FLOOD RISKS AT WORK AND THEIR IMPLICATIONS FOR OCCUPATIONAL SAFETY AND HEALTH

1 Introduction

Climate change is widely recognised as one of the 21st century's most significant global challenges, with profound implications for environmental systems, economic stability and human health. In Europe, climate change is having an increasing influence on occupational safety and health (OSH) by altering the frequency, intensity and distribution of extreme weather events (Adam-Poupart et al., 2013).

Scientific evidence shows that rising global temperatures are closely linked to an increase in extreme weather phenomena including heatwaves, heavy rainfall, storms and flooding (Victoria State Emergency Service, n.d.). In Europe, these trends are particularly evident, with several regions experiencing more frequent and severe rainfall events, leading to an increased risk of flooding in both urban and rural areas (Fatica et al., 2024).

The impact of climate change on OSH is multifaceted. It not only introduces new occupational hazards but also exacerbates existing risks, creating more complex exposure scenarios for workers. For example, extreme weather events can intensify physical hazards, increase exposure to biological and chemical agents, and generate additional psychosocial stress due to uncertainty and disruption (Adam-Poupart et al., 2013).

Furthermore, climate change contributes to the emergence of systemic and cascading risks, where a single event – such as a flood – can trigger a chain of consequences affecting infrastructure, supply chains and labour conditions. These interconnected risks require a shift from traditional hazard-based approaches towards more integrated and adaptive risk management strategies within OSH systems (with reference to institutional and regulatory frameworks at European and national levels) (Schaapman, 2022). This is consistent with EU-OSHA's foresight work, which highlights the interconnected and cascading occupational safety and health risks associated with climate change (EU-OSHA, 2026).

In response to these challenges, European institutions and agencies, including EU-OSHA, have emphasised the need to consider climate-related risks in OSH policies and practices. This includes strengthening resilience, improving preparedness, and promoting a preventive culture that accounts for future uncertainties (WEM, 2023).

1.1 Scope and objectives of this study

This study focuses on the **OSH implications of flooding in small and medium-sized enterprises (SMEs)**. Its objective is to back the development of a clear, practical and useful guidance tool to support SMEs in integrating flood-related risks into their OSH management systems, enabling them to assess, plan and manage OSH risks before, during and after flood events. The guidance, published as a separate document[1], draws on the study which findings are presented in this paper.

Specifically, the objectives of the study and the related guidance were to:

- describe the relationship between climate change, floods and OSH;
- identify the potential OSH impacts of flooding;
- provide technical and organisational recommendations adapted to SMEs;
- support the integration of flood risks into preventive risk assessment and OSH management;
- incorporate the views and practical experience of SMEs through interviews; and
- provide a practical self-assessment checklist.

[1] See *Flood risks at work: practical guidance on preparedness for safe and resilient small businesses*, available at: https://osha.europa.eu/en/publications/flood-risks-work-practical-guidance-preparedness-safe-and-resilient-small-businesses

The guidance is intended for SMEs across sectors that may be affected by flooding. Rather than replacing, it complements – and is intended to align with – any civil protection and emergency management arrangements by focusing specifically on workplace prevention, workplace preparedness, workplace response and recovery from an OSH perspective.

1.2 Methodology

The development of this study followed a mixed-methods approach, combining a brief review of academic and grey literature with qualitative consultations with SMEs. The aim was to ensure that the guidance is based on existing research and policy evidence, while also taking into account the practical experiences and needs of companies potentially exposed to flood-related occupational safety and health (OSH) risks.

The literature review focused on identifying the main occupational risks associated with flooding, their implications for workers and workplaces, and existing preventive measures, preparedness procedures and practical tools relevant to SMEs. Based on the findings, five research questions were developed to guide the preparation of the guide and the consultation with SMEs.

Qualitative interviews were conducted with representatives of four SMEs operating in different sectors (healthcare, manufacturing, construction and agriculture) in Slovenia, Greece, Spain and Ireland, with company sizes ranging from 5 to 150 workers. Whenever possible, the interviews involved company management, workers responsible for OSH management and workers' representatives. A semi-structured questionnaire was used to collect information on flood-related occupational risks, integration of flood risks into OSH management, preventive and emergency preparedness measures, post-flood recovery challenges and support needs.

The findings from the literature review and the qualitative consultations were analysed together and used to inform the development of the practical recommendations included in this paper and in a more extensive way, in the related guide. A more detailed description of the methodology, including the research questions and interview questionnaire, is provided in the Appendix.

1.3 Flood risks and occupational safety and health

Flooding, alongside increasingly frequent and worsening heatwaves, represents one of the most significant climate-related risks affecting OSH in Europe. Due to increasing rainfall variability and urbanisation patterns, flood events are becoming more frequent and more severe, affecting a wide range of economic sectors and workplaces (Fatica et al., 2024).

From an OSH perspective, floods pose both direct and indirect risks to workers. Direct risks arise from immediate exposure to the flood event and include physical hazards such as drowning, injuries, electrocution, and exposure to contaminated water. Indirect risks result from the wider disruption caused by flooding, including damage to infrastructure, interruption to essential services and supply chains, and changes in work organisation (Skouloudis et al., 2023). This distinction describes how the risks arise and does not replace the distinction between physical and psychosocial risks. Direct and indirect impacts can both have physical and psychosocial consequences. In particular, disruption to work organisation, increased workloads, uncertainty and prolonged recovery may contribute to stress, anxiety, fatigue, concerns and fear among workers. This broader understanding is consistent with EU-OSHA's foresight work, which considers immediate climate-related hazards as well as the longer-term effects of climate-driven disruption and transformation on working conditions and workers' safety and health (EU-OSHA, 2026). A distinctive feature of flood-related risks is their temporal complexity, as hazards may arise at different stages of the event, rather than occurring as a single, isolated event:

- Before the flood, workers may be exposed to adverse weather conditions and be involved in preparatory activities to prevent the impact on workers' safety and health, and therefore exposed to related risks such as installing temporary flood barriers, securing hazardous substances, moving equipment to higher areas, checking drainage systems, or preparing evacuation routes.
- During the flood, immediate life-threatening risks become predominant, including drowning, electrocution, being struck by debris, entrapment, slips, trips and falls, or exposure to fast-moving contaminated water.

- After the flood, clean-up, reconstruction, and contamination-related hazards such as mould, sewage, chemical residues, unstable structures, damaged electrical systems and manual handling of debris become sources of exposure.

This multiphase nature of flood risk requires a comprehensive and life cycle-based approach to prevention and management within OSH management systems (TUC, 2016).

The consequences of flooding also evolve over time. In the short term, workplaces may experience fatalities, injuries, infrastructure damage and disruption to operations. In the medium term, organisations may face contamination, mould growth, interruption to essential services, psychosocial stress and workforce displacement. In the longer term, flooding may result in chronic health effects, prolonged economic losses, rebuilding challenges, and changes in employment patterns. Recognising these evolving impacts enables SMEs to plan preventive, response and recovery measures more effectively throughout the entire flood management cycle (Skouloudis et al., 2023).

At EU level, flood risk management is supported by regulatory frameworks such as the Floods Directive (2007/60/EC), which aims to reduce the adverse consequences of flooding on human health, the environment and economic activity. Although primarily focused on territorial planning, this framework has important implications for workplace safety, particularly in high-risk areas. This is reflected in the assessment of site characteristics and flood-prone areas described in Section 2.4.

Flood-related occupational risks also fall within the general duties established by the EU's OSH Framework Directive (89/391/EEC). Although Directive 89/391/EEC does not expressly refer to flooding, flood-related occupational risks are covered by its general obligations. Article 5 requires employers to ensure workers' safety and health in every aspect related to work. Under Article 6, employers must assess occupational risks and take the necessary preventive and protective measures, including appropriate organisational arrangements, information and training. These measures must be adapted to changing circumstances and integrated into all activities of the undertaking and at all hierarchical levels. Article 9 further requires employers to be in possession of a documented risk assessment and determine which protective measures and equipment should be used. These measures must be adapted to changing circumstances and integrated into the organisation's activities and management arrangements. Conversely, Article 8 establishes specific requirements for first aid, firefighting, worker evacuation, and situations involving serious and imminent danger. Employers must establish emergency arrangements adapted to the nature and size of the undertaking, designate workers with adequate training and equipment, and arrange the necessary contacts with external emergency services. Where workers are exposed to serious, imminent and unavoidable danger, they must be informed as soon as possible and enabled to stop work and/or immediately leave the workplace and proceed to a place of safety. Unless there are exceptional circumstances and for duly substantiated reasons, workers should not be required to resume work while a serious and imminent danger persists.

Integrating flood risks and their prevention into OSH management systems is therefore essential to ensuring that workers are adequately protected throughout the entire flood risk management cycle, including preparedness, emergency response, recovery and the safe reorganisation of work activities following a flood. Each phase presents distinct OSH challenges that require specific preventive and protective measures, and these will be detailed in later sections of this paper and in the related guide.

1.4 Why SMEs are particularly vulnerable

SMEs are the backbone of the European economy, representing the vast majority of businesses and absorbing a significant proportion of total employment. However, they are also particularly vulnerable to the impacts of flooding and other climate-related risks (Fatica et al., 2024).

While the impacts described in the previous section may affect organisations of any size, SMEs are generally less able to anticipate, absorb and recover from these consequences because of their more limited financial, technical and organisational capacity. Their vulnerability therefore lies not only in their potential exposure to flooding, but also in their reduced resilience and adaptive capacity.

Limited resource availability represents one of the main factors contributing to this vulnerability. SMEs often lack the financial, technical and human capacity required to implement comprehensive risk management systems, including those that address emerging climate-related hazards (Veeravalli et al., 2022). This limitation can result in insufficient preparedness, delayed response, and slower recovery following flood events.

SMEs' level of vulnerability is influenced not only by their size but also by the nature of their activities and the location of their workplaces. While the findings of this study and the resulting guidance indications are applicable to SMEs across all sectors, the degree of flood exposure varies considerably depending on where the business operates and the characteristics of the workplace. SMEs involved in manufacturing, logistics, warehousing, construction, agriculture and transport are often located in industrial estates, river basins, coastal areas or other flood-prone locations where direct physical impacts may be significant. By contrast, office-based services SMEs located in multistorey buildings may experience lower direct physical exposure but may still be affected by indirect consequences such as disruption to utilities, transport networks, supply chains or business continuity. In Europe, historical patterns of urban development and land use have concentrated many economic activities in flood-prone areas, increasing the vulnerability of businesses operating in these locations (Fatica et al., 2024).

SMEs also tend to have less formalised organisational structures, which can limit the integration of flood risk management into OSH management systems. In many cases, risk assessments may not fully account for complex or low-probability events such as flooding, and emergency planning may be limited or absent (Veeravalli et al., 2022).

As a consequence of these limitations, SMEs may experience greater difficulties in absorbing and recovering from flood events. This reduced resilience can result in significant economic losses, prolonged interruption to operations and, in some cases, permanent business closure. These consequences may also have direct effects on workers, including job insecurity, income loss and increased psychosocial stress (Isa and Mardalis, 2022).

Finally, awareness and training regarding climate-related risks is often insufficient in SMEs. Workers and employers may underestimate the likelihood or severity of flooding, leading to inadequate preparation and response (Veeravalli et al., 2022).

Given these challenges, there is a clear need to support SMEs in integrating flood risk into their OSH management systems, thereby enhancing their capacity to prevent, respond to and recover from extreme weather events. This paper and the related guidance aims to fulfil this need.[2]

2 Practical insights from SMEs

A number of interviews were carried out as part of this study (see Appendix — Methodology), the findings of which were taken into account when drafting the paper and guidance information. The interviews provided valuable insights into how SMEs perceive and manage flood-related occupational risks in practice. Although the participating organisations operated in different sectors and geographical contexts, several common themes emerged regarding risk perception, preparedness, emergency response and recovery.

The findings show that previous experience of flooding strongly influences the way organisations approach preparedness. SMEs that had experienced flood events generally adopted more structured preventive measures, while those with little or no direct experience often regarded flooding as an unlikely event and relied primarily on general emergency arrangements.

Across all interviews, protecting workers was consistently identified as the primary objective during flood events. However, the strategies used to achieve this varied according to the nature of the business, the work activities performed and the level of organisational preparedness.

The following sections summarise the principal themes identified through the interviews and highlight practical approaches that may help other SMEs strengthen their own preparedness.

[2] In developing this paper and the related guidance, examples of practical workplace flood guidance from Australia, the United Kingdom and the United States were also reviewed. These included guidance produced by SafeWork NSW, Public Health Wales, SAIF and the U.S. Occupational Safety and Health Administration, covering workplace preparedness, worker protection, emergency response and safe recovery (SafeWork NSW, 2022; Public Health Wales, 2025; SAIF, n.d.; U.S. Department of Labor, n.d.). The relevant approaches were considered alongside European evidence and adapted to the EU OSH context.

2.1 SMEs' perception of flood-related occupational risks

The interviews revealed considerable differences in how SMEs perceive flood-related occupational risks. These differences were influenced primarily by previous experience, geographical location and the nature of the work undertaken, rather than by the size of the organisation.

Organisations that had previously experienced flooding generally considered it a significant OSH issue. Their experience had increased awareness of the potential consequences for workers, business continuity and critical infrastructure. In these organisations, flooding had become an established element of workplace risk assessment and emergency planning.

By contrast, organisations located in areas where flooding was considered unlikely often viewed the risk as minimal or not directly relevant to their activities. In several cases, employers associated flood risk primarily with geographical location, given that selecting workplaces outside recognised flood-prone areas substantially reduced the likelihood of significant impacts. This perception often resulted in flooding receiving limited attention within existing OSH arrangements.

The interviews also highlighted that some organisations managed flood risk indirectly through operational decisions rather than through dedicated flood procedures. For example, stopping work during severe weather, postponing outdoor activities or following instructions issued by clients or public authorities were commonly identified as practical ways of preventing worker exposure. Although these measures were not always described as flood management, they represented an effective application of the preventive principle of eliminating exposure whenever conditions became unsafe.

Another recurring finding was that SMEs rarely viewed flooding as an isolated hazard. Interviewees frequently associated flood events with a combination of occupational hazards, including electrical hazards, slips and falls, structural instability, contamination, manual handling and psychosocial pressures arising from emergency situations. This reinforces the importance of considering flood events within the broader workplace risk assessment rather than treating them as a standalone emergency.

Overall, the interviews suggested that flood preparedness is influenced less by organisational size than by previous experience and organisational learning. SMEs that had experienced flooding were generally more proactive in integrating flood-related risks into their OSH management, whereas organisations without direct experience tended to rely on existing emergency arrangements or assume that the likelihood of flooding remained low.

2.2 Preparedness before flood events

The interviews demonstrated that preparedness is one of the factors that most clearly differentiates SMEs with a structured approach to flood risk management from those that rely primarily on reactive measures. While the level of preparedness varied considerably between organisations, a common finding was that preventive actions taken before a flood event were generally regarded as the most effective way of protecting workers and reducing operational disruption.

Most organisations reported that their first steps in their preparedness arrangement were to identify and monitor weather forecasts and official flood warnings. Decisions on whether work could proceed were frequently based on information issued by national meteorological services, public authorities or, where applicable, client organisations responsible for coordinating work activities. Early access to reliable weather information was consistently considered essential for making timely operational decisions. Early warning systems should support, rather than replace, workplace preparedness and emergency planning.

The interviews also highlighted different levels of organisational preparedness. Some SMEs relied mainly on operational decisions such as postponing work or preventing workers from attending the workplace during severe weather. Others had developed more structured arrangements, including dedicated emergency procedures, flood-specific training, predefined responsibilities and physical measures designed to reduce the impact of floodwater before it reached critical work areas.

Preparedness was not limited to written procedures. Several organisations emphasised the importance of practical measures that could be implemented immediately when severe weather was forecast. These included installing temporary flood barriers, preparing emergency equipment, verifying drainage routes, identifying safe access points and ensuring that workers responsible for emergency actions were familiar with their roles. Organisations with previous flood experience generally placed greater emphasis on these practical arrangements than on documentation alone.

Training also emerged as an important element of preparedness. SMEs that had experienced flooding recognised that workers needed clear instructions on how to respond, particularly where emergency actions had to be carried out quickly. Participants noted that practical exercises, simple response procedures and clearly allocated responsibilities increased confidence and reduced uncertainty during emergency situations. In contrast, organisations with no previous flood experience often relied on general emergency procedures that did not specifically address flooding.

Another recurring finding was the importance of integrating flood preparedness into existing OSH management processes rather than developing entirely separate systems. Interviewees described preparedness as part of broader emergency planning, workplace risk assessment and business continuity arrangements, allowing organisations to build on existing procedures while adapting them to local flood risks.

Overall, the interviews indicated that effective preparedness depends less on the complexity of the measures implemented than on their suitability for the organisation and their ability to be activated before conditions deteriorate. Even relatively simple actions – supported by clear responsibilities, timely information and worker awareness – can substantially improve an SME's capacity to manage flood-related occupational risks.

2.3 Managing occupational safety during flood events

The interviews consistently showed that managing occupational safety during a flood event relies on timely decision-making, clear communication, and the ability to adapt rapidly to changing conditions. Although the specific arrangements differed between organisations, interviewees agreed that protecting workers always takes priority over maintaining normal business operations.

One of the most consistent findings was the importance of stopping work whenever safe working conditions could no longer be guaranteed. In several organisations, work was suspended immediately following warnings of severe weather, or when flooding prevented safe access to the workplace. Interviewees considered the decision to stop work as one of the most effective preventive measures, particularly where work was carried out outdoors or depended on heavy machinery.

The interviews also highlighted that effective decision-making depends on clear responsibilities. In some SMEs, decisions were taken directly by the employer or site manager, while others relied on instructions issued by public authorities, emergency services or client organisations responsible for coordinating activities. Regardless of organisational structure, participants emphasised the importance of having a clearly identified decision maker to avoid uncertainty during rapidly evolving situations.

Communication emerged as another critical factor. Organisations described the need to inform workers promptly about changes to work arrangements, weather conditions and emergency actions. According to several interviewees, rapid communication reduced confusion and allowed workers to respond more safely, particularly when weather conditions deteriorated unexpectedly.

Another recurring theme concerned access to affected areas. Organisations with previous flood experience reported restricting access until electrical installations had been isolated, buildings inspected, or other immediate hazards eliminated. Participants consistently recognised that re-entering flooded workplaces without appropriate checks could expose workers to unnecessary risks, particularly from electricity, structural instability and contamination.

The interviews further showed that emergency response does not always require complex procedures. Several SMEs described relatively simple but effective arrangements such as predefined work stoppage criteria, temporary barriers, emergency equipment, designated response teams, and straightforward communication protocols. These measures were generally considered easier to implement and more practical for smaller organisations than highly detailed emergency plans.

Overall, the findings suggest that successful emergency management depends less on the complexity of emergency procedures than on the organisation's ability to make timely decisions, communicate clearly and prioritise worker safety throughout the flood event.

2.4 Recovery, organisational learning and continuous improvement

The interviews showed that recovery extends beyond restoring buildings, equipment or business operations. For participating SMEs, recovery was also viewed as an opportunity to review existing arrangements, identify weaknesses and strengthen future preparedness. Organisations that had

previously experienced flooding consistently reported that each event had influenced subsequent planning and decision-making.

A recurring finding was the importance of verifying that workplaces could be reoccupied safely before normal activities resumed. Participants described post-flood inspections as an essential step in the recovery process, particularly when flooding had affected electrical installations, machinery, buildings or access routes. Several organisations also reported engaging external specialists to inspect electrical systems or assess structural safety before authorising workers to return.

The interviews highlighted that clean-up activities often introduce occupational hazards that differ from those encountered during normal operations. Removing debris, handling contaminated materials and restoring damaged equipment may expose workers to biological, chemical, physical and ergonomic hazards. Organisations with previous flood experience recognised the need to manage these activities as planned work rather than treating them as routine maintenance.

Another consistent theme that emerged in the interviews was organisational learning. Following flood events, several SMEs reviewed their emergency procedures, preventive measures and workplace risk assessments to determine whether improvements were needed. In some cases, practical experience resulted in the introduction of additional protective measures, revised responsibilities or improved communication arrangements. Interviewees were generally of the view that previous experience had increased organisational confidence and strengthened future preparedness.

The interviews also identified a clear need for practical guidance tailored to SMEs. Several participants reported that existing information was fragmented or overly generic and expressed interest in tools capable of supporting workplace risk assessment, identifying appropriate preventive measures and simplifying decision-making. Organisations without dedicated OSH specialists considered such resources particularly valuable, as they could reduce administrative effort while improving the quality of flood preparedness.

Overall, the findings suggest that organisational learning is one of the most valuable outcomes of flood events. SMEs that systematically reviewed their experiences and incorporated lessons into their OSH management were generally better prepared to respond to future events than those that relied solely on existing emergency procedures.

3 How floods affect occupational safety and health

3.1 Main workplace and organisational impacts of flooding

Flooding can have consequences that extend well beyond the immediate hazards to workers. It can damage workplaces, interrupt business operations and affect the organisation's ability to continue operating safely. Even when workers are not directly exposed to floodwater, the resulting disruption can create new occupational risks that need to be managed.

The extent of these impacts depends on factors such as the severity and duration of flooding, the characteristics of the workplace, and the resilience measures already in place. Some effects are immediate, while others may continue for weeks or months after the event.

The main workplace and organisational impacts include:

- **Damage to buildings, infrastructure and work equipment**

Floodwater can affect the structural integrity of buildings and damage machinery, electrical installations, tools, vehicles and other work equipment. Access routes, storage areas and utility services may also be disrupted, preventing normal work activities from resuming.

After the flooding, and before reoccupying the workplace, buildings, installations and equipment should be inspected to confirm that they can be used safely.

- **Interruption of business operations**

Flooding may interrupt production, service delivery or administrative activities for extended periods. Damage to premises, equipment or infrastructure can result in temporary closure, reduced productivity and financial losses.

Business continuity arrangements can help organisations maintain essential activities and support a safer recovery.

- **Disruption of utilities and essential services**

Flood events may interrupt electricity, gas, drinking water, wastewater systems and telecommunications. Transport infrastructure and access routes may also be affected, making it difficult for workers, suppliers and emergency services to reach and/or leave the workplace.

Organisations should consider how the loss of essential services could affect worker safety and critical operations.

- **Supply chain disruption**

Flooding can affect suppliers, contractors, transport networks and distribution systems, delaying deliveries of materials, equipment and essential services. In some cases, disruptions occurring far away from the workplace may still affect business operations.

Understanding dependencies within the supply chain can help organisations improve preparedness and business continuity planning.

- **Environmental contamination**

Floodwater may spread hazardous substances released from industrial facilities, fuel storage areas, agricultural land or waste management sites. Contamination may also originate within the workplace if hazardous substances are displaced or damaged during flooding.

These situations may increase occupational exposure at the time of the flood as well as afterwards during inspection, clean-up and waste-handling activities, and should therefore be considered during the workplace risk assessment.

- **Impacts on workers and work organisation**

Flooding may affect workers even when the workplace itself remains operational. Travel disruption, school closures, caring responsibilities, damage to homes and increased workloads can all influence workers' well-being, attendance, and their ability to carry out their work safely. In terms of psychosocial risks, fear of reoccurrence can cause stress, anxiety and mental distress for workers. Similarly, it may involve long periods of bureaucracy or responsibility disputes for companies.

Organisations should recognise these wider impacts when planning preparedness measures, emergency arrangements and recovery activities.

- **Longer-term organisational consequences**

Recovery often continues long after floodwater has receded. Organisations may need to repair or replace equipment, restore services, review work processes and update emergency arrangements based on lessons learned.

Each flood event provides an opportunity to strengthen preparedness and improve resilience to future events.

3.2 Key occupational hazards associated with floods

When considering such impacts, it is worth mentioning that floods can expose workers to a wide range of occupational hazards before, during and after a flood event. While some hazards arise immediately, at the time of the flood event, others become more significant at a later stage, for example during inspection, clean-up, repair and recovery activities. The nature and severity of these hazards vary according to the characteristics of the flood, the workplace and the work being undertaken.

In practice, workers are often exposed to several hazards at the same time. For example, clean-up activities may involve contact with contaminated water, unstable structures, electrical hazards and physically demanding activities.

Recognising these combined exposures is essential for planning effective preventive measures.

Physical hazards

Floodwater, damaged buildings and unstable ground can create immediate physical hazards. Many of these hazards continue after floodwater has receded and may affect workers involved in inspection, repair and recovery activities.

Common examples include:

- fast-flowing or deep water that can cause drowning or loss of footing;
- slips, trips and falls on wet, muddy or unstable surfaces;
- structural instability or collapse of buildings, walls or roofs;
- falling objects and debris;
- hidden holes, open manholes or damaged ground surfaces;
- injuries caused by floating or submerged objects; and
- injuries associated with the use of machinery, tools and vehicles during recovery work.

The level of risk will depend on the condition of the workplace, the type of work being carried out and the duration of exposure.

Biological hazards

Floodwater frequently contains microorganisms originating from sewage systems, agricultural runoff, waste disposal sites and contaminated soil. Workers may also be exposed to mould growth during clean-up and restoration activities.

Potential biological hazards include:

- bacteria;
- viruses;
- fungi and mould;
- parasites; and
- bioaerosols generated during cleaning or demolition work.

Exposure may occur through:

- direct skin contact;
- cuts or abrasions;
- inhalation of contaminated aerosols; and
- accidental ingestion.

The likelihood of exposure increases when contaminated water remains stagnant for prolonged periods, or where drying and cleaning are delayed.

Chemical hazards

Flooding may release hazardous substances stored within workplaces or transported by floodwater. Chemicals can also enter buildings from neighbouring industrial sites, fuel storage facilities or agricultural land.

Potential sources include:

- fuels and oils;
- cleaning agents and disinfectants;
- pesticides and fertilisers;
- industrial chemicals; and
- asbestos-containing materials disturbed by structural damage.

Exposure may occur through skin contact, inhalation or accidental ingestion during the flood, as well as later on during the inspection, clean-up and waste-handling activities.

Electrical hazards

Floodwater can damage electrical installations, equipment and distribution systems, creating serious risks of electric shock, burns and fire during the flood and in later stages.

Typical situations include:

- damaged electrical installations;
- submerged electrical equipment;
- exposed electrical cables;
- temporary electrical supplies used during recovery work; and
- energised equipment before it has been inspected.

Electrical installations should always be inspected and declared safe before power is restored or work resumes.

Ergonomic and physical workload hazards

Physical demands are not limited to the recovery phase, and may also occur during flood preparedness activities such as installing temporary flood protection measures or moving equipment, as well as during the flood event itself. However, recovery activities are often physically demanding and may continue for extended periods under difficult environmental conditions. Workers may be required to handle heavy materials, adopt awkward postures or perform repetitive tasks.

Common ergonomic hazards include, but are not limited to:

- manual handling of debris, furniture and equipment;
- repetitive lifting, carrying, pushing or pulling;
- awkward or constrained working postures;
- prolonged standing or kneeling; and
- fatigue resulting from long working hours.

Planning work activities and providing suitable equipment can significantly reduce these risks.

Psychosocial hazards

Flood events can have significant psychological and organisational consequences for workers. Uncertainty, disruption and increased workloads may affect mental well-being during both the emergency and recovery phases.

Common psychosocial hazards include:

- stress associated with emergency situations;
- anxiety about personal safety or damage to property;
- increased workload and time pressure;
- fatigue caused by prolonged recovery activities;
- exposure to distressing situations; and
- uncertainty regarding work organisation and business continuity.

Organisations should recognise that psychosocial risks may continue after people have completed their physical recovery and should provide appropriate support where needed.

3.3 Jobs and work activities most exposed to flooding

Workers may be exposed to flood-related hazards in many different occupations and sectors. However, the level of risk depends less on the job title itself and more on the work activities performed,[3] the characteristics of the workplace and the stage of the flood event.

Exposure is generally higher where work is carried out outdoors, in low-lying or flood-prone locations, close to watercourses or during inspection, clean-up and recovery activities. Workers may also face increased risks when they are required to restore essential services, remove debris, or work in damaged buildings.

Rather than focusing on specific occupations, employers should identify which work activities within their organisation could be affected by flooding and consider how these activities might expose workers to occupational hazards before, during and after a flood event.

[3] In this paper and related guidance, ‘work activity’ refers to a unit of work or broader operational function that may comprise one or more specific actions. The term is used because flood-related exposure depends not only on the individual actions performed, but also on the workplace, timing and conditions in which the work is carried out.

Table 1 provides examples of work activities by sector that may involve increased exposure to flood-related hazards. The examples are illustrative and should not be regarded as exhaustive.

Table 1: Examples of work activities by sector and exposure to flood-related hazards

Sector	Examples of work activity	Typical flood-related hazards
Emergency services	Rescue, evacuation, emergency response	Fast-flowing water, unstable structures, contamination, fatigue
Construction	Inspection, repair, reconstruction	Structural collapse, electrical hazards, manual handling
Utilities	Restoration of electricity, gas, water and telecommunications	Electrical hazards, confined spaces, contaminated water
Transport and logistics	Road clearance, transport operations, deliveries	Damaged infrastructure, unstable ground, traffic hazards
Agriculture	Livestock care, crop recovery, equipment inspection	Contaminated water, biological hazards, machinery
Waste management	Collection, transport and disposal of flood waste	Biological and chemical hazards, sharps, manual handling
Manufacturing and industrial facilities	Inspection, maintenance, restarting operations	Chemical hazards, damaged equipment, electrical risks
Cleaning and restoration	Cleaning, drying, waste removal, disinfection	Biological hazards, chemicals, ergonomic risks
Facility management and maintenance	Inspection and repair of buildings and installations	Falls, structural instability, electrical hazards
Education	Infrastructure overview and care, utilities, access to buildings	Electrical risks, damaged infrastructure, water pollution
Retail establishments	Restoration of electricity, gas, water and telecommunications	Electrical hazards, confined spaces, contaminated water

Source: compiled by the author.

Flood exposure is not limited to these sectors and work activities. Any worker can be affected if floodwater disrupts the workplace, access routes or essential services. For this reason, flood preparedness should be based on the specific work activities carried out within the organisation rather than on job titles alone.

The examples presented in Table 1 should therefore be used as a reference to support the workplace risk assessment by helping employers to identify which work activities, and the workers performing them, may require additional preventive or protective measures.

3.4 Factors influencing occupational flood risk

The occupational risks associated with flooding are not the same in every workplace or during every flood event. The level of risk depends on a combination of factors related to the flood itself, the workplace, the work activities being carried out and the organisation's level of preparedness.

Understanding these factors helps employers to identify where they may need to implement additional preventive measures, thereby promoting a more effective workplace risk assessment.

The main factors influencing occupational flood risk include the following:

Location of the workplace

The geographical location of a workplace is one of the main determining factors for flood risk. Workplaces situated in flood-prone areas, low-lying land, coastal zones, or near rivers and streams, are generally more likely to be affected. Local topography, drainage capacity and surrounding land use may also influence both the likelihood and severity of flooding.

Employers should make use of official flood hazard and flood risk maps, together with local knowledge, when assessing potential exposure.

Characteristics of the flood event

Not all flood events create the same hazards. The level of risk is influenced by factors such as:

- the depth and speed of floodwater;
- the duration of flooding;
- the extent of the affected area;
- contamination of floodwater; and
- the amount of debris carried by the water.

These characteristics influence both the immediate hazards and the conditions encountered during recovery.

Work activities and workplace characteristics

The type of work being undertaken has a major influence on occupational risk. Activities carried out outdoors, underground, in confined spaces or in damaged buildings often involve greater exposure than work performed in unaffected indoor environments.

The characteristics of the workplace should also be considered, including:

- building construction and condition;
- access and evacuation routes;
- electrical installations and utilities;
- storage of hazardous substances; and
- critical equipment and infrastructure.

Workers at greater risk

Some workers may be more vulnerable to the effects of flooding because of their health, work activities or personal circumstances.

These workers can include:

- workers carrying out emergency response, inspection, clean-up or recovery activities;
- lone workers (teleworkers);
- temporary or agency workers unfamiliar with the workplace;
- young or inexperienced workers;
- workers with disabilities or underlying health conditions; and
- workers who may require additional assistance during evacuation.

These factors should be considered when planning preventive and emergency arrangements.

Preparedness and organisational resilience

The consequences of flooding are often influenced by the level of preparedness before the event occurs.

Examples include:

- effective emergency planning;
- worker information and training;
- clear communication arrangements;
- regular review of emergency procedures;
- business continuity planning; and
- maintenance of flood protection measures.

Well-prepared organisations are generally better able to protect workers, reduce disruption and support a safer recovery.

Flood warnings and access to reliable information

Timely information allows organisations to activate emergency arrangements before conditions deteriorate.

Employers should identify **reliable sources of weather forecasts and official flood warnings**, understand how warnings are issued and ensure that relevant information can be communicated promptly to workers and others who may be affected.

Early warning systems should support, rather than replace, workplace preparedness and emergency planning.

Official flood warnings and civil protection information should inform the workplace risk assessment and emergency decision-making. However, they do not on their own constitute uniform workplace action thresholds that are automatically applicable to every organisation. The appropriate response should take account of any instructions issued by the competent authorities, the workplace risk assessment, and the actual or foreseeable conditions affecting the workplace.

Occupational flood risk is not determined by any single characteristic, but by the interaction of these factors. For that reason, workplace risk assessments should consider the likelihood of flooding as well as its potential consequences for workers, work activities and business continuity. This assessment provides the basis for selecting appropriate preventive measures and developing effective emergency and recovery arrangements.

4 Workplace risk assessment

In accordance with the EU's OSH Framework Directive (Directive 89/391 EEC) and its corresponding transpositions into national legislation, a workplace risk assessment is the foundation of effective OSH management. Where flooding may affect a workplace, the assessment should consider how flood events could expose workers to occupational hazards before, during and after the event.

As mentioned, flood-related risks vary considerably between workplaces. They depend on factors such as the location of the workplace, the work activities carried out, the characteristics of the flood event and the effectiveness of existing preventive measures. For that reason, flood risks should be assessed within the context of each organisation rather than using a generic approach.

The purpose of the assessment is to identify who may be harmed, understand how workers could be exposed, evaluate the level of risk and determine whether additional preventive measures are required. It should also support emergency planning, safe recovery and business continuity.

Where required by national legislation, the assessment should be documented, periodically reviewed and updated whenever significant changes occur, or after a flood event.

4.1 Preparing the workplace risk assessment

A flood-related workplace risk assessment should of course be carried out in advance of any flooding events. Early preparation allows organisations to identify foreseeable hazards, understand who may be affected and plan preventive measures before normal working conditions are disrupted.

The assessment should be proportionate to the size of the organisation, the nature of its activities and the level of flood risk. Existing workplace risk assessments can usually be updated to include flood-related hazards rather than creating a separate assessment.

When preparing the assessment, employers should consider:

- the location of the workplace and its potential exposure to flooding;
- previous flood events affecting the workplace or surrounding area;
- the work activities that may be affected;
- workers who may be particularly vulnerable;
- existing preventive and protective measures; and
- dependencies on utilities, transport networks and suppliers.

Information from official flood hazard maps, flood risk maps, weather services and flood warning systems can support the assessment, together with local knowledge and previous experience of flooding.

The assessment should involve workers and, where appropriate, their representatives. Their practical knowledge of work activities and workplace conditions can help identify hazards that may not otherwise be recognised.

4.2 Conducting the workplace risk assessment

The workplace risk assessment should identify how flooding could affect workers before, during and after a flood event. Rather than considering flooding as a single hazard, employers should examine how it may create or increase different occupational risks throughout the workplace.

The assessment should consider:

- the work activity that could be affected;
- who may be exposed, including workers with increased vulnerability;
- the occupational hazards that may arise during each phase of the flood event;
- the likelihood and potential consequences of exposure; and
- the adequacy of existing preventive and protective measures.

Flood-related risks rarely occur in isolation. Workers involved in inspection, clean-up or recovery activities may be simultaneously exposed to physical, biological, chemical, electrical, ergonomic and psychosocial hazards. These combined exposures should be considered when evaluating the overall level of risk.

The assessment should also take account of how flooding could affect the workplace itself. Damage to buildings, utilities, work equipment or access routes may introduce additional hazards or change the way work is carried out. Disruption to essential services, contractors or supply chains may also influence occupational risks and should be considered where relevant.

Existing control measures should be reviewed to determine whether they remain effective under flood conditions. Where necessary, additional measures should be identified to reduce risks to workers.

4.3 Selecting appropriate preventive measures

The findings of the workplace risk assessment should be used to determine the preventive measures needed to eliminate risks or, where this is not reasonably practicable, to minimise risks.

Priority should be given to collective preventive measures that protect all workers. Personal protective equipment (PPE) should be regarded as a supplementary measure and should not replace other risk control measures.

When selecting preventive measures (detailed in Section 4.1.), employers should consider:

- the nature of the work activities;
- the characteristics of the workplace;
- the workers who may be affected;
- the severity of the potential consequences; and
- the practicality and effectiveness of the proposed measures.

Flood risks and workplace conditions may change rapidly. Preventive measures should therefore remain flexible and be adapted whenever circumstances change.

Further guidance on preventive measures is provided in Section 5.

4.4 Reviewing and documenting the workplace risk assessment

A workplace risk assessment is not a one-off exercise. It should be reviewed regularly to ensure that it continues to reflect workplace conditions and the level of flood risk.

The assessment should also be reviewed whenever:

- a flood event has occurred;
- work activities change significantly;
- new equipment or processes are introduced;
- the workplace is altered; and
- lessons learned identify the need for improvements.

The review should confirm whether existing preventive measures remain effective and identify any additional actions needed to improve worker protection.

Where required by national legislation, the results of the workplace risk assessment should be documented. Documentation should be proportionate to the size of the organisation and the complexity of its activities, while providing a clear record of the hazards identified, the risks assessed and the preventive measures implemented.

Regular review helps organisations maintain effective flood preparedness and supports continual improvement based on operational experience and lessons learned.

5 Preventing and managing occupational flood risks

Effective management of occupational flood risks begins long before flood events occur. Preventive measures should be planned in advance, implemented where appropriate and reviewed regularly as part of the organisation's OSH management.

No single measure can eliminate all flood-related risks. Employers should adopt a combination of preventive, protective and organisational measures based on the findings of the workplace risk assessment. The selection of measures should reflect the characteristics of the workplace, the work activities carried out and the potential consequences of flooding.

This section outlines practical measures that can help organisations prepare for flood events, protect workers during an emergency and support a safe return to work.

5.1 Emergency planning and preparedness

Preparing before a flood event is the most effective way of reducing occupational risks and minimising disruption. Emergency planning should define how the organisation will respond if flooding threatens or affects the workplace, while allowing sufficient flexibility to adapt to changing conditions. This should be aligned with the established contingency plans of public emergency services (for example, the local police and the fire service), either locally or nationally, depending on the severity of the flooding event.

Emergency arrangements should be proportionate to the level of flood risk and integrated, where appropriate, into existing emergency procedures and business continuity arrangements.

In accordance with Article 8 of Directive 89/391/EEC, emergency arrangements should identify the workers designated to implement evacuation, first aid and other emergency measures. The number of workers, their training and available equipment should be appropriate to the size and specific risks of the organisation. Arrangements should also include the necessary contacts with external emergency medical, rescue and fire services.

Key elements include:

- ensuring the active participation, engagement and involvement of workers;
- identifying the roles and responsibilities of those involved in emergency management;
- establishing procedures for activating the emergency response;
- identifying safe evacuation routes and assembly points;
- maintaining up-to-date emergency contact details;
- identifying reliable sources of weather forecasts and official flood warnings;

- defining communication arrangements for workers, contractors and other relevant parties;
- designating and adequately training the workers responsible for implementing emergency measures; and
- establishing the necessary coordination and contact arrangements with external emergency medical, rescue and fire services.

Emergency plans should be communicated to workers and made readily available to those with responsibilities during a flood event.

Where appropriate, organisations should **test their arrangements** by involving or consulting workers, for example through **exercises or simulations**. These do not need to be complex. Even simple scenario-based discussions with workers can help identify weaknesses, clarify responsibilities and improve preparedness. Moreover, practical exercises, such as identifying access points or practising the correct donning of PPE, can greatly enhance workers' sense of involvement and improve their preparedness for emergency situations.

Emergency planning should also consider how work activities could be maintained or safely suspended if access to the workplace, utilities or essential services is disrupted.

Planning should be reviewed periodically, including after flood events or emergency exercises, to ensure that arrangements remain suitable and to reflect on lessons learned.

5.2 Protecting workers during flood events

When flooding threatens or affects the workplace, protecting workers becomes the immediate priority. Decisions should be based on current conditions, recognising that flood situations can change rapidly and that hazards may increase within a short period.

Workers should not be exposed to unnecessary risks in an attempt to protect buildings, equipment or production. Where conditions become unsafe, work should be stopped and workers should be enabled to leave the affected area and proceed to a pre-identified place of safety, in accordance with the workplace emergency arrangements and any instructions issued by the competent authorities.

Where workers are exposed to serious, imminent and unavoidable danger, they should be informed as soon as possible of the risks involved and of the protective measures taken or to be taken. They should be able to stop work and/or immediately leave the workplace and proceed to a place of safety. Workers who leave a dangerous area under such circumstances should not be placed at any disadvantage because of their actions, in accordance with applicable national law and practice.

The measures implemented during a flood event will depend on the nature of the work, the characteristics of the workplace and the severity of the flooding. Typical measures include:

- monitoring official flood warnings and weather information;
- activating emergency procedures without delay;
- restricting access to flooded or potentially hazardous areas;
- suspending work where safe working conditions cannot be maintained;
- ensuring that workers can evacuate safely when required; and
- maintaining communication with workers throughout the event.

Where emergency response or essential work must continue, employers should ensure that workers have the necessary information, equipment and supervision to carry out their activities safely.

Particular attention should be given to workers involved in inspection, emergency response, or other activities that may require entry into affected areas. These workers may face simultaneous exposure to multiple occupational hazards, including contaminated water, unstable structures, damaged utilities and physically demanding work.

Access to buildings should be controlled when there are concerns about structural integrity, electrical safety or other hazards that could place workers at immediate risk. Work should not resume in affected areas until they have been assessed and declared safe by competent persons, where required.

Communication is essential throughout a flood event. Workers should receive clear instructions on the actions expected of them, changes to work arrangements, and any restrictions affecting access to the workplace. Contractors and other relevant parties should also be informed where appropriate.

Where PPE is required, it should be selected according to the hazards identified in the workplace risk assessment and used as part of a broader package of preventive measures. PPE should complement, rather than replace, other risk control measures.

As flood conditions evolve, employers should continue to review the situation and adapt their response as necessary to protect workers and maintain safe working conditions.

5.3 Safe recovery and return to work

Recovery should begin only when it is safe to do so. Workers should not be required to resume work while there is still a serious and imminent danger, except in exceptional cases and for duly substantiated reasons. Returning to the workplace too early may expose workers to hazards that remain after floodwater has receded, including structural damage, contaminated environments, damaged electrical installations and unsafe work equipment.

Before normal work resumes, employers should verify that the workplace can be occupied safely. This process should be based on the findings of the workplace risk assessment and, where necessary, supported by competent persons with the appropriate technical expertise.

Priority should be given to:

- inspecting buildings and work areas for structural damage or other safety concerns;
- ensuring that electrical installations, machinery and work equipment have been inspected before being returned to service;
- identifying any remaining biological, chemical or physical hazards;
- verifying that access routes, emergency exits and welfare facilities can be used safely; and
- assessing whether utilities and essential services have been restored.

Clean-up and restoration activities often involve different hazards to those associated with normal work operations. Removing debris, cleaning contaminated areas, handling waste and restoring damaged equipment may expose workers to biological agents, hazardous substances, sharp objects, manual handling risks and slips, trips or falls. These activities should therefore be planned and supervised appropriately.

Where PPE is required, it should be suitable for the hazards identified and used together with other preventive measures. Safe systems of work remain the primary means of controlling occupational risks during recovery.

Recovery should also take workers' well-being into account. Some workers may have experienced damage to their homes, disruption to family life or other personal consequences of the flood event. Others may experience stress or fatigue associated with prolonged emergency and recovery activities. Where appropriate, organisations should provide information on available support and encourage workers to report concerns that could affect their health or safety.

A flood event provides an opportunity to review existing arrangements and identify improvements. Lessons learned during the response and recovery phases should be used to update the workplace risk assessment, emergency procedures and business continuity arrangements where necessary.

Recovery is complete only when work can resume under safe conditions and when the organisation is satisfied that occupational risks have been reduced to an acceptable level.

6 Key recommendations for SMEs

The findings presented throughout this paper show that effective flood risk management does not depend solely on the severity of flood events, but also on the extent to which organisations anticipate potential impacts, integrate flood-related risks into their OSH management, and respond in a timely and coordinated manner.

Although every workplace is different, the interviews and literature review identified several common practices that can help SMEs improve worker protection, strengthen organisational resilience and reduce disruption before, during and after flood events.

The recommendations presented below should be adapted to the specific characteristics of each organisation, taking into account its activities, location, workforce, and level of flood risk.

6.1 Integrating flood risk into occupational safety and health management

Flood-related occupational risks should be managed as part of the organisation's overall OSH management rather than through standalone emergency arrangements.

Integrating flooding into existing workplace risk assessments, emergency procedures and business continuity planning helps ensure that preventive measures remain proportionate, coordinated and easier to implement.

Employers should:

- consider flood-related hazards within the workplace risk assessment;
- identify work activities and workers who may be particularly exposed;
- review existing preventive measures to determine whether they remain effective during flood events;
- ensure that flood risks are considered when reviewing workplace changes, new activities or significant organisational developments; and
- update the assessment after flood events or whenever lessons learned identify opportunities for improvement.

Embedding flood preparedness within existing OSH processes reduces unnecessary complexity and supports continual improvement over time.

6.2 Strengthening preparedness and emergency planning

The interviews consistently showed that organisations with previous flood experience were generally better prepared to respond to future events. Their experience demonstrated that preparedness depends less on complex procedures than on practical arrangements that can be implemented quickly and understood by everyone involved.

SMEs should therefore focus on developing emergency arrangements that are clear, realistic and proportionate to their operational needs.

Priority actions include but are not limited to:

- ensuring workers' involvement and active participation;
- monitoring official weather forecasts and flood warning systems;
- defining responsibilities for emergency decision-making;
- establishing communication arrangements for workers and contractors;
- identifying evacuation routes and safe assembly points;
- designing and arranging practical measures that can be implemented before flooding occurs; and
- providing workers with appropriate information and training.

Emergency arrangements should be tested periodically and reviewed after exercises or real flood events to ensure that they remain effective. For good practice, this should be performed collaboratively with local civil organisations and emergency services.

6.3 Supporting safe response and recovery

Protecting workers during flood events requires organisations to respond promptly to changing conditions while ensuring that recovery activities are planned and carried out safely. The interviews demonstrated that stopping work when conditions become unsafe remains one of the most effective preventive measures available to SMEs.

During emergency response and recovery, employers should:

- prioritise worker safety over business continuity;
- restrict access to hazardous areas until they have been inspected;
- ensure that damaged buildings, electrical installations and work equipment are declared safe before use;
- recognise that clean-up activities involve specific occupational hazards requiring appropriate planning and supervision; and

- review emergency arrangements after each event and incorporate lessons learned into future planning.

Recovery should be regarded not only as a return to normal operations, but also as a valuable opportunity to strengthen organisational resilience and improve preparedness for future flood events.

7 Conclusions

Flooding is an increasingly important OSH challenge for many SMEs across Europe. Although the nature and severity of flood events vary considerably between regions, the potential consequences for workers, workplaces and business continuity demonstrate the need to integrate flood-related risks into routine OSH management rather than treating them solely as emergency situations.

These findings have shown that effective flood risk management should follow a continuous process that begins long before a flood occurs. Identifying hazards, assessing workplace risks, implementing proportionate preventive measures and planning for emergency response are essential steps in protecting workers and reducing operational disruption. Recovery should be regarded as an integral part of this process, providing an opportunity to review existing arrangements, strengthen organisational resilience and improve future preparedness.

The interviews confirmed that SMEs adopt different approaches according to their previous experience, operational context and perceived level of flood risk. Organisations with direct experience of flooding generally demonstrated more structured preparedness and greater integration of flood-related risks within their OSH management. However, the findings also showed that effective flood preparedness does not necessarily require complex procedures. Practical measures, clear responsibilities, timely decision-making and good communication can significantly improve worker protection, particularly where resources are limited.

The findings also highlights the importance of applying the general principles of prevention when managing flood-related occupational risks. Wherever possible, organisations should eliminate or avoid exposure to hazards, implement collective protective measures before relying on PPE, and ensure that decisions are based on the workplace risk assessment. These principles remain applicable throughout the preparedness, response and recovery phases.

As climate change is expected to increase the frequency and intensity of extreme weather events in many parts of Europe, SMEs will need to strengthen their capacity to anticipate and manage flood-related risks. Integrating flood preparedness into existing OSH management systems will not only improve worker protection but will also enhance organisational resilience and business continuity.

Ultimately, effective flood risk management is not determined by the complexity of emergency procedures, but by an organisation’s ability to anticipate foreseeable risks, respond proportionately to changing conditions and learn from experience. For SMEs, adopting practical, proportionate and evidence-based measures represents the most effective way to protect workers and ensure a safer and more resilient workplace.

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Appendix — Methodology

1. Development approach

The development of this guide followed a mixed-methods approach, combining a brief literature review and a qualitative consultation with SMEs.

This approach aimed to ensure that the guidance based on this paper is backed by, on one hand, existing research and policy evidence and, on the other, practical insights from companies that may face flood-related risks in the workplace.

The methodology included three main steps:

1. A review of academic and grey literature related to climate change, flooding and OSH.
2. The development of research questions guiding the preparation of the study and the related guidance tool.
3. Qualitative interviews with representatives from SMEs to gather practical insights on workplace preparedness and worker protection during flood events.

The findings from both the literature review and the SME consultations were used to inform the development of the practical recommendations included in this guide.

2. Literature review

A brief review was conducted of academic literature and grey literature in order to contextualise the relationship between climate change, flooding and OSH.

The literature review aimed to:

• identify the main occupational risks associated with flooding;
• examine how extreme weather events may affect workers and workplaces;
• review existing guidance and tools related to workplace preparedness for flood events; and
• identify preventive and organisational measures relevant to SMEs.

The results of this review helped define the key themes addressed in the guide and informed the development of the research questions and interview protocol.

3. Research questions

Based on the literature review, a set of research questions was developed to guide the preparation of the guidance tool and the consultation with SMEs.

RQ1 – How can flooding events linked to climate change affect occupational safety and health conditions in SMEs?

RQ2 – What occupational safety and health risks may arise for workers before, during and after flood events?

RQ3 – What preventive and preparedness measures can SMEs implement to reduce flood-related risks to workers?

RQ4 – How prepared are SMEs to respond to flood emergencies and protect workers?

RQ5 – What practical tools and organisational measures can support SMEs in integrating flood risks into OSH management systems?

4. Qualitative consultation with SMEs

To complement the literature review, qualitative interviews were conducted with representatives of four SMEs operating in sectors potentially exposed to flood risks. These companies were based in

Slovenia, Greece, Spain and Ireland, and their size ranged from 5 to 150 workers. Each company was from a different sector, ranging from healthcare, manufacturing and construction to agriculture.

Whenever possible, three perspectives were included in each interview:

• a company management representative;
• a worker responsible for OSH management; and
• a workers' representative.

The interviews were designed to gather qualitative information from SMEs regarding flood-related occupational risks and workplace preparedness.

The consultation aimed to collect practical insights that could help identify relevant workplace situations and inform the development of guidance tailored to SMEs.

The interviews explored the following themes:

- company experience of flooding;
- exposure to flooding risks;
- OSH impacts;
- preventive and preparedness measures;
- emergency response procedures;
- challenges in managing flood-related risks;
- challenges during flood situations;
- support needs for improving preparedness and worker protection.

5. Interview questionnaire

A semi-structured interview format was used in order to allow companies to describe their experiences while ensuring that key topics were covered consistently across interviews.

The interview questions were organised into thematic sections covering the different phases of flood risk management.

Section 1 – Exposure and context

1. Has your company or region experienced flooding or severe rainfall events in recent years that affected work activities?
2. From an OSH perspective, do you consider flooding to be a potential risk for your workers or workplace?

Section 2 – Impacts on occupational safety and health

3. What types of OSH risks could workers face before, during or after a flood event?
4. Which categories of workers in your company would be most exposed to these risks?

Section 3 – Integration into the OSH management system

5. Are extreme weather events such as flooding considered in your company's occupational risk assessment or OSH management procedures?
6. Does your company have specific preventive measures or protocols to reduce risks to workers related to flooding?

Section 4 – Emergency preparedness and worker protection

7. Does your company have emergency procedures or evacuation plans that address flooding scenarios?
8. What measures would your company take to protect workers during a flood event?

Section 5 – Post-flood recovery

9. After a flood event, what occupational safety and health challenges might arise when returning to work?

Section 6 – Support received and support needs

10. What guidance, tools or support does your company currently receive, and what additional support would help your company better manage flood-related occupational risks?
11. Based on your company's experience, what measures do you consider most important to protect workers in case of flooding?

6. Methodological coherence

The interview questions were designed to support the research questions steering the development of the guidance.

- RQ1 – Impact of floods on OSH → Q1, Q2, Q3
- RQ2 – OSH risks before/during/after floods → Q3, Q4, Q9
- RQ3 – Preventive and preparedness measures → Q5, Q6
- RQ4 – Emergency preparedness and worker protection → Q7, Q8
- RQ5 – Tools and organisational support → Q10, Q11

7. Use of consultation results

The qualitative insights gathered from the SME consultations were analysed together with the findings of the literature review. These insights helped identify practical challenges, examples of preparedness measures, organisational practices and support needs expressed by companies. The results were used to inform the development of the recommendations included in the guide.