Fact sheet

The "NaTech" risk, or technological accidents triggered by a natural event

A natural hazard (flooding, earthquake, forest fire, storm, ground movement, avalanche, cyclone, extreme cold spell, heat wave, etc.) may affect industrial installations and cause an accident or series of accidents with serious impacts on human health, property or the environment beyond the site boundary. In this case, the term "NaTech accident" is employed, indicating a contraction of the words "natural" and "technological". These consequences may be direct (property damage: plant, equipment, facilities, etc.) or else indirect (social, operating losses, loss of market share / opportunity cost, etc.).

1. Natural disasters in Europe and in France

An inventory conducted over the period 1975 to 2008 allows to evaluate the distribution of natural disasters which occurred across Europe (Fig. 1) and caused significant human, social and economic consequences. The countries surface can not alone explain the frequency of natural disasters occurrence. The coastline exposition, climatic context, subsoil composition and level of urban density all constitute factors capable of exacerbating or mitigating the effects of these major natural events.
Moreover, the breakdown among the various types of natural phenomena varies from one country to the next. Storms and flooding account for the majority of disasters recorded in Austria, Belgium, Denmark, France, Germany, Ireland, the Netherlands, the United Kingdom and the Scandinavian countries. As an example, on February 2010, the Xynthia storm accompanied by strong precipitation and flooding, crossed and impacted many European countries. The continent's southern countries are also exposed to storms and flooding, yet they must also cope with heat waves capable of sparking forest fires, such as those seen in the south of France, Spain, Italy, Greece and Portugal. In addition, Greece and Italy are the two European countries most frequently shaken by earthquakes. The Aquila earthquake in 2009, along with those occurring in the Emilia-Romagna region in 2012, provide recent and deadly illustrations for Italy.

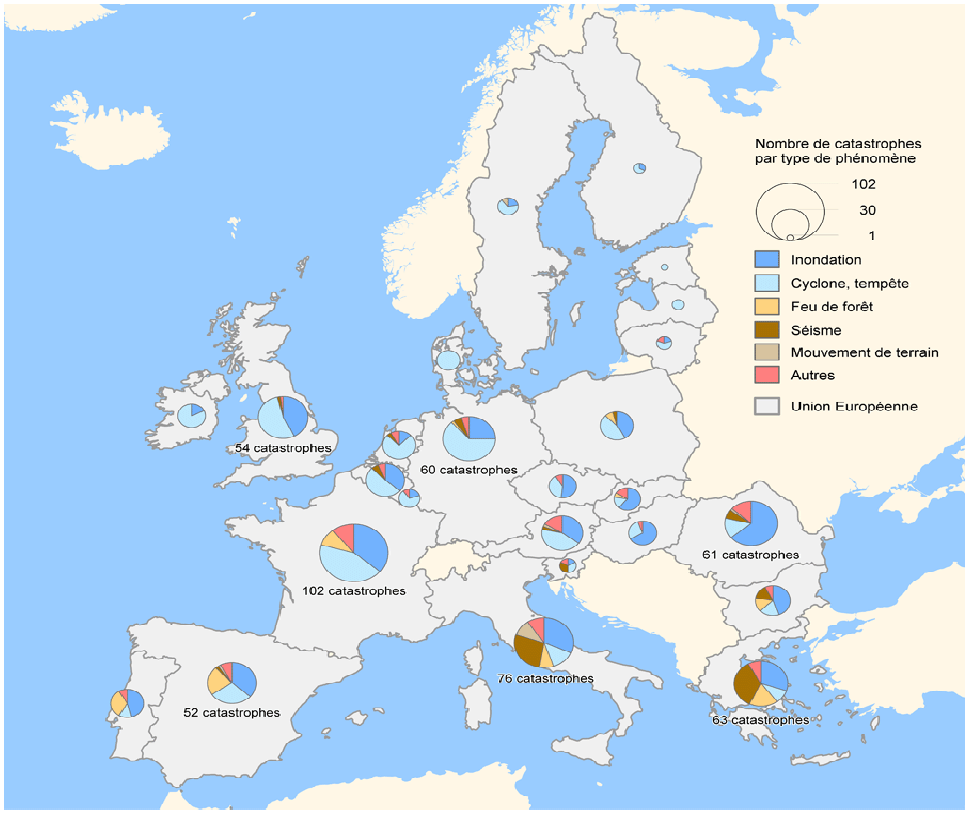

Figure 1: Natural disasters occurring in Europe between 1975 and 2008
Disasters causing 9 or more deaths, or affecting more than 99 people, or giving rise to a declared state of emergency, or a call for international relief aid; other: avalanche, heat wave, tidal wave, volcanic eruption (Source: EM-DAT, the OFDA/CRED International Disaster Database, 2009)

France is included among the European countries most heavily affected by natural disasters. Floods and storms represent nearly three-quarters of all recorded events in the country.

Figure 2: Natural events causing damage in France between 1900 and 2007

(Source: DGPR, database on natural disasters since 1900 in France, figures released in September 2009)

2. Typology of "NaTech" accidents

The ARIA base has recorded a total of 920 accidents occurring at classified or similar facilities, for which natural phenomena were cited as one of or the single initiating event, over the period 1992 to 2012.

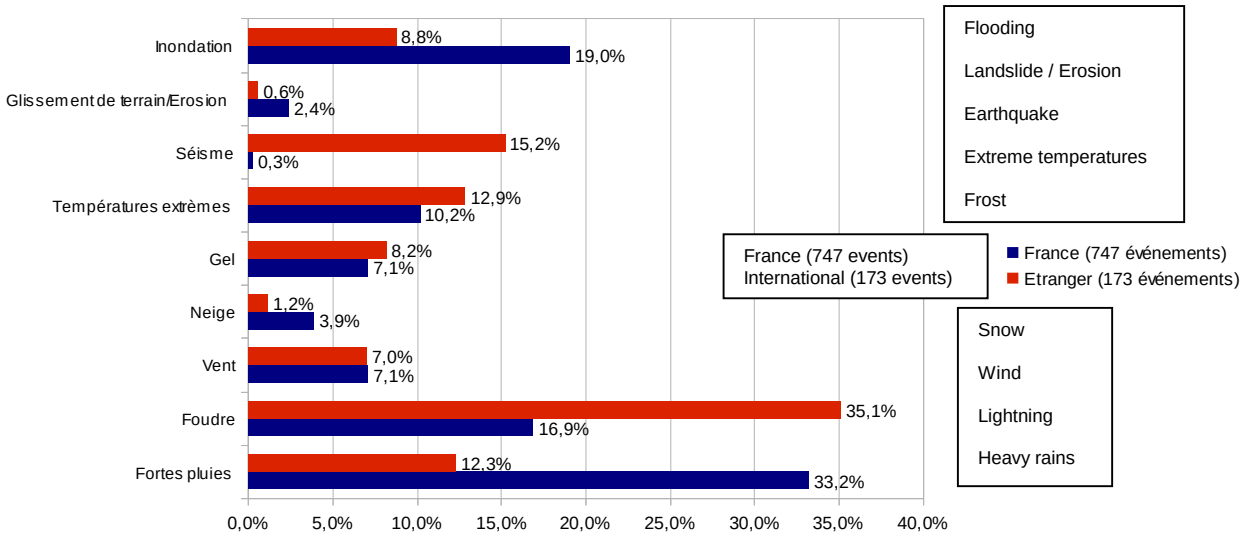

Figure 3: Breakdown of the 920 NaTech accidents occurring at classified facilities and recorded in the ARIA base over the period 1992 to 2012

2.1 Earthquakes

Earthquakes and their often dramatic consequences constitute a sizeable share of the NaTech type accidents recorded abroad (15%). These cause the weakening or collapse of structures (ARIA 42563) or else triggers tsunamis that in turn generate major flooding events (ARIA 40258).

2.2 Heavy rains and flooding

NaTech accident records in the ARIA base (Fig. 3) are correlated with the predominance of natural disasters tied to rainfall and its consequences (Fig. 2), inasmuch as heavy rains and flooding make up half of all phenomena leading to industrial accidents across the country. Floods are often caused by intense, extended rainfall events giving rise to high water levels above the designed protections in place at industrial sites (ARIA 35792), or to major rises in water levels via storm drain networks (ARIA 39616).

2.3 Thunderstorms

Thunderstorm phenomena are responsible for several risks occuring at industrial sites: heavy rains (Section 2.2), in addition to lightning strikes and disturbances to internal and external power supply. Lightning causes fires as well as explosions on flammable liquid tanks (ARIA 40953). The loss or outage of power supply leads to dangerous interruptions of industrial processes (ARIA 38617).

2.4 Extreme temperatures

Heat waves or severe cold spells are seasonal phenomena capable of affecting all sectors of activity. Fires are associated with both of these extreme cases, sparked during the summer by self-ignition (ARIA 42604) or triggered during winter by the low relative humidity rates (ARIA 41754). Frost phases are conducive to the bursting of pipes conveying hazardous fluids (ARIA 23839), in addition to obturating fire extinction water networks (ARIA 41638).

Source: Site operator (Risks Directorate)

3. Conclusion

The consideration of natural phenomena in evaluating risks to classified facilities within safety reports has already made it possible to prevent certain types of accidents or to limit their consequences through laying out technical and organisational measures adapted to the particularities of each site.

Several recent NaTech accidents, occurring in France and elsewhere in the world, have nonetheless served to reaffirm the need to implement appropriate protection at industrial sites against large-scale natural

hazards. For this reason, the Ministry of Sustainable Development has launched an initiative to formalise the "NaTech action plan", intended both to put into perspective all approaches conducted over the past several years and to propose awareness-building campaigns and a new set of regulatory tools to improve prevention efforts relative to various NaTech risks: earthquakes, flooding (flash floods, submergence, etc.), extreme cold, heat waves, forest fires, strong winds, ground movements (landslides, rockslides, underground collapses), and snow.

For further information:

Consult our site www.aria.developpement-durable.gouv.fr for a wide array of NaTech accident analyses:

Earthquakes:

- "Overview of the industrial accidents arising during the massive Tohoku earthquake and tsunami" (Japan)
- Detailed fact sheet: "Devastating earthquakes in a zone of moderate seismic risk in Emilia-Romagna (Italy), 20th and 29th May 2012".

Heavy rains and flooding:

- Synthesis: "Atmospheric precipitation and floods: Inputs to industrial accident statistics"
- Press article: "Industry and flooding, feedback elements"
- Detailed fact sheet: "The impact of floods at Seveso-classified facilities: Series of events from 1993 to 2003 in the Provence-Alps-Riviera Coast and Languedoc-Roussillon regions (France)".

Lightning:

- Synthesis: "Lightning: Industrial accident statistics"
- Press article: "Industry's response to lightning: Serious potential consequences".

Extreme temperatures:

- ARIA news flash: "Severe cold spells: Beware of freezing… and then thawing!"
- ARIA news flash: "Heat wave and scorching heat: Greater risk of fire but that's not all!"
- Detailed fact sheet: "Cyclohexane leak at a chemical plant in Chalampé (France), 16 December 2002".