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Enhancing Safety: The Challenge of Foresight

ESReDA Project Group *Foresight in Safety*

Chapter 13

The Role of Safety Authorities in Providing Foresight

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13 The Role of Safety Authorities in Providing Foresight

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13.1 Executive summary

Safety authorities and regulators have a unique role in governance, which provides them with specific opportunities to generate and disseminate foresight. From the viewpoint of safety, this means foresight concerning risks from accidents and other deviations from safety. This chapter describes some daily activities of safety authorities and discusses the current and potential future possibilities of authorities to provide foresight during these activities. We concentrate here on those authorities that work in the field of safety, especially industrial safety, including safety investigation agencies. Parts of the discussion also apply to public organizations who aid authorities in some sectors.

Authorities working in the field of safety in different countries have different mandates, structures and cultures. This means that their perspective may be somewhat different. In case of an accident, some authorities have the responsibility to find out whether there were any violations of laws or regulations and whether there is reason to fine or prosecute, while others have no mandate to investigate issues of responsibility, but rather to find the root causes of the accident and ways to prevent similar occurrences in the future. Despite these differences in mode of operation, all safety authorities have the common endeavour of working towards a safer future.

Foresight is gained through the authorities' numerous contacts with other actors in the field of safety. Multi-level cooperation produces insight in various safety

areas, which may then be communicated to the sectors, areas or fields that are under the authority's supervision. The discussions between actors that follow this communication produce foresight that e.g. companies can use to maintain and enhance the safety of its personnel, process and products.

13.2 Introduction

This chapter discusses the role of regulatory bodies working in the field of safety, and the authorities' potential in developing and using foresight – for instance by identifying emerging threats to safety and early warning signs of an accident – and sharing this foresight with interested parties such as industry, other authorities and the general public.

An authority or a regulatory body or can be a public entity or a government agency at a sub-national, national or supranational level that has a mandate established by a specific legal act or acts. Such a body typically aims to protect stakeholders in a given sector by supervising that they follow given norms and procedures. Examples are:

- Sub-national level: Transport Scotland aims to deliver a safe and sustainable transport system for the people of Scotland guided by the Waverley Railway Act;
- National level: Finnish Safety and Chemicals Agency (Tukes) supervises the safety and reliability of products, services and industrial activities in Finland, enforcing e.g. the Act on the Safe Handling and Storage of Dangerous Chemicals;
- Supra-national level: European Food Safety Agency (EFSA) provides scientific advice to protect consumers, animals and the environment from food-related risks under Regulation 178/2002.

With the aim of accident prevention and safety promotion, one of the tasks of safety authorities is to detect and communicate early warning signs. Traditionally authorities have carried out analyses of past accidents in order to learn from them. Lessons learned are shared with companies and the public to give insight of risks that are present in their activities and to verify that these risks are managed in an acceptable manner. Using accident-related hindsight, authorities and other regulatory bodies can gain insight and enhance various areas, such as legislation, guidelines and inspection practices.

Safety authorities have wide-ranging cooperation in different ways with numerous other actors that work in the field of safety: standardization organizations, academia, research institutions, and unions, for instance. Some of these stakeholders are listed in table 1.

Table 1: Cooperation network of regulators

Stakeholders	Regulators interact with many stakeholders
Governmental organizations	Local, regional authorities; Military; Supranational authorities (EU institutions); Standardization organizations; Academia and research institutions
Social and political organizations	Non-governmental organizations; Society (citizens); Media
Economic organizations	Companies; Unions; Parties active in advancement of technology

In some countries, such as the United Kingdom, Singapore and The Netherlands, a shift towards strategic foresight has been observed, attempting to cut across the traditional segmentation of problems and their allocation to specific organizations or departments (Habegger, 2010). These countries have realized that focusing on a single issue at a time makes dealing with emerging threats very difficult. Due to the interconnectedness between social, political, economic, environmental and technological sectors, a multi-disciplinary approach in looking at risks through foresight creates increasing margins for improving preparedness and resilience towards identifying weak signals and risk scenarios. Thus, the work done by authorities can become more anticipatory rather than reactive in approach. It can be seen that *a posteriori* methods are insufficient in capturing weak signals to alert companies on time to better prepare themselves for possible adverse effects.

Given their position and role in the governance of risks, authorities are well positioned to identify general industry-wide or societal trends that are likely to lead to safety degradations in the future. They are notified of incidents and can undertake trend analysis. They can observe the evolutions of external constraints

¹¹⁷For instance, the [regulatory framework timeline](#) of EASA on this issue extends into 2023.

(economic conditions, trends in the societal acceptance of specific hazards...) and anticipate their impact. Some examples of this in recent years:

- The rapid increase in the popularity and technical capabilities of civilian drones poses increasing challenges to air traffic control. Regulators in the EU, USA, and other countries are working to change regulations concerning the use of civilian drones to reduce the risk of collisions with general aviation traffic (Cracknell, 2017), and to improve both detection capabilities and enforcement of zoning regulations, including developing drone destroying capabilities¹¹⁷.
- The increased availability of high-power laser pointers poses significant hazards for general aviation pilots (airplanes, helicopters), with many cases of pilots being blinded by pointers during airport approach. Regulators may be able to identify a trend in these new forms of threats and work with airlines to find risk mitigation strategies.
- The chemical industry has seen a trend to reduce the quantities of hazardous materials stored on site, following inherent safety principles. This leads to an increase in the transport of hazardous materials, with consequences for safety of road/rail transport that can be anticipated by authorities. Such effects of new trends can and should be identified early on to avoid unintended consequences.
- Electric scooters have become more and more popular, also with adults in their daily movements. This may mitigate air pollution in big cities, but the scooter speeds of 25-30 km/h cause new problem areas that should be taken into account in e.g. appointed areas to use scooters, traffic rules and accident insurance.

13.3 Types of foresight-enabling activities

13.3.1 Foresight possibilities during daily work.

In order to be effective in carrying out foresight within a safety authority, it is essential to have foresight-enabling activities in place during daily work. This would build and strengthen a *foresight looking culture* that would help stakeholders become anticipatory in managing safety. Foresight should promote thinking about

and visualising future alternative scenarios, whilst engaging stakeholders to actively work together to debate the future and contribute to shaping it¹¹⁸.

When carrying out daily work there are various activities that could enable foresight culture in safety authorities:

- Setting up and sustaining a systematic knowledge base. As there are many forms of knowledge storage (emails, forum discussions, social media exchanges, local and shared drives, cloud, working groups, experts, etc.), having one reference point can be beneficial. Depending on the topics that need to be monitored, stakeholders should co-design processes to systematically capture, index, store, curate, analyse, visualise, apply and disseminate knowledge (old and new; tacit and explicit). Building a knowledge management culture is a necessary component to enable a foresight culture.
- Building a systematic data analytics capability. By having analytical processes in place to systematically understand the past, i.e. what happened (descriptive analytics); to gain the insight on why it happened (diagnostic analytics) and what will happen (predictive analytics) [see also Chapter 10], safety authorities would routinely be able to detect trends, patterns and emerging change. This insight generation process would foster informed decision making and increase foresight capacity of an organisation.
- Encouraging organisational learning. When a safety authority motivates a systematic implementation of knowledge management processes within its organisation, knowledge is embedded into its organisational processes. This way the organisation builds its continuous learning capacity (in terms of practices and behaviours) whilst achieving its corporate objectives. In other words, organisational learning is a sustainable way to improve knowledge utilisation. Building a lessons learning culture is a necessary component to enable a foresight culture.
- Reducing learning barriers. Safety authorities should bring stakeholders together to regularly identify learning barriers and find ways to overcome them. This will help foster organisational learning. Addressing this will enable a foresight culture.

- Putting more emphasis on organisational factors in the development of early warning signs. [see also Chapter 8.] Safety authorities often read lessons learned reports. It can be observed that such documents tend to focus on more technical causes and lessons learned. These result in the development of more technical-oriented indicators that help identify early warning signs instead of organisational-oriented ones. However, when reading such reports, it can be observed that there are underlying organisational factors that have not been explicitly communicated. Focus on the latter will help increase capacity to capture more tacit knowledge.
- Promoting inclusive multi-stakeholder and multi-disciplinary teams. When a strategic foresight related issue needs to be addressed, safety authorities should, as a habit, include in this process many stakeholders from various disciplines. Doing this regularly would ensure a more effective design of a foresight strategy and action plan, thanks to dialectic debate and inclusion of different perspectives.

13.3.2 Inspections and site visits

Authorities can adopt different strategies when interacting with regulated organisations such as operating companies, ranging from a “policeman” attitude which is focussed on identifying gaps between practices on a site and the regulatory requirements, to an “advisor” role which involves discussion with operating companies on how to interpret the regulatory requirements and strategies to attain compliance and improve safety even further. In the academic literature, this differentiation in attitude depending on what inspectors perceive of the motivation of the operating company is called *responsive regulation* (Ayres & Braithwaite 1982). When operating in an advisory role, which leads to richer interactions between inspectors and companies, inspectors are more likely to generate foresight than by operating in a “policeman” role.

Inspectors can help the operating companies identify where procedures, tools and systems could be improved. The challenge for regulators is to aid the company to improve its foresight capacity. As an example, the inspector can look at the elements of the company’s training program as training employees in hazard identification and reporting will lead to better insight of the safety status, discussions of risks and needs to improve, and through these, foresight.

¹¹⁸ <http://www.foresight-platform.eu/community/forlearn/what-is-foresight/>

Safety authorities can identify the fact that the technology on a site is lagging far behind the state of the art and suggest or mandate changes. Regulations that are expressed as obligations to implement best available technologies when possible help make this approach systematic. However, new obligations are bounded by a legal framework and the objective of avoiding adding unnecessary burden.

Safety authorities can audit/inspect the systems in place in operating companies for handling events and detecting warning signals and the organizational and cultural features that are known to be necessary for a learning culture and a mindful organization. For example, they may be able to detect underreporting of significant events by talking with front-line workers about the incidents they experience and the accidents that they remember, and to compare these with the formal record contained in the company's experience feedback database.

Authorities help generate foresight when they distribute to e.g. small and medium-sized enterprises good safety practices, information of identified risks and other safety aspects they have identified during inspections to pioneering companies.

In some cases, where for different systems (aviation, railway, maritime), same regulation stipulates the condition for medical and psychological examination for employees with responsibility in safety traffic (e.g. Romania), the safety and investigation authorities should cooperate and exchange information if an accident occurred having as cause or as contributing factor, an issue relating with the provision of that regulation.

13.3.3 Feedback to legislation

The activities safety authorities and regulators perform have a strong link to legislation. Regulators and other safety authorities may have a mandate to write, monitor, support or update the legislation and associated regulations. Outdated regulations are sometimes a contributing factor in large accidents, where new technologies on the market are not covered by existing regulations and are used without sufficient thought concerning the safety design and related impacts. An example is provided by the fire at Grenfell Tower (London) which caused multiple fatalities in 2017. Companies involved in the refurbishment of the building used combustible building materials which were not specifically covered by existing building codes. (Grenfell Tower Inquiry, n.d.)

“Policy development often lags well behind technological advances” (Lee, 2019). By working with legislators in a proactive manner, safety authorities can help

minimize the temporal lag between the appearance of new risks and the development of appropriate regulations.

Likewise, regulatory bodies need foresight to minimize the lag between societal changes and legislation required to protect society and the environment. For instance, increasing life expectancy is likely to lead to increases in the retirement age in most countries, and to the presence of older workers in the workplace. This change may require modifications to labour laws and related ergonomics standards, for example to account for physical differences, and to government support for lifelong learning programmes.

As soon as a new scientific invention reaches the regulatory bodies, they should be working towards getting that into legislation. There should be certain specific groups that focus on anticipating new innovations, designing processes that inject new knowledge into legislation in a timely manner (horizon scanning).

13.3.4 Market surveillance

Market surveillance done by regulators is targeted at e.g. products that are on the market and available to consumers, product documentation, markings and labels on products, and procedures for demonstrating compliance. Surveillance can be either risk-based or based on random selection. Regulators aim to find and check products with the greatest safety risks as they are only able to check a small proportion of all the products that are on the market.

The authorities have insight through EU cooperation concerning safety-related events, and they can use it to help companies improve foresight. In early 2019, the Finnish Safety and Chemicals Agency carried out a survey on the safety of so-called escape rooms — a popular game for kids and adults — based on a dramatic accident that had occurred in Poland. As a result, Finnish escape room operators significantly improved customers' ability to leave the room in case of a real emergency (Tukes 2019).

The authorities may also use the insight they have to inform consumers to make safer choices — and to gain the needed foresight to do this: In a project called “At your own risk” (Tukes 2018/1) numerous Finnish authorities and other organizations worked together to inform consumers of the responsibility and risks they take when purchasing products from outside the EU regulatory framework. In this project in 2018, e.g. the Finnish Safety and Chemicals Agency tested

products it had ordered online from countries outside the EU. Only 1 out of 32 products fulfilled European requirements (Tukes 2018/2).

13.3.5 Accident database management

National and local authorities often maintain accident and incident databases. Through these databases the authorities can monitor the level of safety on a larger scale and identify trends or e.g. new issues that raise concern. As different safety and investigation authorities have different mandates, their accident (incident, near miss) databases, knowledge and knowhow complement each other. Through accident-related information exchange the authorities can obtain a better view of the situation as a whole. Additionally, with the rise of open data, big data and related methods, existing information can be combined to produce new information that the authorities and others can use to help companies gain foresight to identify emerging problem areas and prepare for new risks.

International databases contain information about risks identified in other countries, and/or different activities (systems) making it possible for the authorities and others to learn from major incidents that have already been realized elsewhere.

When they run an incident database, the regulator is well placed to identify rare events. For example, the icing threat on certain types of pitot tubes that was a causal factor in the AF447 Rio-Paris crash had been detected by EASA prior to the crash. EASA had not yet decided to mandate a change to the equipment, but some airlines had decided to replace the pitot tubes by another model which was thought to be less susceptible to high-altitude icing. In the case of the affected aircraft, Air France was in the process of replacing the pitot tubes, but the change had not yet been implemented on that specific aircraft (BEA 2012).

Some European databases that are utilized widely include:

- The European Commission has established a Clearinghouse for collecting and analysing operating experience from nuclear power plants in order to provide feedback for EU regulators to improve nuclear safety (<https://clearinghouse-oef.jrc.ec.europa.eu/>).
- The European Commission maintains the Major Accident Reporting System (eMARS), houses lessons learned reports of chemical accidents and near misses from EU, EEA, OECD, and UNECE countries. eMARS event

reporting by EU Seveso Competent Authorities is mandatory. (<https://emars.jrc.ec.europa.eu>)

- The French Ministry of Environment/General Directorate for Risk Prevention developed the Analysis, Research and Information on Accidents (ARIA) database, which contains (<https://www.aria.developpement-durable.gouv.fr/the-barpi/the-aria-database/?lang=en>)
- The German database Zentrale Melde- und Auswertestelle für Störfälle und Störungen in verfahrenstechnischen Anlagen (ZEMA) contains annual reports of all events which must be reported to the authorities pursuant to the 12th Federal Emissions Control Ordinance. (<https://www.infosis.uba.de/index.php/en/index.html>)
- Even smaller countries with less resources are able to develop a simple database. This is illustrated by the Belgian Database “Lessons of Accidents” of the Belgian Competent Authority for Seveso Industries (<https://emploi.belgique.be/fr/themes/bien-etre-au-travail/seveso-prevention-des-accidents-majeurs/publications-sur-la-5>)

13.3.6 Horizon scanning and adversarial approaches

Given their position and role in the governance of risks, safety authorities are well positioned to identify general industry-wide or societal trends that are likely to lead to safety degradations in the future. They may be able to detect signs of practical drift or normalization of deviance (Vaughan 1996) through their interactions with companies, thanks to their “outsider” view and their mandate to provide a critical analysis. Indeed, authorities typically work with a range of company roles within high-hazard industry sectors, as well as with representatives of civil society (local government officials, members of local communities). Authorities are notified of safety-related incidents, participate in audits and investigations, and can undertake trend analysis. They can observe the evolutions of external constraints (economic conditions, trends in the societal acceptance of specific hazards...) and anticipate their impact.

The following points illustrate horizon scanning and adversarial activities that can be undertaken by authorities and other organizations:

- Brainstorming sessions amongst inspectors after an accident or near miss to come up with a list of questions to ask that may enable to identify

establishments with similar root causes and problems. These discussions can be enriched by operational experience feedback data, and can help to identify potential pathways to an accident (scenario-based approach) that have not yet been identified. These could be the basis for the development of lagging indicators.

- Brainstorming sessions amongst inspectors to come up with a list of leading indicators.
- Implement “red team” type exercises with volunteer firms. These adversarial exercises, developed in the military planning sector, consist of establishing two teams, a “red” team which searches for “holes” in the organization’s defences and event sequences that can lead to an accident, and a “blue” team which is responsible for defence (Bloomfield & Whaley 1963). These exercises actively challenge an operating firm’s beliefs and the assumptions underlying its risk analyses, and can help reduce complacency. A well-known example of this practice is the stress tests used by financial regulators to ensure that banks and insurance companies have sufficient capital reserves to deal with extreme events¹¹⁹. A similar approach is taken to review the safety of nuclear power plants in Europe with [stress tests](#) defined and organized at the EU level after the Fukushima Daiichi accident. This included self-reporting on defined questions from national regulatory bodies and independent public expert review and conclusions.

With this information, authorities are in a position to:

- Provide additional guidance to operating companies, warning them of emerging risks and potential preventive actions. An example of this activity is provided by the UK Health and Safety Executive’s annual Foresight reports (UK HSE 2018).
- Update their inspection checklists to integrate new threat types.
- Suggest changes to regulations that can be made by the legislator.

13.3.7 Insights from research, other organizations and the industry

Efforts to improve risk governance exist in all domains (e.g. transportation, process and the food industry) where modern government tries to reduce cost and assure

safety and benefits. Risk governance approaches and experience from different domains contains universally useful values for improving regulatory efficiencies and foresight (IRGC, 2017). This cross-domain exchanges could be useful for different elements of regulatory framework, i.e. to improve policy, legislation, enforcement, inspections, experience feedback practice and foresight. Broadly, there are three sources of risk regulation experience from different domains potentially useful to improve risk governance and achieve social and environmental goals, i.e.: 1) research; 2) international organizations; and 3) similar hazardous industries (IAEA 2020).

Research about risk governance (policy development, implementation and regulatory process) exists in all domains and its results could be universally valuable. The value of research could go from developing approaches to evaluate regulatory efficiency to identification of best practices to improve specific regulatory features and include evaluation of the regulatory framework designs.

Regulatory efficiency could be measured by assessing costs and benefits of regulation which could be useful for deciding about introducing specific regulatory requirements or selecting alternative approaches, e.g. Robinson et al. 2008. It is important but also challenging to measure efficiency and effectiveness of regulation with interconnected impact of co-existing regulatory features, e.g.: communication, consultation, consistency, flexibility, independence, accountability and transparency (Berg, 2001). Identifying and explaining best practice can help improve regulatory efficiency.

Comparison of regulatory framework designs can contribute to improved regulatory decision making. Different regulatory designs aim to enforce compliance and to improve efficiency from collaboration with regulated organisations. Systematic empirical research into the applicability and effectiveness of different regulatory types for different problems and under different conditions is lacking (NASEM, 2018).

International organizations like OECD and the European Commission (EC) are facilitating risk governance experience exchanges from different domains. The EC has organized workshops with regulatory experts from different domains, e.g.

¹¹⁹These [stress tests](#) are run by the European Banking Authority in collaboration with the European Systemic Risk Board, the European Central Bank and the European Commission.

shipping, aviation and nuclear industry (EC 2008). This kind of activity presents opportunity for exchange of applicable best cross cutting regulatory practices.

OECD facilitates exchanges between many different regulatory domains in order to improve policy and governance. The OECD Council on Regulatory Policy and Governance published recommendations and tools for effective and efficient regulatory policy, governance and management (OECD 2012). Another OECD report provides guidance on improving regulatory enforcement and inspections with examples of good practices and principles, i.e.: evidence-based enforcement, selectivity, risk focus and proportionality, responsiveness, long-term vision, transparency, information integration, fairness, compliance promotion, and professionalism (OECD 2014). The OECD has also developed indicators of regulatory policy and governance covering three principles (stakeholder engagement, regulatory impact assessment and ex-post evaluation) and providing a baseline measurement to track status and progress¹²⁰.

More specific experience and more directly applicable insights are coming from domains (industries) which share some similarities. The governance of safety in all hazardous industry could produce experience and insights applicable in other domains. This could include all different aspects from regulatory organization and activities to specific technical and human. Findings from investigations of major accidents in other hazardous industries should be included within the scope of experience feedback. The role of the regulator was assessed e.g. for offshore safety following the Macondo disaster (Weaver, 2014). Novel activities from regulators in other hazardous industries could be considered for adoption and as a source for improvements. For example, process industry regulators from different EU countries organized mutual joint inspections in order to exchange insights and best practice (Wood, 2014).

Risk governance experience insights from different industries, especially high hazard ones, are potentially universally applicable and should be regularly reviewed. Existing activities and available information from different industries could help risk governance in many segments (from policy development, through implementation, and regulatory process) including foresight. There are however many challenges to fully utilizing all these potential opportunities related to the applicability of findings, uncertainties of results, and the need for additional

resources. International organizations like the OECD and EC are providing arrangements to identify, scrutinize and disseminate such cross domains risk governance experience.

13.4 Conditions for success

13.4.1 Authorities working with companies

Compared with the classical operating mode of many safety regulators, which is primarily focused on verifying compliance with prescriptive requirements and investigating incidents and accidents, the adoption of foresight-informed approaches often involves changes to the way in which the authorities operate and interact with regulated organisations, legislators and the public. This foresight-informed regulatory approach also requires the development of new competencies for the authorities' staff.

To increase foresight, authorities will need to adopt a cooperative relationship with operating companies, advising and working in collaboration towards safety, rather than a relationship focussed on enforcement alone. This requires the development of trust, openness and positive collaboration, all features which cannot be imposed but rather which develop with sustained effort over time. Both actors need to foster a constructive and open safety environment where early warning signs can be identified and dealt with in a transparent and efficient manner. Here the safety culture of the regulatory organization also plays a role (NEA 2016).

Effective foresight development also requires specific skills and competencies for the inspectors and other regulatory personnel, such as the ability to anticipate risks, knowledge of methods such as scenario development and horizon scanning, and communication skills. Maintaining and developing these competencies requires specific attention at the organizational level. These competencies are easier to develop in authorities which maintain specialist expertise in the areas they are overseeing, rather than delegating part of their supervisory authority to industry personnel (delegation of this type by the US aviation regulator has been

¹²⁰Indicators are available online for 2015 and 2018 at www.oecd.org/gov/regulatory-policy/indicators-regulatory-policy-and-governance.htm.

heavily criticized after the Boeing 737 Max disasters in 2018 and 2019). Also the interface between the company and the regulatory body should be developed.

Regulators must follow up on their recommendations to ensure that they are implemented within an appropriate timeframe. Otherwise, companies may omit to implement recommendations, as for example at BP Texas City, where OSHA had identified a number of safety management deficiencies during various inspections but did not enforce their recommendations (CSB 2007, page 20).

It is important to note that the role of regulators in generating and disseminating foresight is not necessarily positive: if a regulatory body is excessively conservative, and does not work towards modernizing legislation, the regulatory framework and inspection practices, if the regulatory body promotes an outdated view that equates safety with compliance (minimum demands fulfilled), it may constitute an obstacle to foresight activities within companies, by preventing the implementation of novel technologies and organizational strategies.

13.4.2 Companies working with authorities

Between the authority and the company it supervises there should be regular discussion and follow-ups of lessons learned, with a focus on near misses. The questions addressed in these discussions should also be discussed inside the company.

- What could have been done to prevent this near miss: at individual, organizational, corporate level?
- What can we monitor (which indicators) on a regular basis to ensure that we could anticipate and prevent such an incident from occurring?
- Who are the key actors to ensure that such a process is designed, with an integrated follow-up mechanism?

Once indicators have been identified, encouraging all actors (company, inspectors, and other stakeholders) to continuous learning:

- ensure awareness on this issue (continuous culture building and follow-up of its effectiveness);
- know what to effectively do when such EWS are detected for continuous knowledge building to ensure long-lasting imprinting.

Regular discussions and follow-ups of possible scenarios (e.g., known unknowns and unknown unknowns) is a useful exercise to make people aware that these

types of events can occur and discussions such as these increase collective knowledge and awareness about the establishment. Thus, a positive environment for an “early warning sign detection” culture.

13.5 Conclusions

Authorities have a unique role in the governance of safety, which provides them with opportunities to generate and disseminate foresight. Authorities are able to identify trends and new threats to safety due to their ability to have: integrated view of the status of regulated activities; collect and review events that occur in a large number of companies; and to observe interactions with a multitude of other actors (such as research organisations, unions, citizens and other relevant authorities). Safety authorities have channels that help disseminate foresight and lead to changes in safety management both within companies and at the regulatory level.

Safety authorities can produce and disseminate foresight through their interactions with actors at different system levels and in different industry sectors, as a part of many different activities such as inspections, events’ trend analysis, work on regulations, market surveillance, and more currently, horizon scanning and adversarial exercises.

From hindsight to insight to foresight: learning from the past, combined with multidimensional analyses assists in looking into the future and identifying the possible roads to follow. The possible obstacles on those roads will lead to new viewing angles to identify both existing and emerging risks. Here the role of the safety authority is that of a facilitator and enabler: when the viewpoint of foresight is included in the regulator’s daily activities, the discussions between the authorities and the organisations it interacts with will generate new possibilities to maintain and improve safety.

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