economic consequences of an accident, and the consequences of any kind involving citizens. However, no specific link with the Seveso (thus, safety-related) regulation exists.

Eventually, the NISP assumed the pivotal role of contact point with the EC, being in fact responsible for the coordination in the elaboration of inter-ministerial directives regarding supplementary protection parameters and for the elaboration of the data concerning potential threats, risks, or vulnerabilities (D.Lgs 61/2011, artt. 4, 13-14). However, no explicit reference to quantitative risk assessment techniques nor detailed quantitative security analysis tailored to Seveso plants are adopted.

4.2 Critical infrastructure protection in the Netherlands

In response to parliamentary requests (Motie Wijn, 2001), after the 9/11 attacks, the Dutch Ministry of Interior published a report 'Critical Infrastructure Protect Policy' in 2005, in which it identifies, discusses and plans the protection of critical infrastructure in relation to all hazards (not just terrorism) in the Netherlands.

The private sectors need to report annually on their vulnerability and risk assessments and the status of implementation of protective measures to avoid discontinuity, both as a consequence of human error, excess demand, extreme circumstances (such as natural hazards or societal risks) as well as intentional obstruction and attacks. Safety and security are hence integrated in this approach, and the policy includes specific attention to interdependencies between critical infrastructures and vital sectors (Dupont and Reniers, 2010).

The Dutch Chambers of Parliament therefore noted in 2011 that after following due procedure it could be concluded that no new legislation was required for the implementation and adoption of Directive 2008/114/EC in the Netherlands. The all-hazard approach was already integrated in the Dutch risk assessment, protection and emergency response policies and a long-term cooperation between public and private sector was already in place to identify new risks and take protective measures to ensure continuity in the face of either human error, natural hazard-induced disaster or security breaches.

5. Conclusions and future developments

In Italy, regulation has not integrated safety and security but focused on implementation of a domain-specific risk-oriented strategy of intervention through a top-down approach. Specific vulnerabilities of the Italian territory were in fact pivotal in risk management, especially regarding the implementation of safety measures. Natural disasters have been a constant in the history of the country, and they forged the institutionalization of strategies for risk prevention, intervention and mitigation. Italy adopted a risk-oriented strategy based on a deterministic approach which has been tailored on the physical specificities of its territory. Hazard coming from a non-physical environment (security risks) are not subjected to a national risk assessment and management policy, nor integrated in emergency and disaster response planning.

In contrast to the Italian case, the Dutch authorities adopted and consolidated a bottom-up all-hazard approach that fosters the integration of safety and security. Due to its high population density and its engineering approach to dealing with flood risks (though the construction of massive coastal and inland flood control infrastructures), the Dutch historically adopted a probabilistic approach to safety risks. With previously fragmentary legislation and mandates now being replaced by framework legislation such as the Safety Regions Act of 2010 and the Omgevingswet of 2024, the Dutch crisis and risk management approach highlights a relatively strong interconnection between high-risk industries, territories, citizens and public services.

The integration of safety and security through the implementation of an all-hazard approach, can be decisive in improving risk prediction and crisis and emergency management. The resilience of all kinds of critical infrastructures is therefore subjected to the development of specific strategies that foresee the coexistence of safety and security measures. The introduction of specific quantitative tools to address security aspects of major accident installation (e.g., Seveso establishments), both including probabilistic and deterministic evaluations, is of pivotal importance to support the sound integration of safety and security.

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