

Foresight Study on the Occupational Safety and Health Implications of Future Climate Change-Related Developments and Crises

Report

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Abstract

This foresight study, commissioned by the European Agency for Safety and Health at Work (EU-OSHA), explores the indirect and cascading impacts of climate change on occupational safety and health (OSH) and the future of work in Europe over the next 10 to 25 years. Employing a scenario-based methodology, the study combines a scoping literature review, stakeholder survey, and expert workshops. Four plausible future scenarios are developed to illuminate the complex pathways through which climate change may reshape labour markets, job roles, and workplace risks. The findings highlight that climate action, while essential to address climate change, introduces new challenges and opportunities for OSH, and that a healthy, resilient workforce is critical to achieving a just green transition. The report examines cross-cutting themes, outlines key target elements for 2050, and analyses trade-offs and implications relevant to policymakers, employers and workers' representatives, intermediary organisations, workers, and researchers. It underscores the importance of coordinated, inclusive, and adaptive strategies to protect worker health, safety and wellbeing in Europe.

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Abbreviations

AI	Artificial Intelligence
AIT	Austrian Institute of Technology
AIoT	Artificial Intelligence of Things
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CSRD	Corporate Sustainability Reporting Directive
EMF	Electromagnetic field
ESG	Environmental, Social, and Governance
EU	European Union
EUCRA	European Climate Risk Assessment
EU ETS	European Union Emission Trading System
EU-OSHA	European Agency for Safety and Health at Work
EVs	Electric Vehicles
GHG	Global Greenhouse Gas
IFI	Insight Foresight Institute
ILO	International Labor Organization
IoT	Internet of Things
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
STEM	Science, Technology, Engineering, and Mathematics
UK	United Kingdom
US	United States of America
UV	Ultraviolet

1 Introduction

1.1 Project background

The European Agency for Safety and Health at Work (EU-OSHA), based in Bilbao, Spain, plays a pivotal role in making working life across the European Union (EU) safer, healthier, and more productive. Through conducting research, developing balanced and impartial information, and leading continent-wide awareness campaigns, EU-OSHA helps shape policy and practice in occupational safety and health (OSH).

A key aspect of its work is anticipating future changes in the world of work by undertaking foresight studies, which inform policymakers, researchers, and workplace stakeholders about emerging OSH risks and help set research and action priorities. These studies employ scenario-building to envision possible futures and their implications for workers' safety and health, encouraging broad expert and stakeholder participation. Notably, previous foresight cycles have explored OSH risks associated with green jobs (European Agency for Safety and Health at Work, 2013), digitalisation (European Agency for Safety and Health at Work, 2018), and the circular economy (European Agency for Safety and Health at Work, 2021), generating both macro- and micro-scenarios to guide targeted interventions.

This report presents the outcomes of the fourth foresight cycle, focusing on OSH challenges and opportunities related to climate change and crises. This initiative aligns with the EU's 2021-2027 OSH Strategic Framework and the European Commission's vision for a social Europe equipped for green, digital, and demographic transitions, ensuring preparedness for future health crises and supporting just transitions in the workplace.

What emerges clearly is that climate change is not only an environmental issue, but also a profound social and economic disruptor. It will reshape labour markets, transform industries, and create new risks and vulnerabilities for workers. At the same time, OSH is revealed as a critical enabler of resilience: without safe, healthy, and supported workers, the green transition cannot succeed. Addressing climate change is essential for our survival as a species, but it is equally essential to ensure that the people in the workforce driving this transition are protected, empowered, and able to thrive.

The project has been delivered by RAND Europe in partnership with the Insight Foresight Institute (IFI) and the support of the Austrian Institute of Technology (AIT) as part of the Foresight-on-demand consortium.

Through the development, exploration and analysis of future scenarios, this study aims to explore the potential indirect impacts of climate change on OSH and the nature of work in Europe over the next 10 to 25 years.

1.2 Project objectives: exploring the indirect consequences of climate change on OSH to inform future actions.

Climate change is one of the defining challenges of our time. It is characterised by long-term shifts in temperature, precipitation patterns, and the frequency and intensity of extreme weather events. These changes are primarily driven by human activities, most notably the burning of fossil fuels and deforestation, which have led to rising concentrations of greenhouse gases in the atmosphere (Trenberth, 2018; Fawzy *et al.*, 2020; Bandh *et al.*, 2021; Lynas, Houlton and Perry, 2021).

Over the past decade, the direct impacts of climate change on workers have received growing attention from researchers, policymakers, and international organisations. While the issue is far from resolved and further research and practical interventions are urgently needed, many of the key risks are now relatively well understood. Rising temperatures, heatwaves, floods, wildfires, and ecosystem disruptions are already exacerbating occupational hazards, affecting health and safety of workers (ILO, 2024). These direct effects have been the subject of recent reviews by institutions such as the International Labour Organization (ILO) (ILO, 2024), the Lloyd's Register Foundation (Lloyd's Register Foundation, 2025) and others (Schulte *et al.*, 2023). EU-OSHA has also recently released a report based on the 'OSH pulse 2025' survey, which looked into workers' views and experiences regarding climate change-related risks, as well as other key areas such as digital technology and psychosocial factors (European Agency for Safety and Health at Work, 2025a).

A summary of these impacts is provided in Box 1

Box 1. Direct effects of climate change on OSH

- **Ultraviolet (UV) Radiation:** Increased exposure to ultraviolet radiation heightens the risk of skin cancer and other health issues for outdoor workers.
- **Air Pollution:** Climate change exacerbates air pollution (indoor and outdoor), leading to respiratory problems and other health issues, especially in urban and industrial areas.
- **Extreme Weather Events:** More frequent and severe weather events, such as hurricanes, floods, and wildfires, pose direct physical risks to workers and disrupt work environments.
- **Vector-Borne Diseases:** Changes in climate patterns can expand the range of vectors like mosquitoes and ticks, increasing the risk of diseases such as malaria and Lyme disease.

However, the implications of climate change for workers go far beyond these direct threats. The climate crisis is reshaping the broader social, economic, and technological landscape, creating new and complex pathways of risk. The strategic choices made by governments, employers, workers, and society in response to climate change, through mitigation policies, adaptation strategies, and the adoption of new technologies, will alter the world of work too. These indirect effects may transform labour markets, redefine job roles, disrupt global supply chains, and introduce novel hazards that challenge existing OSH frameworks.

This foresight study focuses on mapping these indirect and cascading impacts. While past research has examined climate change effects on the economy (e.g., Kalkuhl and Wenz, 2020) and population distribution (e.g., Skeldon, 2025), less attention has been given to how these and other factors will affect workers' health, safety, and wellbeing. By exploring future scenarios over the next 25 years, the study aims to anticipate (but not predict) how climate change might influence OSH in ways that are not yet fully visible. These scenarios are designed to raise awareness, stimulate strategic thinking, and support preparedness among key stakeholders.

Ultimately, the long-term goal of this project is to help OSH actors, from policymakers and employers to researchers and workers, think beyond the immediate and prepare for the future. By identifying emerging risks and opportunities, the study aims to support proactive action that safeguards worker health, safety and wellbeing in a climate-resilient future.

1.3 Key terminology

To ensure clarity and consistency throughout this report, this section defines some core terminology used to describe the future intersection of work, health, and environment.

Climate action and the green transition

Climate action refers to the comprehensive measures taken by society to mitigate and adapt to climate change, including building climate resilience, 'climate-proofing' infrastructure, and preparing for major crises. This concept is divided into two primary approaches:

- **Adaptation:** Aims to minimise the negative physical impacts of climate change by adjusting existing systems and practices, thereby enhancing resilience and reducing vulnerability to climate-related hazards (e.g., building sea walls, relocating facilities, implementing smart cooling systems).
- **Mitigation:** Focuses on reducing or preventing the further escalation of climate change by addressing its root causes, primarily by reducing greenhouse gas emissions (e.g., shifting to renewable energy, implementing carbon capture).

The **green transition** is the overarching process of shifting the economy and society away from fossil fuel dependence and linear production models towards a sustainable, low-carbon, and circular economy.

This involves fundamental, structural changes across all industrial sectors, labour markets, and consumption patterns (European Training Foundation, 2022).

Occupational Safety and Health (OSH)

Occupational Safety and Health (OSH) encompasses the complete framework of policies, procedures, and practices that protect workers' safety and health.

According to the ILO, "OSH deals with all aspects of health and safety in the workplace. Its goal is to prevent the occurrence of occupational accidents and diseases. A safe and healthy working environment is one where risks are eliminated or when all reasonably practicable actions have been taken to reduce risks to an acceptable level and where prevention has been integrated as part of the organization's culture" (ILO, 2020). EU-OSHA has adopted a similarly broad conception of OSH as a multidisciplinary activity that takes a holistic approach to preventing occupational risks and promoting workers' safety, health and wellbeing. This definition aligns with the European OSH Framework Directive (89/391/EEC), which covers both the technical aspects of worker safety and the prevention of ill health, including working conditions, relationships and environments (European Agency for Safety and Health at Work, 2012).

Within this report, occupational health encompasses both physical and mental well-being. The terms OSH, workers' health and safety, as well as workers' health, safety, and wellbeing, are used interchangeably.

Direct vs indirect impacts on OSH

Direct impacts on OSH refer to the immediate physical effects that climate change poses to workers—such as heat stress, extreme weather events, increased exposure to air pollution, and vector-borne diseases. These hazards typically arise from direct environmental changes and are relatively well understood.

Indirect impacts, by contrast, are secondary or cascading effects that emerge through shifts in economic, social, or organisational systems triggered by climate change. These may include changes in job structures, supply chain disruptions, the introduction of new green technologies with unknown risks, or altered work patterns due to climate adaptation policies. Indirect impacts can be equally profound in shaping workplace health, safety and wellbeing over time.

1.4 About foresight methods and future scenarios

Foresight methods are systematic yet creative ways to look ahead and prepare for several possible futures, rather than trying to predict exactly what will happen. These approaches help organisations and policymakers think strategically and make better decisions when facing uncertainty. The future of complex systems, such as Europe, cannot be predicted with confidence because so many factors are linked together. Changes in politics, technology, the environment and human behaviour all interact in ways that create many different possible outcomes.

Foresight encourages people to question their usual assumptions, such as the idea that current trends will continue without interruption. It provides a structured way to look closely at what might change and which expectations may no longer hold true. The purpose is not to produce forecasts but to understand the key forces, tensions and uncertainties that could shape future developments. Through this process, people can engage, share knowledge and explore trends, which can help them recognise important pressure points and the long-term consequences of decisions made today.

The future scenarios method involves creating multiple stories about how the future might unfold. These scenarios are not predictions but plausible examples that show different ways major uncertainties could interact. By focusing on what could reasonably happen rather than what is most likely to happen, the scenarios help people visualise the range of possible outcomes. (Spaniol and Rowland, 2019)

Scenarios act like thought experiments, combining evidence, trends and analysis into clear narratives that make it easier to grasp complex ideas. The aim is to make future possibilities tangible enough for people to reflect on their implications. In the context of this study, scenario planning can help illuminate the underexplored, indirect impacts of climate change on OSH—offering a structured way to anticipate emerging risks and inform more resilient, inclusive policy responses.

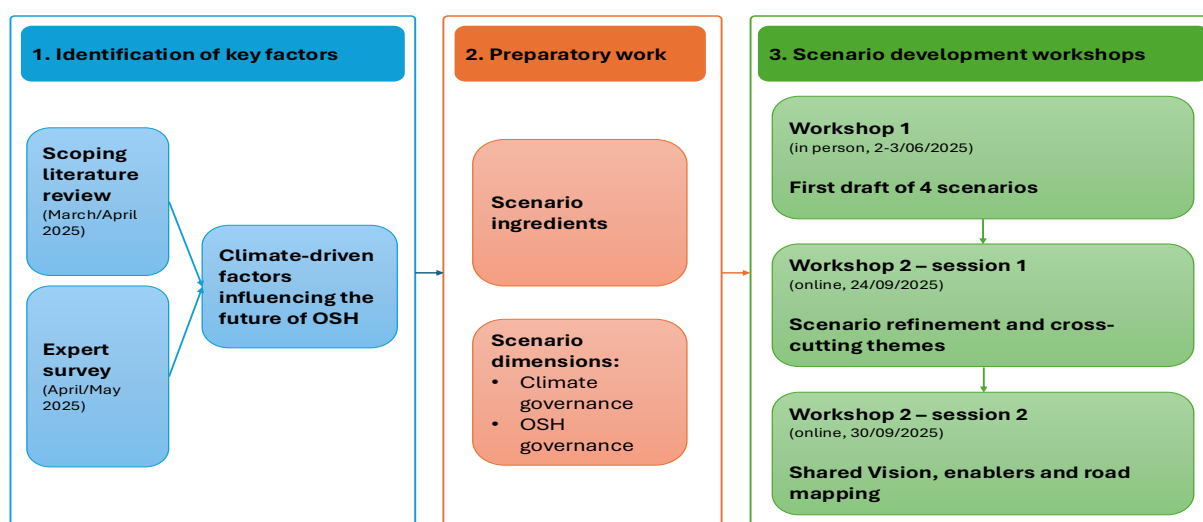
2 Methodology

2.1 Overview of the methodology

This study uses a foresight approach to examine the indirect effects of climate change on OSH in Europe over the next 10 to 25 years. This time horizon was selected because it is long enough to capture the emergence and evolution of indirect impacts, yet short enough to remain relevant for current policy and planning decisions.

The method combines a scoping review of existing literature with a stakeholder survey to identify and rank the main climate-related factors shaping OSH. These factors informed the development of scenario “ingredients” and key dimensions used in the scenario design process. The final stage of the research involved three expert workshops. Participants worked together to develop and refine four future scenarios, discuss the main elements of a shared vision for 2050, and identify the key stakeholder actions needed to help bring about that shared vision. An overview of the methodology is shown in Figure 1.

Figure 1. Methodology overview



Here we provide a brief description of the methodology, with more detailed information presented in Annex A.

2.2 Identification of key factors and drivers of change

2.2.1 Scoping literature review

A scoping literature review was conducted to identify key climate-driven trends and factors influencing OSH. Sources included academic publications, policy documents, and previous foresight studies found mainly through Google and Google Scholar. The review focused on indirect impacts of climate change—such as technological adaptation, migration, and economic instability—and their implications for the future of work and worker safety. Through the literature review, a list of 24 factors was identified (described in Section 3) and organised using a PESTLE framework (Political, Economic, Social, Technological, Legal, and Environmental). The research team conducted separate searches for the each of the PESTLE elements, except Environmental, which was already captured through terms related to climate change. For the remainder of this report, the framework will therefore be referred to as PESTL. These factors were then presented to experts for feedback in a survey.

2.2.2 Expert survey

An online survey was distributed to 76 stakeholders, 30 of whom completed it (response rate: 39.5%). The pool of participants included stakeholders from academia, research institutions, trade unions, industry, and policy bodies. More information on the survey in Annex A, while the survey full text can be found in Annex D. Participants were presented the factors identified through the literature review and rated each factor's significance using a five-point scale and provided open-ended comments and reflections. Quantitative responses informed the selection of critical factors for scenario development, while qualitative insights shaped the narrative elements of the scenarios presented in the next chapter.

2.3 Preparatory work for scenario development

In this section we describe the preparatory work that was conducted ahead of the stakeholder workshops. This preparatory work aimed to ensure a productive engagement and discussion with participants.

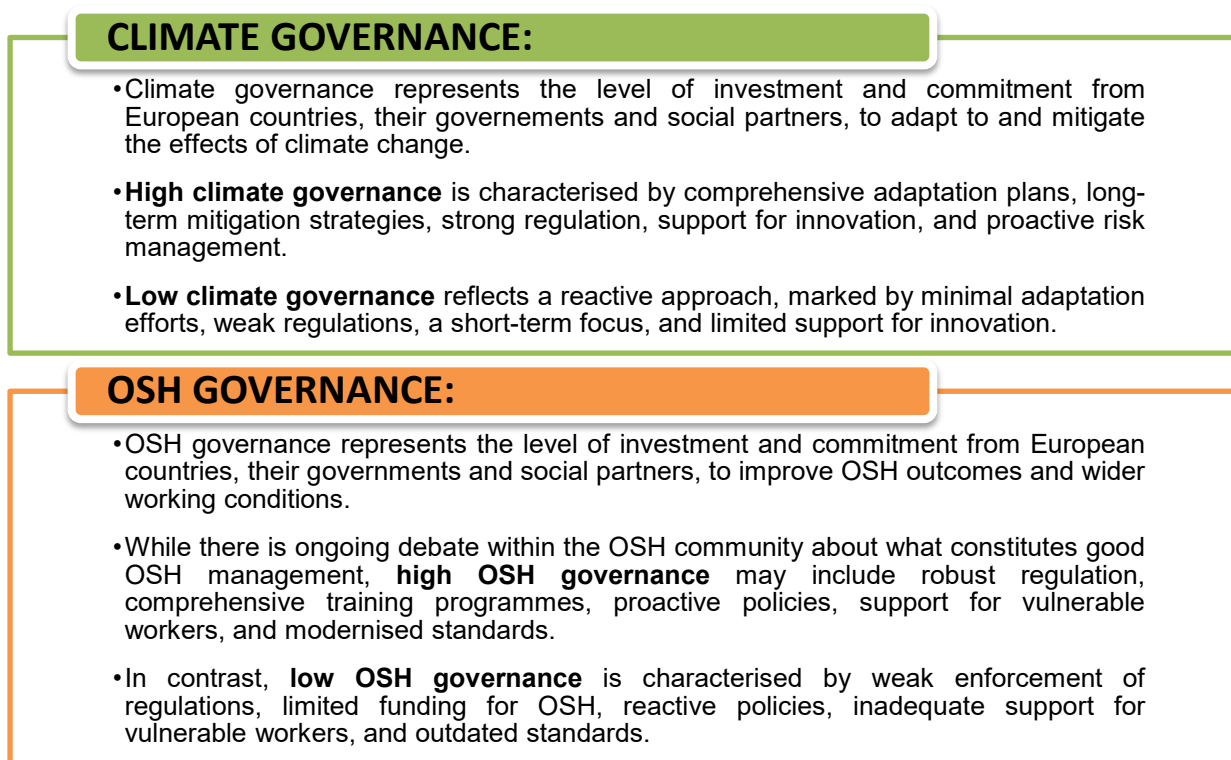
2.3.1 Scenario dimensions

Scenario development can be structured in various ways, each with advantages and trade-offs (see for example ref (Bishop, Hines and Collins, 2007)). A possible way of framing scenarios is by pre-defining key dimensions that provide a structured starting point for stakeholder discussions.

Given the complexity and scope of this study, we adopted this guided approach. We provided stakeholders with two key dimensions to anchor the scenarios and guide their conversation during the workshop.

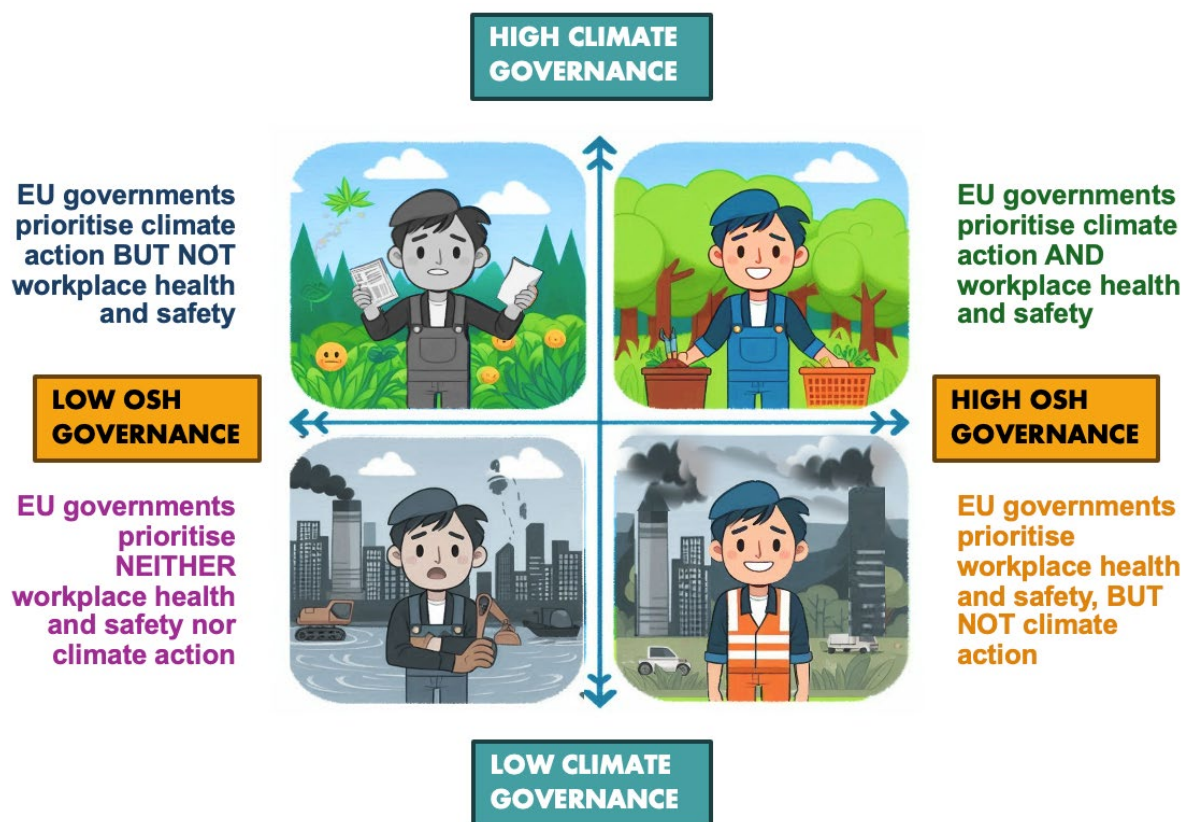
These dimensions are climate governance and OSH governance, and are described in Figure 2 below. These were chosen based on the study's central research question around climate change and OSH, as well as the findings from the scoping review. These dimensions were also refined in close collaboration with EU-OSHA. Each of these dimensions is a continuum and can be high or low, so when they are intersected, they form the basis for four scenarios.

Figure 2. Scenario dimensions



The matrix that is formed by the intersection of these dimensions is visualised in Figure 3.

Figure 3. Scenarios matrix



2.3.2 Scenario ingredients

Ahead of the first workshop, the project team prepared examples of potential scenario components, which are referred to here as 'ingredients.' These ingredients—such as 'climate change-triggered mass migration' or 'rapid deployment of untested green technologies'—were presented to participants as potential building blocks for the future scenarios.

The primary aim of these ingredients was to stimulate the discussion during the workshop. They were intended as prompts, encouraging participants to assess the concepts, to either adopt them, disagree with them, or propose entirely new elements. They also served as a contingency measure, to be used if the conversation around the key dimensions began to slow down.

The research team developed these ingredients based on the climate-driven factors and uncertainties identified in the preceding literature from the scoping review and PESTL analysis, as well as the open-text comments provided by the survey participants. These responses offered valuable insights into the interconnectedness of climate-related factors and their potential impact on OSH and workplace outcomes. While many responses reinforced the factors already identified by the research team, others introduced crucial nuances and complexities that enriched the scenario foundation.

The specific ingredients prepared for the participants in each scenario are detailed in the Annex, Figure A. 2. to Figure A. 5. Participants discussed these ingredients, refined them and added more. It should be noted that not all of these prepared ingredients were ultimately adopted by the participants and subsequently included in the final draft of the scenarios

2.4 Scenario development workshops

Two workshops over three sessions involving expert stakeholders were conducted between June 2025 and September 2025. The initial workshop took place in person over the course of two days, whereas the second was delivered online across two sessions.

Following their contribution to the survey and based on their expertise and background, 20 participants were invited to further participate to the study by attending our workshops. Participants were encouraged to commit to all sessions, which included the initial in-person workshop and two online sessions, ensuring continuity of input. One additional participant was later invited to the online sessions as a substitute, bringing the final cohort to 21 individuals.

The group's expertise was highly specialised: all but one participant held a background in OSH, while the remaining specialist focused on climate change research. The cohort offered a broad distribution of professional backgrounds, including: academia and research institutions (n=11), trade unions (n=3), employer organisations (n=3), national or EU agencies (n=3), and one professional body (n=1). Participants represented a broad European cross-section, with attendees from 12 countries across the continent: Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Portugal, Sweden, and the UK.

The complete list of participants and their affiliations is available in Annex B, Table B. 1, while more details about the workshops can be found in Annex A.

Stakeholder contributions were documented through participant-generated post-it notes, both physical and virtual, as well as session transcriptions and research team observations and notes.

2.5 Analysis and write up

The final stage of the project involved the collation and analysis of all data generated throughout the study. We integrated insights from all stages of the study: scoping literature review, stakeholder survey, and workshops. Here we describe the findings sections of the report and how the analysis contributed to the findings.

- Climate-driven factors influencing OSH (Section 3) were identified through the initial scoping review and further refined using input from the stakeholder survey, which assessed the perceived impact of each factor.
- Future scenarios (Section 4) were developed using thematic analysis of post-it notes and participant contributions from the first workshop. These scenario drafts were cross-checked against the literature review and survey findings to ensure completeness. The research team prepared initial drafts, which were reviewed by EU-OSHA and circulated to participants for feedback prior to the second workshop (first session). Two participants volunteered written feedback. Additional comments were incorporated, and the scenarios were further refined during the second workshop.
- Cross-cutting themes (Section 5) emerged from a thematic analysis of both the scenario narratives and workshop discussions, supplemented by findings from the scoping review.
- The Shared Vision for 2050 (Section 6) was synthesised by identifying positive elements across the scenarios, particularly those highlighted as priorities during the workshop discussions. A preliminary vision was drafted and presented to participants in the second workshop (second session), where its key components, enablers, and barriers were discussed and refined.
- Tensions and trade-offs (Section 7) were identified through thematic analysis of barriers raised by participants in the second workshop (second session), as well as recurring challenges noted throughout the project.
- The roadmap and stakeholder implications (Section 8) were developed based on a thematic analysis of participant contributions during the second workshop session (second session), focusing on steps that stakeholders could take to realise the Vision for 2050.

The final version of the report was reviewed by EU-OSHA and two independent peer reviewers at RAND Europe.

2.6 Limitations

There are a few limitations worth noting. Due to the broad scope of the topic and the limited project timeframe, the initial literature review was not executed as a systematic review but rather as a scoping exercise. It should be noted that, unlike systematic reviews, scoping reviews may not capture all relevant literature or provide a comprehensive assessment of study quality, potentially limiting the depth and rigour of the findings. However, the study was explicitly built upon the literature reviews and foundational work established by previous EU-OSHA foresight studies (e.g., on the circular economy and digitalisation), which contributed to ensuring the research was grounded in existing evidence and benefitted from the insights developed in those earlier projects. Furthermore, the scoping effort was complemented by robust expert input (through the survey and workshops), which served to validate the findings and help identify potential gaps.

As all foresight research exercises, the study's aim was not to make precise predictions about the future, but to qualitatively explore a range of plausible future scenarios based on expert reflection and insight. Consequently, the results are subject to inherent biases common to qualitative studies. These include the subjectivity bias of the participants who may unconsciously prioritise their own professional interests or viewpoints, and limitations in their individual knowledge bases. It is also important to acknowledge the potential for researcher bias in the analysis and framing of the scenarios, as the research team guided the selection of key dimensions and synthesised the final narratives. As a consequence, these biases may result in scenarios and recommendations that do not fully reflect the diversity of perspectives or the complexity of issues within the wider OSH community. To minimise participant and research biases, we involved a broad spectrum of experts; however, there remains a risk of groupthink—a phenomenon where the desire for harmony or conformity within a group leads to the suppression of dissenting opinions and critical thinking, potentially resulting in less robust decision-making.

The stakeholder engagement process, while productive, faced some constraints. While the online workshop format (including the use of platforms like Mural¹) was designed to be creative and accessible, some participants encountered technical difficulties engaging with the digital tools. Also, the final scenario narratives and the Shared Vision for 2050 were developed by prioritising consensus and coherence over incorporating every individual viewpoint raised. This approach aimed to create scenarios that are coherent and plausible, but it necessarily means the analysis and synthesis may not encompass every single point contributed.

Finally, readers should note that the recommendations derived from this study are deliberately high-level and strategic in nature. This is because the scope of the study (i.e., examining the indirect impacts of climate change on the entire European world of work) is too broad to yield specific, detailed policy advice in the remit of this study. This project is intended to provide an overview and strategic framework for OSH actors to understand the complex issues and prioritise future detailed work.

¹ www.mural.co

3 Climate-driven factors influencing the future of OSH

3.1 Findings

This chapter describes the findings from the scoping literature review, in which the research team examined previous EU-OSHA foresight reports, academic and grey literature, as well as news articles, the research team identified 24 climate-driven factors influencing the future of OSH. These can be described as possible future events, and drivers of change that are influenced by climate change and, in turn, affect OSH and the world of work.

The review of the literature was conducted using a PESTL framework, as described in section 2.2.1. This framework provided a useful, structured way to examine the material systematically. However, the research team further analysed the factors that are relevant to OSH and the world of work and grouped them under the following categories:

- **Economic factors:** The research team found that, of all the PESTL elements, the greatest amount of evidence in the literature concerned economic factors, and the content of the articles themselves further demonstrated that this category is potentially the most influential within the world of work and OSH. Changes in energy costs, market disruptions, resource scarcity, and shifts in global supply chains directly affect employment stability, investment in safety infrastructure, and the feasibility of implementing green technologies.
- **Factors related to adaptation and mitigation strategies:** These represent the core human response to the climate crisis. Both sets of strategies are essential for coping with and fighting climate change, yet they introduce their own set of OSH risks. For instance, the demand for speed in mitigation efforts may compromise safety, while large-scale adaptation projects introduce new construction hazards. Considering these risks is crucial to avoid creating new problems for workers while attempting to solve environmental ones.
- **Other factors:** this category contains all remaining non-economic PESTL elements, such as political, social and regulatory factors.

The list of factors for each group is summarised in Table 1 below.

Table 1. List of climate-related factors influencing the future of OSH

Economic factors	Adaptation factors	Mitigation factors	Other factors
▪ Carbon pricing. ▪ Economic decline in Europe. ▪ Global trade impacts. ▪ Greenflation. ▪ Increased cost of insurance. ▪ Infrastructure and supply chain disruptions. ▪ Investment shifts. ▪ Regulatory compliance costs. ▪ Resource scarcity. ▪ Sectorial disruption.	▪ Construction and modernisation of large infrastructures. ▪ Development of climate-resilient technologies. ▪ Investment in disaster preparedness.	▪ Circular economy initiatives. ▪ Development and deployment of mitigation technologies. ▪ Investment in green infrastructure. ▪ Transition to renewable energy.	▪ Conflicting views on green transition. ▪ Digitalisation and AI. ▪ Increased demand for green jobs and skills. ▪ Increased migration. ▪ Political short-sightedness. ▪ Regulatory and policy changes. ▪ Social and wealth inequality.

The identified factors, along with brief descriptions, were provided to expert participants during the survey. Participants were asked to rank each factor as 'extremely impactful', 'very impactful', 'somewhat impactful', 'not so impactful' or 'not impactful at all' for the future of OSH and the world of OSH. The factors most frequently rated as 'extremely impactful' were:

- Social and wealth inequality – 50% of participants indicated that this factor is extremely impactful.
- Increased migration – 47% of participants indicated that this factor is extremely impactful.
- Political short-sightedness – 43% of participants indicated that this factor is extremely impactful.

Conversely, the factors that the greatest proportion of participants considered least impactful were:

- Carbon pricing – 23% of participants regarded it as 'not so impactful'.
- Conflicting views on green transition – 23% assessed it as 'not so impactful', with an additional 6% rating it 'not at all impactful'.
- Regulatory compliance costs – 20% considered it 'not so impactful'.
- Development and deployment of mitigation technologies – 14% evaluated it as 'not so impactful'.
- Increased cost of insurance – 6% found it 'not so impactful', while 10% viewed it as 'not at all impactful'.

Below, we highlight the findings from the scoping review by providing a brief description of each factor, its relationship with climate change as well as its potential implications for OSH and the world of work.

3.2 Economic factors

3.2.1 Carbon pricing

▪ Brief description, definition and relationship with climate change

Carbon pricing refers to schemes which place a monetary value on emissions and pass the cost onto companies to incentivise them to reduce their emissions. This can take the form of a straightforward tax on emissions or a trading system which places a cap on emissions and allows the excess to be bought and sold within a closed market (Döbbeling-Hildebrandt *et al.*, 2024). All EU countries are part of the EU Emissions Trading System (EU ETS), which as of 2023 has helped to reduce the emissions of European power and industry plants by approximately 47% since 2005 (European Commission, 2025). Evidence suggests that even low-level carbon pricing can help reduce emissions, although inconsistent and uneven application of pricing across an economy appears to limit the reduction in emissions (National Institute of Economic and Social Research, 2024). Climate change is likely to prompt more countries to consider or seek to introduce climate taxes in the future, whether on a national or EU level, although these may be politically unpopular. Such taxes can face opposition because they may lead to increased costs for businesses and consumers, potentially raising prices on goods and services, including essentials like energy and transport. There are also concerns that climate taxes could disproportionately affect lower-income households and industries that are heavily reliant on fossil fuels, exacerbating social and economic inequalities. Furthermore, some view these measures as government overreach or worry about their impact on international competitiveness if other countries do not impose similar taxes.

Whether these will be effective in reducing emissions depends in part on the scale and consistency of their application.

▪ Relevance and potential implications for OSH and the world of work

Carbon pricing may result in some firms deciding to offset the cost of emissions by making various cuts, including to OSH initiatives such as systematic OSH management, health and safety training and personal protective equipment (PPE). The broader impacts on the financial viability of firms may also result in job and financial instability. These impacts will also be more likely if the cost of emissions rises

or if the cap on emissions is reduced, which may be regulated in order to reach net zero emissions. Evidence suggests that temperature rises will necessitate higher carbon taxes (European Central Bank, 2023), and it may be less feasible for some companies and industries to reduce emissions at a certain point, meaning costs will have to be passed on to ensure financial viability. Further it might also show that innovative new ways of production will have less OSH risks than traditional methods.

3.2.2 Economic decline in Europe

▪ Brief description, definition and relationship with climate change

While the EU economy as a whole has begun to grow after a period of stagnation, recent years have seen external shocks related to COVID-19, geopolitical instability and conflict, and the impacts of climate change already being felt (European Commission, 2024). Weather- and climate-related extremes have already caused economic losses of over \$162 billion between 2021 and 2023 (European Environment Agency, 2025a).

Alongside existing challenges, the economic losses from climate change are not expected to reduce by 2030. Climate change is associated with decreased economic output and productivity and shortened lives (Kalkuhl and Wenz, 2020; Roy, 2024), with a Lancet report showing a loss of 490 billion productive work hours at a global level in 2023 due to heatwaves alone (Romanello *et al.*, 2023). As noted in the section on greenflation (see section 3.1.4), the planned transition of the EU towards energy neutrality necessitates significant economic investment and may place further pressure on already strained economies (Speck *et al.*, 2023).

▪ Relevance and potential implications for OSH and the world of work.

The impacts of economic decline in the EU may be felt with regards to OSH in various ways. Evidence is mixed with regards to the overall impacts of recession on health and safety. Jenke *et al.* suggest that occupational injuries in Western Australia between 2004 and 2019 increased during times of economic growth and decreased during times of recession. However, recession can have a deleterious impact on safety through the removal of funds and personnel, and injury prevention strategies in the manufacturing industry have been shown not to be as effective during periods of downturn risks (Jenke, Oosthuizen and Cattani, 2021). Economic downturn is also likely to impact the economic viability of firms in the longer-term leading to job insecurity and workers forced to accept unsafe or insecure work due to limited alternatives (Anyfantis, Boustras and Karageorgiou, 2018). Downturns may also make workers less likely to report accidents, leading to under-investment in safety due to accidents which are not being accurately recorded (Boone *et al.*, 2011).

3.2.3 Global trade impacts

▪ Brief description, definition and relationship with climate change

Global trade networks are a key mechanism for facilitating the green transition but are also highly susceptible to the direct impacts of climate change. Extreme weather events and disasters can disrupt the mobility and production of raw materials and essential goods, causing unpredictable and wide-ranging impacts. The restructuring of the job market to facilitate changes in global trade amidst the green transition could also lead to significant job losses, as well as reskilling and the creation of new jobs (ILO, 2019; Mikaelsson and Dzebo, 2023). Additionally, the comparative efficiency of countries in producing specific goods or services can change over time due to factors such as climate effects on productivity, resource availability, and sectoral outputs. These variations may influence global trade patterns and shift trade flows among regions, resulting in adjustments to trading relationships as certain countries experience changes in competitiveness for particular goods (OECD, 2017).

▪ Relevance and potential implications for OSH and the world of work

Disruption in the production and mobility of goods could threaten the survival of industries and companies, leading to job losses. Funds being diverted away from OSH initiatives, like systematic OSH management, training and PPE, could lead to worsened OSH outcomes, such as increased number of injuries and accidents. A restructuring of the labour market around new industries and technologies could bring with them new risks to health and safety. This could lead to job losses in some regions and job creation in others. Workers in declining sectors may face redundancy or be forced to transition to

new types of work, sometimes in unfamiliar or less regulated sectors, potentially increasing exposure to health and safety risks. Furthermore, shifts in trade flows may drive migration of workers between regions and sectors, often leading to a more precarious workforce.

3.2.4 Greenflation

▪ Brief description, definition and relationship with climate change

Greenflation refers to the inflation driven by the green transition, specifically through the cost of energy and raw materials (e.g. metals used to make electric batteries). Europe, having committed to achieving carbon neutrality by 2050 (European Parliament, 2020), will need to shoulder the burden of investment, and the associated costs may be seen as prohibitive and become an obstacle to the climate transition. In the event of inflation, European states may find it more difficult to justify unpopular green policies, particularly if other states continue to make use of fossil fuels. Nonetheless, the extent to which a green transition will actually contribute to inflation is a subject of debate. For example, Chung et al. predicted a small but statistically significant effect on headline inflation from the green transition (Chung and Kim, 2024).

▪ Relevance and potential implications for OSH and the world of work

If the green transition contributes significantly to inflation, this could impact OSH outcomes because, as similarly noted elsewhere, economic cycles are correlated with safety outcomes. Firms with lower margins, spending more on energy, may put less investment and resources into prioritising health and safety – however new innovative forms of work can also be beneficial for OSH as well. If the green transition is only moderately inflationary, as predicted by Chung et al. (Chung and Kim, 2024), it seems likely that any rise in energy costs is primarily going to affect small businesses and vulnerable groups, who have less financial capacity to absorb higher energy expenses.

3.2.5 Increased cost of insurance

▪ Brief description, definition and relationship with climate change

There is a risk that climate-related shocks could induce banks to reduce lending and cause an abrupt and broad-based repricing of any assets exposed to risk as a result of climate change. This would make insurance more expensive and potentially render some assets uninsurable (Pariès, 2022; Zhou, Endendijk and Botzen, 2023). Already, 62% of the global losses from natural disasters which occurred in 2023 were uninsured (Harris and Arnold, 2025). In the US, many major insurance companies withdrew from offering home insurance following the wildfires of 2025 (Harris and Arnold, 2025).

▪ Relevance and potential implications for OSH and the world of work

The impact of climate change on insurance will be varied and heterogeneous but are likely to reduce the stability and profitability of firms. Insurance for certain types of work or for assets exposed to climate risks may become prohibitively expensive. For example, Marinaccio et al. indicate that increasing heat stress and heatwaves would increase the risk of work-related injury and estimated 49 million euros of compensation payments are already being made due to heat-related occupational injuries in Spain (Marinaccio et al., 2025). The increased cost of insurance may also be passed onto firms, resulting in lower investment in OSH and worsened health and safety outcomes. On the other hand, one could envisage a development where investing in OSH could be a way of keeping insurance prices down.

3.2.6 Infrastructure and supply chain disruption

▪ Brief description, definition and relationship with climate change

Climate change is likely to have significant and varied impacts on both infrastructure and supply chain. The exact consequences of climate change on infrastructure are hard to predict as these will be the product of complex interactions between different environmental factors and different kinds of infrastructure. The nature of infrastructure also means that damage to a single piece of infrastructure in one place can have far-reaching consequences across a broader network, such as flooded signalling on a line causing rail disruption. Some examples of direct impacts include heat-related power outages, damage to transport infrastructure such as bridges and tunnels, grounding of flights in unsafe conditions,

flooding and outages caused by damage to the water supply system, and the failure of telecommunication systems (McKinsey, 2020; Leal Filho *et al.*, 2024).

The nature of global supply chains means that the impacts of climate change are not confined geographically but can spread to other regions and sectors. Climate change has the potential to impact the supply of goods, food, water, energy, and agricultural products, with Sun *et al.* suggesting that supply chains amplify the economic cost of heat risk (Sun *et al.*, 2024).

By 2060, it has been estimated there could be 0.6-4.6% global economic losses resulting from climate change related to health loss, labour productivity loss and indirect loss. This could have significant impacts on the EU economy, specifically these impacts will be felt more strongly by small- and medium-sized economies (Sun *et al.*, 2024). EU countries would likely face indirect losses due to reductions in the production capacity of trading partners, particularly in scenarios where more of these countries are impacted by heat risk or climate disasters (Sun *et al.*, 2024). The impacts of climate change on food production will be felt across supply chains, with the production of goods such as rice, tomatoes and poultry already being impacted. This poses a risk of food shortages, lower earnings and higher volatility/increases in prices (Tchoukouang, Onyeaka and Nkoutchou, 2024).

▪ **Relevance and potential implications for OSH and the world of work**

The impacts of climate change on OSH through infrastructure and supply chain disruptions are likely to vary depending on the specific area and context. However, it seems certain that damage to infrastructure will have negative impacts on services and private sector companies reliant on them, potentially diverting resources away from safety measures. Workers in some industries may also be exposed to increased safety risks and unsafe working conditions as part of repairs to damaged infrastructure.

The economic impacts of supply chain disruption caused by climate change is likely to affect OSH outcomes through a reduction in organisational income, particularly in more exposed industries such as transportation. Supply chain disruptions can lead to job insecurity, price fluctuations, and food shortages, which may negatively affect both physical and mental health by creating uncertainty about employment and access to necessities.

3.2.7 Investment shifts

▪ **Brief description, definition and relationship with climate change**

Climate change is driving significant shifts in global investment patterns as countries transition to sustainable, low-carbon economies. The European Green Deal emphasises the need to direct financial and capital flows to green investments to achieve climate goals (European Commission, 2019b). The EU has also implemented the Sustainable Finance Strategy to help improve the flow of money towards financing the transition to sustainable economic activities (European Commission, 2021). One of the most prominent developments is the rapid growth of the green bond market in the EU, which provides funding for environmentally friendly projects (European Environment Agency, 2025c). Investments in climate-relevant infrastructure also see substantial increases, particularly in renewable power plants, electricity grids, and rail infrastructure, while investments in conventional fossil fuel infrastructure are shrinking (Klaaßen and Steffen, 2023). A 2023 McKinsey report highlighted that investments in climate-driven growth businesses by the top 377 companies (by market capitalisation) increased sixfold between 2019 and 2023, demonstrating the accelerating pace of green investment (McKinsey, 2025).

▪ **Relevance and potential implications for OSH and the world of work**

The reallocation of investments driven by climate change, particularly toward green industries and technologies, brings both opportunities and challenges to OSH. While green industries create new job opportunities, traditional industries such as coal mining and oil extraction are expected to contract, leading to job displacement and economic insecurity for affected workers. Moving away from these traditional industries may lower exposure to longstanding risks inherent in such sectors, particularly as many are associated with elevated mortality rates (Lloyd's Register Foundation, 2025). However, there are new and emerging risks also associated with green industries and technologies, and OSH regulation and standards haven't been updated to reflect those new hazards (Vitale *et al.*, 2024). Workers transitioning to new jobs in green industries can be exposed to less hazardous work than for example

mining, that can improve health and safety. On the other hand, they may also experience stresses associated with job insecurity and reskilling/upskilling requirements. Green industries may prioritise efficiency and sustainability, potentially increasing workloads and creating high-pressure environments that negatively impact workers' mental health. In addition, there are geographical variations in investment shifts, possibly contributing to disparities in job opportunities and economic growth. Workers in areas with less green investment may face limited access to new employment opportunities, exacerbating regional inequalities.

3.2.8 Regulatory compliance costs

▪ Brief description, definition and relationship with climate change

Since the launch of the European Green Deal in late 2019, the EU has been introducing new regulations and guidelines to drive green transition (Council of the EU, 2024c). For instance, under the corporate sustainability reporting directive (CSRD), companies face obligations such as auditing supply chains and reporting adverse impacts on human rights and the environment (Council of the EU, 2024b). The Construction product regulation requires manufacturers to provide environmental information about the lifecycle of products and design products that facilitate re-use, remanufacturing and recycling in line with the principles of circular economy (Council of the EU, 2024a). Navigating these complex and evolving regulations presents challenges for businesses, especially when there is ambiguity in interpreting and implementing the laws. Compliance costs under these regulations are considerable (Andy Bounds, 2024).

▪ Relevance and potential implications for OSH and the world of work

The high compliance costs incurred under the EU's climate policies have implications for business operations and OSH. The high compliance costs may adversely affect companies' financial health and cause disruptions in businesses operations, particularly for small businesses. The financial strain can limit companies' ability to invest in OSH and implement robust OSH practices, which could compromise workers' safety and health, especially in industries grappling with climate-related OSH risks. The financial burden of compliance costs may also prompt companies to relocate their emission-intensive activities to non-EU countries with less stringent regulations, which can result in job displacement for workers impacted. But creative innovations to reduce compliance costs could possibly also result in solutions which supports better OSH.

3.2.9 Resource scarcity

▪ Brief description, definition and relationship with climate change

Climate change has the potential for profound impacts on essential resources like water, fossil fuels and other minerals, and sources of food. The impacts of resource scarcity are likely to be wide-ranging and varied depending on geographical location and the impacts of different environmental factors. The nature of global trade means that disasters in one location could have far-reaching impacts: for example, 80-90% of global rare earth materials processing is conducted in a single region of China that is already affected by heavy rainfall (Mikaelsson and Dzebo, 2023). Some parts of Europe are already facing water stress conditions; temperature rises of 2°C could create new water scarce areas in countries like Germany, Bulgaria, France and Romania (Bisselink *et al.*, 2020). Another study found that a 2°C additional warming would aggravate existing impacts on national food supplies by over 50% across all levels of economy (Bajaj *et al.*, 2025).

▪ Relevance and potential implications for OSH and the world of work

The increased scarcity of natural resources due to climate change may drive up costs and affect industries reliant on these resources, influencing job security and working conditions. Food shortages could contribute to higher prices and make it more difficult for workers to afford adequate food for themselves and their families on an average salary. Furthermore, resource scarcity can introduce additional risks to the work environment. As key resources become more limited, competition for access may intensify, potentially fostering the growth of illicit markets and black-market activities. This heightened competition can lead to greater safety and security concerns for those working in affected sectors, such as increased risk of theft, violence, or exploitation. Workers may be exposed to more hazardous conditions as companies seek to secure diminishing supplies or cut corners to reduce costs.

In some cases, the pressure to maintain production or profitability amidst scarcity could result in the relaxation of health and safety standards, further endangering workers.

3.2.10 Sectorial disruptions

▪ Brief description, definition and relationship with climate change

The impact of climate change varies across different sectors and regions (European Commission, 2022a). Sectors such as agriculture and tourism are particularly vulnerable due to their reliance on stable climate conditions. Southern Europe is projected to experience significant declines in crop yields due to excessive heat and water shortages. Suitable areas for crop cultivation will also shrink. Conversely, Northern Europe may benefit from the opening of new areas suitable for warm season crops as temperatures rise, potentially increasing agricultural productivity in certain regions. Similarly, the tourism market in the southern Europe is projected to decline due to higher warming scenarios, whereas central Europe may increase its tourism appeal for its moderate climate. In the energy sector, Europe will see decreased demand for heating and increased demand for cooling. Extreme weather events also pose threats to energy infrastructure, causing damages and disruptions. The rising temperature, worsening air pollution, and the spread of vector-borne diseases also exacerbate physical health and mental health challenges, causing productivity loss and straining the health care systems (World Economic Forum, 2023).

▪ Relevance and potential implications for OSH and the world of work

The sectorial disruptions caused by climate change have implications for economic activities, employment, and OSH. Sectors such as agriculture, forestry, fishery, and tourism in affected regions are likely to face job losses and increased OSH risks. Sectors related to renewable energy, green technology, climate-resilient infrastructure, and environmental policies are likely to see employment growth (Wyne, 2024). While green transition creates new job opportunities, it also causes employment declines in carbon-intensive sectors like fossil fuel. In addition, certain populations, such as those in rural areas and those living in poverty, are disproportionately affected by climate-related job losses (ETUI, 2014). Job losses caused by sectorial disruptions as a result of climate change can lead to stress, insecurity, and mental health challenges for affected workers. Green job workers may also face psychological strain from the need to reskill and upskill, adapt to new technologies, and new emerging OSH risks (European Agency for Safety and Health at Work, 2024).

3.3 Factors related to adaptation strategies

Adaptation refers to the development and application of technologies designed to help systems withstand, adapt to, or recover effectively from the physical impacts of climate change, thereby supporting long-term resilience.

3.3.1 Construction and modernisation of large infrastructures

▪ Brief description, definition and relationship with climate change

Upgrading and modernising existing infrastructures, as well as building new ones to be climate-resilient, will be essential to mitigate the negative impacts of climate change. Examples of these types of adaptation strategies may include the development of new systems to prevent flooding, new types of housing, installing coastal protection and upgrading existing infrastructure to be more climate-resilient, for example by integrating cooling systems (Allard, 2021).

▪ Relevance and potential implications for OSH and the world of work

While there are clear benefits in improving infrastructures, including the development of more climate-resilient buildings and transportation systems, projects to repair or upgrade existing infrastructure may increase occupational hazards. The nature of infrastructure projects can involve risks such as steep terrain, water scarcity, high temperatures and radiation (Baghdadi, 2024). These risks in turn are likely to contribute to greater rates of death and injury among workers on infrastructure projects. These hazards might increase in scenarios where other climate impacts also contribute to water scarcity, rising temperatures and other environmental factors. Finally, the essential nature of key infrastructure may mean that repair work and adaptation is prioritised over ensuring safe working conditions. However,

improved infrastructure can also deliver benefits to workers in the long term by providing safer, more resilient workplaces, better transport links, and enhanced access to essential services.

3.3.2 Development of climate-resilient technologies

▪ Brief description, definition and relationship with climate change

Climate-resilient technology refers to “technology designed to ensure systems withstand, adapt to, or recover effectively from climate change impacts, supporting long-term sustainability” (Sustainability Directory, 2025). Examples of climate-resilient technologies include advances in genomics and agricultural breeding techniques that accelerates the growth of drought-resistant varieties, precision irrigation systems with smart technology that optimises water usage, boost crop yields, and support sustainable farming, AI and machine learning used to analyse complex climate data and predict disasters, and Carbon Capture and Utilisation (CCU) technologies.

▪ Relevance and potential implications for OSH and the world of work

While climate-resilient technologies are pivotal in addressing the challenges brought by climate change—offering solutions for decarbonisation, energy transition, and emissions reduction—they also present new OSH challenges. As industries integrate new technologies to adapt to climate impacts, workers may encounter novel hazards that stem from the use, maintenance, and implementation of these technologies. For example, in agriculture, the complexity of technology may increase the cognitive demands on farmers who need to learn how to operate these new technologies, interpret data, and make decisions based on predictions (Gardezi *et al.*, 2022). The integration of advanced machinery, such as drones and automated equipment, introduces physical risks, including mechanical injuries or equipment malfunctions. Bioengineering and regenerative techniques used to restore soil health and increase diversity may pose unforeseen risks to human health (Kendra Klein, 2023). Electromagnetic fields (EMFs) are widely used in the renewable energy sector, especially in wind farms, electric vehicles, and power plants. While the acute, short-term effects of high-level EMF exposure (e.g., burns) are well understood, the long-term effects of low-level exposures is uncertain and require further research (European Agency for Safety and Health at Work, 2025b).

3.3.3 Investment in disaster preparedness

▪ Brief description, definition and relationship with climate change

Investment in disaster preparedness is important to mitigate the risks of climate-related disasters. While disasters are expected to become more frequent and severe as a result of climate change, they already carry a heavy economic burden, with disasters across Europe in 2023 costing more than EUR 77 billion. This could rise to as high as EUR 175 billion under a 3°C warming scenario (World Bank, 2024).

▪ Relevance and potential implications for OSH and the world of work

A failure to invest in disaster preparedness can lead to infrastructure collapse and critical failures in the event of a disaster. For example, 42 hospitals suffered moderate or severe damage during the 2023 earthquakes in Türkiye while four fire stations and an entire fleet of vehicles were lost during the floods in 2021 in Germany (World Bank, 2024). Beyond the immediate risk to life, this could have secondary consequences for the workers involved in repair and disaster response. The failure of key transport routes or infrastructure can lead to significant disruption and could make firms in some industries less profitable (World Bank, 2024). Investment at an individual company level has the potential to mitigate climate risks but could also divert resources away from OSH initiatives, leading to worsened outcomes.

3.4 Factors related to mitigation strategies.

Mitigation focuses on reducing or preventing the further escalation of climate change by addressing its root causes, primarily by reducing global greenhouse gas (GHG) emissions.

3.4.1 Circular economy

▪ Brief description, definition and relationship with climate change

The circular economy is a system where products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting. This

approach aims to extend the lifespan of products and materials while minimising waste, contrasting sharply with the traditional linear economy characterised by a 'take-make-dispose' model (Ellen MacArthur Foundation, 2025). It was estimated that 45% of GHG emissions are linked to the production of materials, products, and food, as well as the management of land. Therefore, the circular economy presents a significant opportunity to reduce GHG emissions while providing additional societal and environmental benefits (Material Economics, 2018). An analysis conducted by Material Economics suggests that a more circular economy could cut emissions from heavy industry (steel, plastics, aluminium, and cement) by 296 million tons CO₂ per year, or 56%, by 2050 in the EU (Material Economics, 2018). Since 2015, the EU has been actively promoting the circular economy as part of its strategy to combat climate change (European Commission, 2019a).

▪ **Relevance and potential implications for OSH and the world of work**

The efforts towards implementing a circular economy can have significant impacts on jobs, work conditions and OSH outcomes. The EU has seen a steady increase in the number of people employed in the circular economy, with over 4 million people employed in circular economy sectors as of 2021 (European Environment Agency, 2025b). A study estimated that a more circular economy could create 700,000 new jobs by 2030, driven by increased labour demand in repair and recycling sectors (Cambridge Econometrics, Trinomics, and ICF, 2018). Workers might also need to acquire new skills related to materials science, environmental management, and green technology operations to adapt to new job requirements (CEDEFOP, 2023). However, the waste and recycling sector remains a high-risk sector. The introduction of new materials, such as nanomaterials and biological agents, can pose novel OSH risks. While the adoption of technologies in a circular economy may enhance workplace safety by reducing hazardous manual tasks, it could also lead to reduced labour demand, potentially resulting in job losses. A foresight study published by EU-OSHA explored the potential impacts of a circular economy on OSH, highlighting both opportunities and challenges associated with this transition (European Agency for Safety and Health at Work, 2021).

3.4.2 Investment in green infrastructure

▪ **Brief description, definition and relationship with climate change**

Green infrastructure refers to networks of green space in cities and human settlements that contribute to the natural ecosystem and that also provide benefits for human populations. This can include parks and patches of natural landscape as well as other elements of nature (e.g. trees) that support natural ecosystems. Green infrastructure can contribute to managing stormwater, lowering heat island effects, decreasing building energy usage, and protecting coastal areas (U.S. Environmental Protection Agency, 2026). These functions may enhance resilience to extreme weather and assist with climate change mitigation.

▪ **Relevance and potential implications for OSH and the world of work**

While green and blue urban infrastructures offer health benefits, they may also lead to unintended negative effects, such as increased risks of infectious diseases due to new habitats for vectors and hosts, and heightened problems for those with allergies (Nieuwenhuijsen, 2021). Furthermore, the development of green infrastructure may introduce new occupational risks due to the use of new and complex construction techniques and materials. There is less research into the harms of these new materials or techniques, meaning some of the related OSH risk could be unknown. Green construction projects usually require more time than traditional ones, with tight construction deadlines which can create more safety risks (Qazi *et al.*, 2021). These projects often take longer because they require extra planning, certification, and coordination to integrate sustainable materials and technologies while meeting environmental standards (Hwang and Ng, 2013).

3.4.3 Transition to renewable energy

▪ **Brief description, definition and relationship with climate change**

The transition to renewable energy is likely to constitute significant social and economic upheaval, due to the decarbonisation of key industries, the development of new technologies and the use of renewable energy sources such as wind and solar power.

▪ **Relevance and potential implications for OSH and the world of work**

The processes involved in the transition to renewable energy are likely to have significant impacts for OSH and the world of work. The ILO estimates that up to 7 million jobs may be lost due to the shift to renewable energy, with a further 25 million jobs created – relative to the destruction of 71 million and growth of 78 million due to the green transition (ILO, 2019). Evidence suggests that many of these jobs will be in industries that are associated with significant OSH risks, such as building, mining, manufacturing and transport. The creation of new jobs and use of new technologies poses new risks which may have been insufficiently considered, particularly in the context of rapid economic change. The shift towards digital work and automation could also mean less bargaining power for workers in new contexts (Albin *et al.*, 2025).

3.4.4 Other mitigation technologies

▪ **Brief description, definition and relationship with climate change**

Mitigation technologies are essential to achieving climate targets. Some examples include Carbon Capture and Storage (CCS) technology, which captures CO₂ from a coal-fired powered plant and transports it to a storage site by pipeline and store CO₂ in saline aquifer. Another example is Electric Vehicles (EVs) powered by batteries of hydrogen fuel, which reduce emissions compared to fossil-vehicles. Retrofitting upgrades buildings to improve their energy efficiency and reduce GHG emissions with better insulation and windows, efficient lights and advanced heating and cooling systems are a third example (World Economic Forum, 2024).

▪ **Relevance and potential implications for OSH and the world of work**

While climate mitigation technologies play an important role in achieving climate goals, they also introduce new occupational risks and require workforce training to ensure safe and effective implementation. For example, the development and application of CCS remain in early stages. In the EU, CO₂ is classified as a hazardous substance under REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) and CLP (Classification, Labelling and Packaging) regulations. Exposure to high concentration of CO₂ can cause headaches, dizziness, confusion and loss of consciousness, posing direct risks to human health and potentially leading to workplace accidents. Therefore, the risk of leakage during transportation and storage can have serious consequences to workers and nearby communities (Environment Agency, 2011; Fendt, Reisch and Feit, 2024). EV batteries, particularly lithium-ion batteries, pose risks of fires or explosions that can release toxic gases harmful to human health. Battery aging or degradation can create unsafe conditions. Handling and recycling EV batteries involve exposure to hazardous chemicals, which require special training and protective equipment to mitigate risks (OSHA, 2019). Energy-efficient materials used in building retrofitting may also introduce new chemical exposure risks for workers (Mmereki and Brouwer, 2022). Moreover, the deployment of mitigation technologies often requires significant financial investment, which can be particularly challenging for smaller businesses. Adopting these technologies also demands specialised knowledge and retraining for workers.

3.5 Other factors

3.5.1 Conflicting views on green transition

▪ **Brief description, definition and relationship with climate change**

The green transition may incur substantial societal costs related to the cost of energy, raw materials and geopolitical risks to supply. These costs will be felt more heavily by economies that have committed to net zero and the reduction of emissions and could result in conflicting views about how and whether to facilitate a transition to green energy (Crawford and Gordon, 2023). Political parties in various European countries have already begun to push back against the energy transition due to the impacts on cost-of-living (Crawford and Gordon, 2023). Workers' unions may struggle to choose between protecting the status quo and livelihood of workers versus supporting a green transition which could threaten livelihoods (Kalt, 2022).

▪ **Relevance and potential implications for OSH and the world of work**

These differing views on the green transition could lead to conflicts among workers and potentially create resistance against green job initiatives and the green transition. This could reduce the speed of the energy transition and result in worsening climate impacts, particularly in industries which are more exposed to disasters and climate risks. The attention could be on better OSH in the remaining jobs, but this is not necessarily guaranteed.

3.5.2 Digitalisation and AI

▪ **Brief description, definition and relationship with climate change**

Digitalisation, encompassing a wide range of digital technologies, such as artificial intelligence (AI), online platforms, the Internet of Things (IoT), and big data analytics, transform business models, processes, and activities, and also drives organisational and cultural changes. Digitalisation and AI are increasingly recognised as pivotal tools in addressing climate change challenges (World Economic Forum, 2021; OECD, 2025). For instance, Artificial intelligence of things (AIoT) solutions can be applied to measuring, reporting and predicting carbon footprint. Digital and smart technologies can improve the efficient use of energy (International Energy Agency, 2019). The EU has been encouraging a “twin” green and digital transitions (Muench *et al.*, 2022). However, it is worth mentioning that the widespread use of digital tools may also lead to more electronic waste and bigger environmental footprint (Director-General for Climate Action, 2025).

▪ **Relevance and potential implications for OSH and the world of work**

As digital tools become integral to many business operations, digitalisation has already transformed how work is organised and performed, affecting job characteristics, requirements, and OSH management. Digital tools can if applied with a human-centric approach enhance productivity and reduce OSH risks through e.g. improved safety monitoring using wearable devices and enabling remote work arrangements. Workers now require new skills related to digital literacy and technology proficiency. While automation can increase efficiency, it may also lead to job displacement and digital exclusion, particularly for low- and medium-skilled positions. A previous EU-OSHA foresight study explored the new and emerging OSH risks associated with digitalisation. The report highlighted several risks, including cyber threats, psychological challenges associated with increased screen use, and various safety and health concerns arising from human-machine interfaces (European Agency for Safety and Health at Work, 2018)

3.5.3 Increased demand for green jobs and skills

▪ **Brief description, definition and relationship with climate change**

According to the ILO, green jobs are defined as “decent jobs that contribute to preserving or restoring the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency” (ILO, 2016). Examples of green jobs include solar panel installation, waste recycling, green construction, and manufacturing of electronic vehicles. The EU has undertaken several policy initiatives to drive green transitions aimed at achieving a climate neutral and sustainable economy. These initiatives include the European Green Deal (European Commission, 2019b), the Fit for 55 Package (Council of the EU, 2024c), and the Renewable Energy Directive (European Commission, 2023). These climate initiatives could have impacts on the labour market. Green jobs are expected to grow and demand higher skill levels than other jobs, although they only represent only a small share of total employment in the EU (European Commission, 2022b). Conversely, jobs that involve highly polluting activities in industries such as mining, manufacturing, and agriculture are expected to contract or undergo structural changes due to climate policies.

▪ **Relevance and potential implications for OSH and the world of work**

The growth of green jobs brings important implications for OSH and the broader world of work due to changes in job roles, workplace conditions, and skill requirements. One study reviewed new specific risks associated with green jobs, including exposure to new materials and technologies (e.g., nano-materials and related nano-technologies) with unknown long-term effects on human health, chemical

risk exposure and safety hazards due to isolated locations in the renewable energy sector, and green ergonomics risks in activities that involve non-traditional manual handling or prolonged incongruous postures (Vitale *et al.*, 2024). However, existing OSH standards may not fully address the risks associated with green technologies and materials. Regulatory frameworks need to evolve to ensure comprehensive protection for workers in green jobs. As traditional jobs in high-polluting industries phase out, workers may face job displacement and economic insecurity. Transitioning workers into green jobs will require significant investment in reskilling and upskilling programs to equip them with the necessary competencies for new roles. Lastly but not least, green jobs are not inherently good jobs in terms of working conditions, fair pay, worker satisfaction, worker participation, autonomy and wellbeing.

3.5.4 Increased migration

▪ Brief description, definition and relationship with climate change

Climate change is expected to render certain regions uninhabitable and is likely to induce migration both within countries (e.g. from more impacted to less impacted areas) and globally. The specific impacts of these changes in different places are difficult to predict, but the most widely cited estimate for environmental migrants suggests there could be as many as 200 million moving due to climate change by 2050 (Skeldon, 2025).

▪ Relevance and potential implications for OSH and the world of work

Migration within countries will create new populations of workers, some of whom will be particularly susceptible to OSH risks depending on their background and profession. Hargreaves found that migrants moving from lower-income to higher-income countries are particularly susceptible to workplace accidents as well as social determinants like poor housing and living conditions (Skeldon, 2025). These groups may also be undocumented and be at risk of exploitative forms of work or modern slavery, working in unregulated settings without proper safety management. Furthermore, migrant workers might face language barriers and have trouble understanding safety instructions.

3.5.5 Political short-sightedness

▪ Brief description, definition and relationship with climate change

Political short-sightedness (or myopia) can see governments prioritise short-term concerns over long-term issues, potentially neglecting emerging risks around the climate or its impact on worker safety and health. Amidst other prevalent issues such as the economy and global and geopolitical challenges, the public may have a limited appetite for the disruption entailed by some climate mitigation measures (Burns, Eckersley and Tobin, 2020; Genschel, Limberg and Seelkopf, 2025).

▪ Relevance and potential implications for OSH and the world of work

Short-sightedness could limit the implementation and scope of measures to prepare for or limit the impacts of climate change, at both company and society level. This could result in a failure to plan for future conditions, meaning there is a lack of the appropriate infrastructure, guidance or tools to properly deal with changing climate conditions. This lack of forward planning could, in turn, exacerbate occupational safety and health risks, as workplaces may be unprepared to protect workers from the evolving hazards associated with a changing climate.

3.5.6 Regulatory and policy changes

▪ Brief description, definition and relationship with climate change

The EU has implemented a series of regulations and policies to reduce greenhouse gas emissions and transition to a low-carbon, sustainable economy, in line with its climate goal of achieving net-zero by 2050 under the European Green Deal. So far, the Green Deal has set out over 100 regulations and directives concerning net-zero industry, emissions trading system, clean energy, circular economy, and sustainability reporting mandates (Council of the EU, 2024c).

Under the Green Deal, businesses must navigate an increased number of regulations and policies and adhere to new standards and requirements. Among them, corporate sustainability due diligence directive (CSRD) mandates large companies to identify and mitigate adverse impacts on human rights and the environment, and to put in place a climate transition plan in line with the Paris agreement on

climate change (Council of the EU, 2024b). The EU emission trading system (EU ETS), caps the total emissions allowed for sectors including electricity and heat generation, industrial manufacturing and aviation, and requires companies to purchase allowances for their emissions (European Commission, 2025). Another key component of the Green deal is the Circular Economy Action Plan, which sets regulations on product lifecycle management, encouraging businesses to adopt sustainable product frameworks (European Commission, 2019a).

- **Relevance and potential implications for OSH and the world of work**

These regulations and policies under the Green Deal force companies to invest in environmental sustainability, which entails working with regulators, environmental specialists, adoption of new technologies to track and report environmental impact, and training workers. Such compliance costs and operational changes may positively or negatively influence workers' safety and health. For example, organisational changes associated with green transition may cause financial pressures to companies, which leads them deprioritise and decrease investment in worker safety, uncertainty and job insecurity, and increased workload. On the other hand, cleaner work environments improve air quality and reduce potential risks for workers. Employers may also integrate OSH considerations into their sustainability strategies, and training programmes may enhance worker empowerment and satisfaction.

3.5.7 Social and wealth inequality

- **Brief description, definition and relationship with climate change**

Existing evidence suggests that climate change is disproportionately impacting poorer populations, people living in rural areas, women, and other marginalised groups due to their vulnerability to climate shocks, lack of access to resources, and other pre-existing disparities (Eastin, 2018; Paglialunga, Coveri and Zanfei, 2022). Research also indicates that climate changes and certain climate change policies widen income inequality (Cevik and Jalles, 2023; Bettarelli *et al.*, 2024). For example, policies aimed at reducing carbon emissions may lead to higher energy prices, disproportionately affecting low-income households that spend a larger share of their income on energy. Additionally, adverse employment effects caused by climate change can disproportionately impact workers in vulnerable industries, such as agriculture, fisheries, and tourism. Notably, these industries often employ significant portion of low-income workers, amplifying the economic challenges faced by these populations.

- **Relevance and potential implications for OSH and the world of work**

Populations susceptible to climate change, as well as those affected by specific climate change policies, are frequently employed in sectors and occupations with insufficient occupational safety and health protections and limited access to adaptive resources. The possible rise of precarious employment and job losses within these groups intensifies economic instability and increases psychological stress and mental health concerns. New approaches to tackle inequality in employment and a strengthened focus on OSH could mitigate this risk.

4 The scenarios

As described in sections 2.3 and 2.4, the following four scenarios were developed and refined by expert participants, working closely with the research team and EU-OSHA through a series of workshops and feedback sessions. Table 3 provides an overview of the scenarios, setting out their main characteristics and highlighting the ways in which certain key themes play out in each scenario. The four scenarios are then expanded upon in the narratives that follow.

Table 2. Key characteristics of each scenario

	 Scenario 1: Just transition Europe	 Scenario 2: OSH havens Europe	 Climate race Europe	 Grassroots hope Europe
	High OSH – High climate governance	High OSH – Low climate governance	Low OSH – High climate governance	Low OSH – Low climate governance
Summary	<i>Following extensive awareness campaigns, Europe has committed to tackling climate change while safeguarding all its workers.</i>	<i>Europe has attempted to adapt to changes in the climate through technology, a shift that has resulted in fewer but safer and healthier jobs.</i>	<i>In a last-minute scramble to tackle climate change, Europe is neglecting the safety and health of its workers.</i>	<i>Geopolitical instability and climate change have put Europe's employers and workers under huge pressure, but grassroots movements are bringing change.</i>
Climate action	The green transition is well underway, and real progress is being made in mitigating climate change.	Feeling that attempts to tackle climate change alone were futile, Europe has instead gone down the path of adaptation through technology, rather than mitigation of climate change. However, many areas are becoming less habitable due to floods, heat and cold.	After decades of slow progress on climate change, Europe is now rushing to avert its worst effects where possible and adapt where not.	Climate change has largely fallen off the agenda in a Europe depleted by war. The situation is now dire.

	Scenario 1: Just transition Europe	Scenario 2: OSH havens Europe	Scenario 3: Climate race Europe	Scenario 4: Grassroots hope Europe
OSH	OSH is a priority for governments and businesses and is seen as a vital element of a just transition.	Many jobs have been automated, and the economy is thriving. For those still in work, OSH protections are excellent.	Businesses have responded to government signals by prioritising a rapid green transition over all else, including their workers' OSH.	OSH is neglected in the formal economy, but a strong focus in many of the community-based roles that are appearing at the margins of the economy.
Geopolitics	Europe has formed strong partnerships with the many other nations who have committed to tackling climate change, and is using carbon border taxes to encourage its trading partners to adopt greener practices.	In the face of unchecked climate change, Europe is dependent on countries that supply the raw materials, components and technologies it needs to maintain its technologically advanced way of life.	Globally, efforts to mitigate climate change have been insufficient, triggering extensive migration to cooler areas such as northern and central Europe.	Europe has become increasingly fragmented. This has impeded coordinated action both within the EU and with partners outside of it.
Automation and technology	Europe makes extensive use of AI and other technologies, but in a human-centred way, and only where these systems create social value.	Europe has put its faith in science and technology to adapt to climate change. Many jobs have been automated, and Europe is dependent on AI for the necessities of life, from food to healthcare.	Technological progress is seen as necessary to tackle climate change. However, it is often cheaper to employ low-skilled workers than to implement expensive AI systems.	AI has developed fast, but with little regulation. The AI systems that businesses can afford tend to malfunction and cause harm to workers.
Migration	Migrant workers are well integrated, supported, and valued as necessary to meet workforce demand in key sectors.	Migration to Europe is minimal, as jobs are extremely hard to find and living conditions for those without a job are poor. However, Europe's most prestigious companies recruit	Northern Europe has absorbed millions of migrants from southern Europe and beyond. Low-skilled migrant workers are often treated as expendable.	There is very little migration. Europeans are reluctant or unable to relocate, and the continent is not attractive to migrants from the rest of the world.

	Scenario 1: Just transition Europe	Scenario 2: OSH havens Europe	Scenario 3: Climate race Europe	Scenario 4: Grassroots hope Europe
		talented workers from across the globe.		
Energy	There has been extensive investment in renewable energy, including solar and wind, as well as nuclear power.	Europe's focus has been on ensuring a highly reliable power supply. This has led to the widespread adoption of nuclear power. Fossil fuels remain in the mix.	Europe is scrambling to generate as much energy as possible from renewable sources. Nuclear energy is seen as too slow and expensive.	Use of fossil fuels to generate energy remains common. Renewable energy is not a priority.
Health	With a just and sustainable transition underway, the mood in Europe is hopeful, and the population's health is improving. AI is used judiciously for diagnosis, but human relationships are seen as key to good care.	The working population is doing well due to high levels of OSH. Those without jobs are increasingly unwell and stressed. Healthcare systems are struggling but are being propped up by widespread use of AI.	Across Europe, public services such as healthcare are under strain due to climate change and extensive migration.	In the wake of war and unrestrained climate change, acute illness, chronic conditions and disabilities are increasingly common. Resource shortages are impacting the quality and availability of healthcare.
Inequalities	Attempts have been made to ensure that nobody is left behind in the green transition, and social safety nets are excellent. However, some are less well off than they were, and others resent the state's "nannying".	European society is unequal. Valued workers thrive, while the rest of the population simply survives.	Most workers in this scenario work in intense and demanding conditions, but low-skilled workers and migrants in particular are under huge pressure to perform in jobs that can be dehumanising.	Geopolitical instability and rampant climate change have made most people's lives harder but particularly affected those less privileged. Grassroots communities are springing up that value equality, self-reliance and mutual respect over material wealth.

Scenario 1: Just transition Europe: united for a greener, safer future

A high climate governance, high OSH governance scenario



The year is 2050. Following extensive awareness campaigns in the early 2030s, Europe has decided to tackle the problem of climate change head-on while also protecting all its workers. Over the past 20 years, this green and just transition has been proceeding rapidly, and the continent's economy and labour market have undergone some radical shifts. Some citizens have struggled with the pace of change, but most are united behind the effort to create a safer and more sustainable Europe.

Europe in 2050

- **Europe has responded to climate change with ambitious, coordinated action.**

In the early 2030s, Europe saw a huge wave of popular support for environmentalism following a series of targeted and highly effective campaigns. European governments and institutions have met their climate neutrality targets, invested extensively in renewable (e.g. solar, wind and thermal) and green energy (e.g. nuclear), sustainable transport and green industry, put substantial carbon taxes and climate resilience taxes in place, and bankrolled major climate action incentives for businesses and the public to reduce their energy consumption. These actions are supported by initiatives and followed up by social partners and other interest groups.

- **Much of the rest of the world has followed suit, and considerable progress has been made in mitigating climate change.**

Europe has not been alone in committing to climate action: over the past couple of decades, many other regions, including some key global players, have similarly realised the seriousness of the climate situation. As a result, while the goals set in the Paris Agreement have not quite been met, a great deal of progress has been made. Europe has formed strong partnerships with nations that are also committed to mitigating climate change, and with countries rich in the critical raw materials needed for the green transition (e.g. lithium, cobalt and uranium). Its foreign policy is centred on enforcing carbon border taxes, which pressures non-compliant nations to adopt greener practices. At the same time, this pivot has diminished the geopolitical influence of fossil fuel-dependent nations.

- **Europeans have increasingly adopted more environmentally friendly lifestyles.**

Europeans' lifestyles have changed a great deal in the past 25 years. Thanks to intensive educational and awareness-raising campaigns, the population has increasingly come to accept the seriousness of the climate crisis. This shift in attitudes has enabled governments to introduce restrictions on personal energy and water consumption as well as per-capita "carbon credits" for polluting activities such as flights. Less carbon-intensive forms of transport, such as electric trains and buses, are incentivised through reduced fares. Diets too have changed: the population now eats mostly plants, and the consumption of alternative proteins, such as insects and lab-grown meat, is common. What's more, mass consumption has declined as Europeans are increasingly participating in the "sharing economy". Many resource-intensive products, such as cars, are now commonly owned by communities or small groups of households, or have been replaced by electric autonomous taxis.

- **Europe's cities are more sustainable.**

Green and blue urban spaces (such as city parks and waterfronts) are plentiful and easily accessible for citizens. They serve as essential, planned, and integrated infrastructure that provides three main benefits: environmental sustainability and biodiversity, proactive public health and wellbeing for all citizens, and climate resilience (e.g. management of heat and flooding, which remain a risk despite the strong progress made in mitigating climate change).

- **While most Europeans have supported these changes, not everybody is on board.**

A majority of the population has either welcomed or at least accepted the green transition, even despite higher price tags and higher taxes, leading to lower levels of consumption, holiday travel, etc. However, a minority resent the restriction of their personal freedoms and lifestyle choices. This small but vocal group stages protests and votes for parties that promise to turn back the green tide.

The world of work

- **The green transition has created, revolutionised, or dismantled whole sectors of the economy.**

Certain traditional industries, such as oil and gas, are practically a thing of the past; green industries, including renewable energy generation, climate-resilient construction, and sustainable transport, are booming, creating a new and vibrant economic landscape. New roles are emerging in areas like urban farming, biodiversity restoration, and sustainable circular construction and consumption. The demand for workers in healthcare and social care is also high, as an aging population requires support for longer.

- **Technology is used strategically and ethically.**

The Europe of 2050 is certainly not hostile to technology. Many of its industries now depend on hi-tech, often AI-powered systems, which use much less energy than they did twenty years ago. However, its deployment of these systems is deliberately restricted to cases where they have clear social value. For example, driverless electric cars and buses are both cleaner and safer than traditional human-driven petrol or diesel models, and they have also helped to ensure rural populations are able to easily access urban centres, where jobs are concentrated. On the other hand, the role of AI in front-line healthcare and social care, for example, is minimal: while AI is routinely used for diagnosis, when it comes to treatment, most Europeans feel that a computer is no substitute for a trusting relationship with a caring professional.

Scenario 1. Key sector spotlight: Agriculture

Over the past 25 years, agriculture has undergone a sustainability revolution. Urban and vertical farming are common, leading to reduced use of water and pesticides, while cultivation of climate-resilient varieties of fruits, vegetables and grains in permaculture farms is established practice. Livestock farming is now rare, as most Europeans get their protein from alternative sources, such as plant-based proteins, synthetic meat and insects. These shifts have changed the nature of the labour market in agriculture, creating new roles (including in cities) but also putting an end to some traditional jobs (such as dairy farming). The roles now available within the agricultural sector are varied, blending traditional manual labour with high-tech management involving monitoring, adjusting and refining the environments in which crops are grown (e.g. the controlled environments within vertical farms). This variety, along with the flexibility and autonomy afforded modern-day farmers, make agriculture an attractive career choice for hands-on, scientifically-minded workers.

- **Migration is helping to meet demand for workers in key sectors.**

Some of this demand for workers to fill often physically demanding roles has been met by migrants, who generally come to Europe for economic rather than climate reasons: as the European population ages, there is a real need for workers young and fit enough to take up jobs in sectors like construction and healthcare. Engineers and doctors are also in demand. These migrants are not an exploited labour force, but are afforded the same OSH protections and social services as local citizens. Proactive integration

policies, such as training in the local language and culture, prevent the widespread social tensions seen in other scenarios.

- **Despite the thought and care that has gone into the green transition, some workers and businesses have been left behind.**

A great deal of care has been taken to ensure that the green transition and climate action measures leave as few people as possible behind. For instance, governments and businesses have provided extensive opportunities for Europeans to reskill to join booming industries. Nevertheless, not all workers have been willing or able to retrain. Strong social safety nets mean that very few of these individuals are experiencing material hardship, but some have nevertheless struggled to adapt. Similarly, while governments have put considerable effort into designing smart climate regulation that does not disadvantage small and medium enterprises (SMEs) or create excessive red tape, some smaller enterprises have nonetheless struggled with the complexity of the regulatory landscape, and some larger conventional businesses have left Europe for less restrictive jurisdictions. The high taxation required to sustain the green transition, while accepted as necessary by most, has also proved burdensome for some companies.

Occupational safety and health

- **OSH is a top priority for all stakeholders.**

The green transition has been accompanied by a strong focus on safe, healthy work, supported by considered, evidence-based policy and regulation. OSH is a priority for governments, businesses and workers and is designed into jobs, especially in newer sectors such as urban farming and permaculture (sustainable, energy-efficient, low-waste food production) and the circular economy.

- **OSH management is proactive and joined up.**

OSH management is focused on eliminating or minimising both physical and psychosocial hazards. Waves of investment in OSH have created a new type of OSH: holistic safety, health and wellbeing strategies which are part of an organisation's overall objectives. Employers are conscious of the importance of organisational OSH management as first stage and in involving and connecting workers to the safety, health and wellbeing support and training they need at any given moment. Many are also employed in ensuring that there are no unintended risks in the green transition. For example, new "green" products and materials are subject to thorough lifecycle assessments to ensure that they have no unforeseen safety or health consequences for either workers or the population at large.

- **Traditional industries are safer than they once were.**

The construction sector exemplifies the shift towards safety in traditional industries. Building and construction is now done largely off-site through mass production of pre-fabricated parts for flooding- and heat-resilient buildings. This has reduced the risk of accidents and injuries on building sites – and has had the welcome side effect of attracting more women into a traditionally male-majority industry. Social norms and attitudes to safety in the industry have changed too. OSH is now a top priority, and is recognised as both a way to prevent harm to workers and a means of reducing business costs and increasing productivity in the long term. Supervisors see instilling a strong safety culture as one of the most important parts of their role, and risks are eliminated or reduced wherever possible, ideally at the design stage (e.g. by minimising dangerously noisy tasks or tasks involving repetitive manual handling).

- **However, some old risks remain.**

For example, retrofitting old houses with greener heating and cooling systems continues to bring workers into contact with asbestos; and large-scale "greening" projects, which aim to make cities more environmentally friendly, require labourers to work outside, sometimes in high temperatures or extreme weather conditions. Larger construction companies can afford to put time and money into reducing their workers' exposure to these risks, e.g. by minimising the time they spend outside in hot weather or supplying them with modern personal protective equipment (PPE) that is relatively comfortable to wear; but smaller enterprises and sole traders are often obliged to make do with bulky, hot, ineffective PPE that reduces mobility and increases the risk of overheating, especially in the summer months.

- **Overall, work is safer, healthier and more sustainable.**

There may still be issues to iron out, but overall, Europe has made steady progress towards better workplace safety and health over the past couple of decades. Increasingly, work promotes individuals' health and wellbeing rather than damaging them, and most workers feel their work is meaningful: after all, their labour is helping to create a more sustainable, greener and healthier Europe.

Scenario 1. Focus on vulnerable workers: Older people

While many older people have been great supporters of the green transition, in some ways, their lives have become harder because of it. Funding the transition has required some difficult economic choices to be made: pensions are less generous than they once were, and the average retirement age in Europe is now 71. The rapid pace of societal change has also been a struggle for some older people to adapt to. While governments and businesses have offered extensive opportunities to retrain to join thriving new green sectors, not everyone has been able or willing to take them up. Some older workers have preferred to leave the workforce altogether rather than start afresh in a new industry. Strong social safety nets mean that very few older people are living in poverty, but many are less well-off than their peers of thirty years ago.

Scenario 2: OSH havens Europe: adaptation through technology in a divided society

A low climate governance, high OSH governance scenario



The year is 2050. Having failed to stop the progress of climate change, Europe has attempted to adapt to it through rapid technological progress. Many jobs have been automated. The working-age citizens who do still work, however, are well-protected by extensive OSH management: keeping the skilled workforce safe and healthy is a priority for governments and businesses, especially at a time when the climate is increasingly affecting public health. As a result, the minority of Europeans with jobs are both wealthier and healthier than Europeans who are not in work, who survive on a (low) universal basic income. How sustainable is this divide between valued workers and the rest of the population?

Europe in 2050

- **Climate change has gone unchecked.**

Over the past two decades, the world has largely abandoned its efforts to mitigate climate change. With regret, Europe has followed suit – after all, what’s the use of trying to fight climate change alone, when the rest of the world is pumping out more greenhouse gases than ever? In some parts of Europe, scorching heat, frequent fires and floods, and increasing air pollution now keep most of the population cooped up inside for most of the year, living ever more restricted and sedentary lives.

- **In Europe and elsewhere, new technologies have been developing at rapid speed.**

Realising that the world was losing the battle against climate change, over the past 25 years, Europe has put its faith in science and technological progress to adapt to a new climate reality. The pace of technological change has been extremely fast, especially in AI. While power-hungry data centres have themselves contributed to worsening climate change, in other ways, this has been a positive shift. Technological developments have facilitated Europe’s adaptation to climate change, enabling Europeans to manage life during climate-related challenges. Additionally, AI has triggered a productivity boom that has boosted Europe’s economy, enabling the introduction of a universal basic income funded by increased tax revenues.

- **These new technologies have helped Europe adapt to the climate change it failed to mitigate – although vulnerabilities remain.**

For instance, most food is now grown in AI-controlled vertical farms, and AI “assistant practitioners” have propped up Europe’s hard-pressed healthcare systems, which have struggled to cope with two pandemics in the past decade, the appearance of new infectious diseases similar to dengue fever, and plummeting mental health in the population due to climate anxiety and increasingly physically and mentally unhealthy environments. Europe has increasingly relied on AI and technology for many of its daily needs; however, this dependence has also led to greater exposure to potential cyberattacks. Its population too is vulnerable: the stress of rapid societal shifts, the hostile external environment, and increasing ill health have all taken their toll.

The world of work

- **Climate change and AI have transformed the economy.**

Automation and the use of AI is now so capable, and so inexpensive in comparison to humans, that many human workers have been replaced by machines. Many repetitive and dangerous jobs, such as factory floor work and hazardous maintenance tasks, have been automated. Despite the technological progress, however, not enough effort has gone into preventing further escalation of climate change, which is severely impacting work and day to day life. – but so have many creative and fulfilling roles, such as journalism, graphic design, and law. This has led to a society-wide crisis of meaning: for many, it is a struggle to find purpose in the absence of fulfilling work.

- **The majority of the working-age population do not work, instead receiving a universal basic income.**

To tackle high rates of unemployment (driven by increasing automation) and inactivity (due to an increasingly fragile and chronically ill population), Europe has introduced a low universal basic income that provides all citizens with just enough to make ends meet. Some of the recipients of the basic income are content with their lives, spending time dedicating themselves to fulfilling pastimes, such as family and art. Others, however, are frustrated and restless, and crime and anti-social behaviour are on the rise.

- **However, certain highly skilled workers remain in huge demand.**

The remaining workforce is motivated, highly skilled, well protected and valued. Demand is focused on two key areas: technical expertise and human interpersonal skills. Talented engineers and technicians are needed to design, build, and maintain complex, climate-resilient infrastructure. This includes roles like AI systems engineers for vertical farms, and robotics supervisors overseeing large-scale, automated construction of new AI-designed cities. At the same time, jobs requiring human empathy and interaction remain essential: individuals with excellent interpersonal skills remain in demand in sectors like advanced healthcare, social care, and entertainment, where the human touch is still seen as desirable.

Scenario 2. Key sector spotlight: Engineering

In a Europe that has gone all-in on technological progress, highly skilled engineers are extremely sought after. Talented systems engineers are particularly prized for their ability to orchestrate the complex AI systems in use in almost every sector, from farming to construction and healthcare. These systems are largely self-running but still require humans to oversee them and fix any snags that the systems themselves cannot. Success in this role requires both an in-depth understanding of how these systems work and an ability to deal with huge complexity. Due to persistent gender imbalances in attitudes to Science, Technology, Engineering, and Mathematics (STEM) subjects and take-up of STEM training, a majority of engineers in these roles are male. Talented engineers have their pick of a range of highly flexible, extremely well paid, very attractive jobs in which their health, safety and job satisfaction are paramount.

Occupational safety and health

- **Valued workers enjoy excellent workplace protections.**

Europe's labour force may be skilled and motivated, but it is also drawn from a population that, for the reasons described above, is increasingly sick and stressed. Governments and the private sector have recognised the importance of supporting workers' health and wellbeing to retain this highly valuable, but also vulnerable, workforce. All jobs are now "safe by design", with OSH considerations a priority.

Extensive OSH practices and supportive regulation has been implemented well, social partner relations are strong, and enforcement is effective, lowering rates of work-related illness and accidents. Almost all repetitive tasks are now taken on by machines, the skilled workforce is given a great deal of autonomy in their work, and working hours are strictly limited. The few remaining manual workers make frequent use of exoskeletons and hi-tech PPE.

- **They also receive high-quality, data-driven private healthcare.**

Companies offer extensive wellbeing programmes and mental health support that attempts to plug the gaps in state healthcare, which, despite having received a great deal of investment, is focused on tackling emergencies and acute illness. These AI-supported programmes collect and analyse a wealth of data on workers' health, enabling early and tailored intervention to prevent illness – but at a cost to individual privacy.

- **However, these OSH protections do not extend to Europe's supply chains.**

Europe is now heavily dependent on countries that supply the rare earth minerals, proprietary technologies, and advanced components needed to support the continent's hi-tech way of life. As a consequence, it has little ability to influence these countries' OSH standards. What's more, Europe's focus on securing a reliable (not necessarily renewable) energy supply has led to the widespread adoption of nuclear power, which depends on uranium sourced from unregulated mining in developing countries. As a result, OSH standards are enforced in Europe but often neglected in supply chains.

- **Companies of different sizes have responded differently to the push for better OSH.**

SMEs initially struggled to keep up with the increasing volume of OSH regulation. In the 2030s, however, OSH AI platforms designed for SMEs were introduced to reduce the financial and bureaucratic burden of regulatory compliance. In larger companies, OSH management is still an in-house affair. To attract and retain the very best talent, some companies have developed radical new health and wellbeing programmes that go beyond the traditional boundaries of the workplace. For instance, certain major companies are starting to create huge, indoor, self-contained "villages" for workers and their families. These "villages" offer workers and their families state-of-the-art private healthcare, high-quality company-run schools, a vast array of entertainment options, excellent security, a ready-made community, and housing in a perfectly climate-controlled environment, where the temperature is pleasant all year round, the air is pure, and UV radiation is blocked.

- **For valued workers, life is good – but resentment of the professional elite is growing.**

There is an increasingly large divide between elite workers, who enjoy fulfilling work, high job satisfaction and excellent living and working conditions, and the rest of the population, who are largely surviving rather than thriving. This division is creating simmering tensions that both fuel support for radical, anarchic, egalitarian political movements and occasionally lead to physical conflicts, such as robberies and assaults.

Scenario 2. Focus on vulnerable workers: Informal workers

In this scenario, the majority of the working-age population is unemployed and receiving a universal basic income. Some are content with this state of affairs, but others decide to "top up" their income by working informally. Most of these people work part-time, offering a wide variety of services, including child and elderly care, DIY support and music lessons, more cheaply than the formal economy can. Some have even set up networks of informal providers who businesses can (informally) hire. Although technically illegal, for many, this highly flexible and often fulfilling work brings both a little extra cash and a sense of purpose. However, it is also conducted with no oversight whatsoever from the authorities, so OSH is down to each individual worker to consider. This works well for some, but has also led to an increasing number of accidents for which clients, rather than informal providers, have been held liable.

Scenario 3: Climate race Europe: rushed climate action at the expense of worker safety

A high climate governance, low OSH governance scenario



The year is 2050. After decades of slow progress on climate change, in the 2040s, severe climate crises finally opened Europe's eyes to the need to tackle climate change. Faced with mounting pressure and constrained by time, Europe has accelerated its transition to environmental sustainability. Yet in the rush to adapt, a critical dimension has been overlooked—worker health and safety. As new policies, technologies, and infrastructures are rapidly deployed, OSH considerations are falling through the cracks, leaving many workers exposed to unanticipated risks in a fast-changing environment.

Europe in 2050

- **Europe started to take action on climate change too late.**

Despite widespread attention and policy commitments throughout the 2020s and 2030s, these efforts never translated into meaningful climate action, and meaningful mitigation efforts at both national and international levels remained fragmented and insufficient. It was only in the 2040s that Europe finally shifted course, but only after a series of terrible catastrophes happened, from floods that destroyed whole towns to wildfires raging over hundreds of square miles, in which thousands of Europeans died, and millions lost their homes or migrated to safer areas. Since then, European governments and supra-national organisations have been pulling every lever to help the continent not just adapt to climate change but fight it. With very little social dialogue, European governments have enacted aggressive, legally binding policies to broker a rapid green transition, including substantial carbon taxes, environmental regulations, and subsidies for green industries to scale up their production and exports. The goal is to achieve climate targets at any cost, and speed is prioritised over all other considerations.

- **Millions of southern Europeans have migrated north, to more liveable areas of Europe.**

While some efforts were made in southern Europe to adapt to the worst effects of climate change, the relatively temperate climate of northern Europe came to appear increasingly attractive. Migration from southern to central and northern Europe to escape the worst effects of climate change began slowly, as a small number of well-off, cosmopolitan southern Europeans decided to move north for a better lifestyle. Now, in 2050, these pioneers have been followed by millions of their compatriots. There is huge demand for good jobs, decent housing, healthcare and school places in more liveable areas of Europe. Urban centres are expanding and encroaching on green space, and there is an urgent need for upgraded infrastructure.

The world of work

- **The new push to mitigate and adapt to climate change has led to an explosion in poorly regulated green industries.**

The construction sector is booming with projects focused on climate-resilient infrastructure (e.g. building seawalls, constructing flood barriers, and retrofitting existing homes). In agriculture, the focus has moved to sustainable food production, with a rapid increase in urban vertical farms and large-scale permaculture initiatives designed to withstand droughts and high temperatures. Manufacturing has also been transformed, with a new focus on producing renewable energy components like solar panels and wind turbine blades, as well as developing new “green” materials. Waste management and recycling have become major growth areas due to the push for a circular economy.

- **Migration of qualified workers has had dramatic effects on Europe's economy.**

Competition for secure, well-paid jobs in liveable areas is fierce, as the pool of highly skilled workers in these areas has vastly increased. Many qualified workers have left Southern Europe, which is now experiencing economic stagnation. At the same time, an influx of skilled workers has made companies in northern and central Europe more diverse and innovative. Given Europe's newfound resolve to tackle the changing climate, much of this innovation is directed at developing technological “fixes” for climate change, such as mechanisms to remove greenhouse gases from the atmosphere. Indeed, technological progress is seen as part of the solution, and there has been a push to develop energy-efficient AI systems that could help to fight climate change.

- **This shift has created a huge number of jobs for lower-skilled workers, but working conditions are poor.**

In northern Europe, demand for manual labour is exceptionally high. The rapid, crisis-driven green transition requires extensive physical construction and material handling—work that companies have no economic incentive to automate. Due to mass migration, there is a massive, readily available supply of workers, making it significantly cheaper to employ human labour for tasks like installing infrastructure and manual recycling than to invest in complex AI and robotics systems. This large, inexpensive workforce is the primary fuel for the transition. However, this increased demand has failed to translate into better pay or working conditions for lower-skilled workers, because there is also a massively increased supply of workers (from Europe and beyond) wanting to live and work in the relatively temperate climate of northern Europe. In fact, the opposite has happened: downward pressure on both wages and working conditions is intense.

Scenario 3. Key sector spotlight: Energy

Transforming electricity generation has been a key element of Europe's recent push to tackle climate change. Up until the late 2040s, fossil fuels were still in relatively common use across the continent, but Europe is now scrambling to increase its renewable energy generation capacity and scrap fossil fuels. Nuclear energy is not seen as an acceptable alternative: it is considered too slow and expensive to implement, and the lack of OSH governance means there is no trust in Europe's ability to safely manage its long-term risks. The shift to renewable energy is creating many jobs, but many of these are low-quality roles that involve working long hours for low pay to achieve excessively demanding targets, facing hazards caused by unsafe working environments and poor-quality materials, and joining a saturated workforce in which individual workers are seen as replaceable.

Occupational safety and health

- **OSH has been deprioritised.**

With fighting climate change at the top of Europe's agenda, occupational safety and health is not a priority for governments or businesses. Governments are focused on legislating and regulating to promote the green transition, while businesses are pouring their limited resources into complying with sustainability requirements. As a result, many former OSH specialists in industry are now sustainability specialists, with a broad remit that might technically include workplace health and safety but is predominantly focused on environmental considerations.

- **Not all “green” jobs are not good jobs.**

There has been a real push to introduce more climate-resilient approaches within established industries, such as circular economy models in waste management or flooding-resistant designs in construction. However, these jobs remain as demanding, stressful and hazardous as jobs that are less “green”. Indeed, rapid deployment of more climate-friendly technologies often involves poorly designed and implemented projects, with less attention given to OSH management and less budget for prevention

support (training, PPE etc). This is leading to frequent accidents and product failures that are hazardous to both workers and the public, such as fires caused by low-quality solar panels.

- **Regulation intended to promote sustainability has had unintended consequences for workers and the public.**

There has been a flood of well-meaning but ill-considered regulation, with no social dialogue or worker involvement, obliging businesses to use “sustainable” technologies and “green” materials, which has had several unfortunate consequences. One of these is that many small businesses, unable to keep up with the pace of regulatory change, have either shut down or begun operating illegally. As a result of this, informal work is booming, the quality of both workmanship and products tends to be poor, and workers are at increased risk of accidents and injuries. Another consequence of the recent raft of climate regulation is that new “green” products and materials, such as biodegradable plastics and biopesticides, are coming to market without sufficient testing. It is increasingly coming to light that some of these materials and products are harmful to the health of both workers and the general public.

- **Manual workers are poorly protected.**

Workers are poorly protected in general, including in new sectors such as geo-engineering where trade unions are not yet well established. However, front-line workers and manual labourers are bearing the brunt of this deprioritisation of workplace safety and health. For example, emergency responders are under huge stress in the face of increasingly frequent fires and floods, which they are obliged to tackle without adequate support for their physical or mental health. Workers in other industries too are under pressure to work fast to meet enormous demand, but often without adequate protections. Wearable tech is commonly used to track workers' movements or output to ensure they are working at peak efficiency, rather than to monitor their health or provide support.

- **Knowledge workers are also under pressure.**

In some ways, higher-skilled workers are in a better position than lower-skilled manual workers: they are at least not expected to risk their lives at work. However, they are still under considerable stress. As a consequence of both the impressive capabilities of AI and the increased concentration of highly-skilled professionals within the liveable areas of Europe, the market for highly-skilled jobs in northern Europe is saturated. This means employers have less of an incentive to compete for workers by offering more secure, healthy or flexible working environments: after all, if one worker can't take the strain of a high-pressure environment, a dozen more will soon be queueing up to take their place. As a result, burnout, overworking, and mental and musculoskeletal problems are common among knowledge workers.

- **Accidents and ill health are on the rise, and productivity is plummeting.**

Poor OSH regulation and enforcement have increased workplace accidents and illnesses. Workers are often exposed to new risks without proper training or equipment, resulting in more injuries, chemical exposures, and stress. Although migrant labour has filled staffing gaps, this substitution has not translated into sustained productivity. Many new workers enter unsafe, unsupported roles, particularly in high-risk sectors like construction and waste management, where climate targets drive rushed, hazardous practices. These conditions have led to lower morale, greater absenteeism, and declining health. Productivity is faltering—not because of a lack of labour, but because the conditions under which people work are increasingly unsustainable.

Scenario 3. Focus on vulnerable workers: Migrants

In this scenario, northern Europe has seen an influx of migrants from southern Europe and the rest of the world. Some of these migrants are talented, highly qualified workers aiming to compete for prestigious but pressured high-skill knowledge work. However, the vast majority are lower-skilled workers drawn to northern Europe for both its temperate climate and its tight labour market. While finding a job is relatively easy, much of the manual work on offer is poorly paid, sometimes hazardous and often physically and mentally stressful. What's more, language barriers and lack of awareness make it more difficult for migrants to access the few OSH services, such as training, that do exist.

Scenario 4: Grassroots hope Europe: geopolitical instability, neglect, and the rise of people power

A low climate governance, low OSH governance scenario



The year is 2050. Long years of geopolitical instability have exhausted Europe and its resources, leading to chronic neglect of both climate change and OSH. Both businesses and workers are under enormous stress, and occupational safety and health considerations have been neglected. Could grassroots movements and collectives that prioritise human wellbeing, including in the workplace, point the way forward?

Europe in 2050

- **Europe has been exhausted by years of geopolitical instability**

Long-running geopolitical instability and war has depleted Europe, consuming much of its attention and resources. National economies are struggling, and relations between European countries are strained, making coordinated action on major issues difficult. In areas of Europe that still have functioning democracies, politics tends to be focused on the short-term, with frequent changes of government and political direction; across the continent, Europeans' faith in their institutions and political leaders is at an all-time low.

- **In these conditions, climate change has gone unchecked.**

Making real progress in either mitigating or adapting to climate change has been extremely challenging. Lack of political will to act has been compounded by the need to maintain Europe's defence and war machine, which still relies on fossil fuels (e.g. to fuel military aircraft). As a result, climate sustainability considerations have largely fallen by the wayside: for instance, taking environmental, social and governance (ESG) concerns into account when investing is a thing of the past. Consequently, the climate situation is now very difficult, particularly in southern Europe, where temperatures in the summer months are dangerously hot and where the risk of extreme weather events is highest.

- **Despite the seriousness of the climate situation, there has been very little migration within Europe.**

While environmental pressures—such as heatwaves, water scarcity, and agricultural disruption—have intensified in southern regions, many Europeans are reluctant or unable to relocate. Rising geopolitical tensions and fragmented trust between EU member states have led to tighter border controls and a gradual erosion of the Schengen framework. In any case, there is little appetite among Europeans to move north or east, as this would be to move closer to the war and to Europe's threatened borders.

- **The population's health is in decline.**

Natural disasters and pandemics now occur with alarming regularity, and responses to them are often reliant on civilian volunteers and only partially successful. As Europe's air becomes more polluted and temperatures soar, there are many preventable deaths from both chronic and acute illness (especially among the elderly). A lack of planning or resources for anything other than the continent's most pressing needs is also having negative effects on the population's health: for instance, old nuclear plants have been decommissioned without adequate funding or oversight, creating long-term risks for local populations.

- **The outlook seems bleak, but there are reasons for hope.**

Across Europe, grassroots movements are emerging that aim to rebuild a just society, often by turning away from materialism and consumerist lifestyles. These groups are formed by idealistic individuals, often young people, who are determined to rebuild and organise outside failed state-corporate structures. If change comes, it seems likely to start with these individuals and the communities they are forming, rather than with governments and large organisations, which have squandered their political capital.

The world of work

- **In the wake of the geopolitical instability, Europe's economy is slow.**

Growth and wages are low, and unemployment and economic inactivity are high. The workforce is increasingly unwell, stressed and, in some cases, suffering the ill effects (both mental and physical) of war. Climate-related disruptions are also getting worse and worse, causing problems such as frequent disruption to supply chains and damage to critical infrastructure. These are both a source of huge anxiety for the population and a drag on the economy. The formal labour market is harsh, with jobs being scarce and highly insecure.

- **Technology is unreliable and sometimes dangerous.**

Despite the strict regulatory frameworks that governed AI development in the 2020s, Europe significantly relaxed its oversight in the 2030s and 2040s to enable rapid deployment of AI and emerging technologies in support of wartime operations. As a consequence, AI developed quickly but with little oversight. With limited resources and mounting pressure to remain competitive, many European businesses have turned to low-cost, untested AI systems to automate processes and boost productivity. These systems often malfunction in ways that harm workers and the population in general. For instance, under-tested and poorly maintained agricultural drones often over-apply fertiliser and pesticides to crops, leading to environmental contamination and health risks for nearby communities. Similar issues are emerging across sectors, where AI-driven tools are being used to monitor and manage workers without adequate consideration of OSH implications.

- **Some workers prefer informal roles in their local communities to formal positions.**

An unexpected surge in grassroots collectives and community-based economies has created a number of localised and resilient, but informal, jobs. These roles focus on immediate community needs and survival. Examples include “repair and repurpose” technicians (fixing critical infrastructure and extending the life of goods), community medics (offering basic, peer-to-peer healthcare outside of strained public systems), local food producers (managing small-scale urban gardens or collective farms), and sharing economy coordinators (overseeing the sharing and exchange of goods and services). Social media plays a key role in coordinating these informal community workers. While these roles lack traditional benefits and security, they offer a sense of community, purpose, and autonomy that is entirely absent from the slow, formal economy. In an environment of resource scarcity, the continent has become fertile ground for this small-scale, bottom-up innovation and local resilience.

Scenario 4. Key sector spotlight: Manufacturing

Over the past decade, Europe has increased its industrial and defence capacity. As a result of this, manufacturing is one of the few sectors that are still growing and creating jobs. These jobs are generally demanding, involving long hours, shift work and considerable pressure to meet targets; however, they do provide comparative stability and benefits such as pensions. In most factories, humans work alongside robots. While this has made production lines more efficient, warehouse robots have been known to dangerously malfunction, sometimes harming workers as well as setting back business operations.

Occupational safety and health

- **OSH has dropped off the agenda.**

Distracted by other priorities and facing resource shortages, Europe's governments and businesses have neglected OSH. There has been little new occupational safety regulation for the past few decades, and existing regulation is rarely enforced. Some businesses are now so frequently affected by natural disasters that they have become uninsurable or face extortionate premiums, with the result that some employers and workers are no longer covered by liability insurance.

- **Working conditions are poor.**

The workforce is under pressure to do more with less, especially given the need to keep Europe battle-ready. As a result, most working environments are extremely stressful and sometimes dangerous: injuries, accidents and deaths at work are relatively common among manual workers. As unemployment is high, workers have little bargaining power. While employed workers technically still have rights, a pervading sense of insecurity at work makes most workers unwilling to speak out about unsafe conditions for fear of coming into conflict with their boss and potentially losing their job. At the same time, businesses have little incentive to attract potential workers by offering better working conditions (especially for lower-skilled workers, who are particularly at risk of being replaced by either other workers or AI).

- **However, there are some bright spots.**

"People power" is on the rise, and this phenomenon is starting to spill over into the world of work. For instance, small cooperative organisations have begun to appear across Europe that value their workers' health and wellbeing. These organisations tend to have relatively flat hierarchies, an ethos of mutual support and respect, and a focus on flexibility, autonomy and purpose for workers. Some commentators are even predicting a resurgence of trade unions and workers' rights movements, as what was an increasingly individualistic continent rediscovers its collectivist spirit.

Scenario 4. Focus on vulnerable workers: Disabled workers

In the wake of both geopolitical instability and unchecked climate change, the health of the population has suffered, and many more people now have physical or mental health issues or disabilities than was the case 20 years ago. In theory, disabled people are still protected against discrimination at work, but in practice, their needs are often not taken into account and employers tend to be unwilling to provide reasonable adjustments. This has made work inaccessible to some and detrimental to the health of others. Many disabled people have fallen out of the workforce entirely and are supported by their families, friends or community groups. As a result of this situation, disabled people are far less likely to be in work than those without disabilities and are far more likely to be living in poverty.

5 Cross-cutting themes

Across the four scenarios developed in this project, several recurring themes emerged highlighting shared challenges, opportunities, and strategic priorities at the intersection of climate action and OSH. While these scenarios offer insights into possible futures, they represent only a small subset of the many pathways that could unfold. The themes outlined below are therefore not exhaustive, but they reflect consistent patterns that surfaced through both the literature and the stakeholder perspectives we engaged with.

5.1 Climate action is necessary, but not without risk

Ensuring Europe's resilience to climate change will require decisive measures, both to adapt to its impacts and to prevent further escalation of the situation. Across all scenarios, climate action can be seen as a force of economic transformation. As Europe phases out fossil fuels and embraces renewable energy, sustainable construction, and circular economy models, entire sectors are being dismantled, reimagined, or created from scratch. This shift will generate new opportunities in green industries, from vertical farming and biodiversity restoration to AI-powered climate-resilient infrastructure. If these labour-market transitions are not managed effectively and proactively, Europe risks losing its global competitiveness and descending into a deep economic crisis. Furthermore, there is also the risk of leaving some workers behind. Older workers, low-skilled labourers, and those in declining sectors might struggle to retrain or transition, especially when support systems are fragmented or underfunded. The green transition is not just a technical challenge, it is a social one too. Without inclusive labour policies and proactive reskilling strategies, climate action risks deepening inequalities and creating pockets of economic exclusion.

5.2 A healthy workforce is key to achieve the green transition

Throughout the scenario development process, participants consistently stressed that climate policy without OSH is fundamentally unrealistic. In scenarios where climate governance is strong but OSH governance is weak (Scenario 3), worker safety becomes collateral damage in the race to decarbonise. Governments and businesses, under pressure to meet climate targets might prioritise speed and scale over safety. This leads to the rapid deployment of new technologies and materials—some of which are poorly tested or inadequately regulated. Workers are exposed to new hazards, from toxic biopesticides and overheating PPE to unsafe retrofitting practices and extreme outdoor conditions. Informal work also surges in response to regulatory overload, leaving many without any OSH protections at all. Healthy and safe workers are essential to implementing climate adaptation measures, responding to future crises, and managing the long-term impacts of environmental change. The message is clear: climate action that neglects OSH not only harms workers—it undermines the very resilience it seeks to build. Conversely, advancements on the climate governance side directly support OSH by creating a more hospitable work environment and reduced exposure to environmental harms, supporting a healthier and more productive workforce unburdened by climate-related acute and chronic disease.

5.3 Technology introduces both challenges and opportunities

The advance of AI and digital systems is present in all the scenarios, but how Europe chooses to harness, or restrain, these tools vary dramatically. In some futures, technology can be deployed carefully, its use weighed against environmental costs and social value. In these cases, AI can be a partner in the green transition, but only when it truly serves the public good. In other scenarios, the rush to innovate can outpace regulation, leading to a patchwork of expensive, unreliable systems that sometimes do more harm than good. Where climate action lags but OSH is prioritised, technology can become a shield, keeping workers safe in an increasingly hostile environment. Yet, even in the most climate-focused scenarios, public wariness about surveillance and autonomy can limit how much AI is embraced in the workplace, revealing deep-seated anxieties about the future of work and privacy.

5.4 Climate change intensifies social and economic divides

Participants and findings from the literature suggest that, unfortunately, social and wealth disparities might widen in the future. Even in the best-case scenarios, the green transition might leave some vulnerable workers behind, fuelling resentment and social tension. In the worst-case scenario,

polarisation may deepen, and the divide between the secure and the precarious is also likely to widen. Strong OSH protections can support many workers, but those outside formal employment may still face hazardous conditions. In most futures, the divide between high- and low-skilled workers can become stark, with opportunity and protection reserved only for the few. Migration, whether driven by climate, conflict, or economic need, adds further pressure to labour markets and public services. Without strong integration policies, displaced workers risk exclusion and exploitation. These divides fuel resentment, polarisation, and social unrest.

5.5 The tension between public and private responsibility persists

The question of who is responsible for workers' health, safety and wellbeing takes on new urgency. The scenarios demonstrate that robust OSH is best achieved through a coordinated, multi-level structure of accountability. In some imagined futures, governments may step up, wielding the tools of law and policy to drive both climate action and worker protection, compelling employers to follow suit. Elsewhere, the absence of strong top-down governance can leave employers to chart their own course, sometimes rising to the challenge with comprehensive support for workers, but just as often prioritising short-term survival over long-term wellbeing. The tension between public and private responsibility is present in most scenarios, especially when the resources are stretched thin. In situations where governmental coordination and investment are insufficient, workers face increased risks, while safety and sustainability practices may be deprioritised as employers focus on maintaining operations. In the scenarios where neither the government nor the employers are willing to take responsibility over health and safety, the workers themselves might have to self-organise. The best case for Europe is one where government, employers, and workers all actively embrace their responsibility to secure a safe and stable future.

6 Shared Vision for 2050

The Shared Vision for 2050 sets out a picture of **what a safe, healthy, and sustainable world of work would ideally look like in Europe** by the middle of the century. This is an ambitious, and in many ways idealistic, vision. Nevertheless, it is helpful to visualise what one wants to achieve to set the road ahead. Achieving this vision, however, will not happen without encountering trade-offs, barriers and difficult decisions, which will be discussed in the next chapter.

This vision builds on the insights gained from the scenario development and analysis of cross-cutting themes. It was refined and validated through stakeholder consultation during the second online workshop. The vision outlines a common direction based on collective values and long-term goals, providing a guiding framework for future actions and policy recommendations.

As summarised in Figure 4, the Shared Vision for 2050 imagines a future where climate action and OSH governance are both prioritised to create inclusive, resilient, and ethically governed workplaces that protect all workers while driving sustainable transformation across sectors.

Figure 4. Key elements of the Shared Vision for 2050

Just Transition

Coordinated action between OSH and climate strategies

Safety by design in green technologies and practices

Ongoing monitoring and evaluation to track emerging risks

Adaptive, pragmatic and inclusive regulation

Focus on the affected groups

Human-centred innovation and sustainable technology

6.1 Just Transition

By 2050, Europe has successfully realised a Just Transition—one that places equal emphasis on climate action and worker health and safety. This vision is aligned with Europe’s formal commitment to substantially cut greenhouse gas emissions by 2030 and achieve climate neutrality by 2050 (European Parliament, 2020). Furthermore, it actively incorporates the Just Transition Mechanism (European Commission, 2020), a key EU framework designed to ensure that the shift to a low-carbon economy is fair, inclusive, and supportive of the regions, sectors, and communities most affected by the transition.

Europe has come to recognise that a **healthy workforce is not just beneficial to society, but a strategic necessity**. Workers’ health, safety and wellbeing are foundational to resilience. In this vision for 2050 worker health and safety are embedded in every stage of the transition, from policy design and infrastructure planning to technological deployment and workplace practice, making Europe’s green future both resilient and inclusive.

6.2 Coordinated action between OSH and climate strategies

By 2050, coordinated action across all key stakeholder groups—policymakers, employers, workers, researchers, and intermediary bodies—is a defining feature of Europe’s approach to climate and OSH. This collaborative model was widely recognised by participants as one of the most **critical enablers of the vision**.

Collaboration takes place at multiple levels. Within governments, departments work across mandates to align OSH and climate objectives. Between institutions, partnerships flourish—linking e.g. public agencies with social partners (employers’ organisations and trade unions), and civil society organisations. Cross-sector engagement is routine, with OSH professionals working alongside architects, engineers, climate scientists, and digital innovators to co-design safe and sustainable solutions.

Importantly, this is not a one-way integration. The OSH community actively reaches **beyond its traditional boundaries to engage with actors in the climate and sustainability domains**. At the same time, climate experts and sustainability leaders embed OSH into their strategies, recognising that **worker health, safety and wellbeing are essential to achieving environmental goals**. This reciprocal relationship ensures that both agendas are advanced in tandem.

Formal **platforms for dialogue** have been established to support this coordination—ranging from interdisciplinary research consortia to stakeholder roundtables and joint foresight initiatives. These spaces foster mutual understanding, shared learning, and the co-creation of policies and practices that are effective for both climate and OSH challenges.

6.3 Safety by design in green technologies and practices

By 2050, safety is no longer treated as an afterthought or a compliance box to tick at the end of a project. Instead, OSH is embedded from the very beginning—at the design stage—of all green technologies, infrastructure, and sustainability-oriented activities. This shift reflects one of the most important lessons from the scenario work: prevention must be proactive, not reactive.

“**Safety by design**” means that OSH is considered as a core design parameter, alongside cost, performance, and environmental impact. Whether developing new renewable energy systems, retrofitting buildings for climate resilience, or deploying AI-driven tools in the workplace, OSH is integrated into the planning, development, and implementation phases. This approach ensures that risks are anticipated and mitigated early, rather than addressed only after harm has occurred.

Organisations and workplaces have successfully adapted to climate and technological change by embedding OSH into their sustainability strategies. This required not only technical foresight, but also **cultural change**—recognising that worker wellbeing is a fundamental component of sustainable development.

6.4 On-going monitoring and evaluation to track emerging risks

By 2050, continuous, up-to-date research and monitoring has become standard practice across Europe for **identifying emerging risks and ensuring that products, technologies, and processes are safe before widespread adoption**. This proactive approach to OSH allows policymakers, social partners, and researchers to anticipate hazards early and intervene before too much harm occurs.

Robust monitoring systems are well-established to evaluate the effectiveness of OSH policies and their alignment with broader sustainability goals. **Clear indicators** are developed to track progress, including toxicovigilance systems that monitors health risks from chemical exposure in real time. These systems enable timely responses to new threats and support evidence-based decision-making.

Importantly, **OSH metrics are also aligned with environmental frameworks**, as Europe recognised that worker health and environmental sustainability are deeply interconnected. Indicators are designed to capture both short-term effects and long-term trends, ensuring that OSH remained adaptive and relevant.

6.5 Adaptive, pragmatic and inclusive regulations

By 2050, regulations and policies across Europe are firmly grounded in evidence, designed to be pragmatic, and continuously adapted in response to new data and emerging risks. They are no longer static instruments but **living frameworks—regularly reviewed and refined through ongoing monitoring and stakeholder feedback**. This ensures that regulatory systems remain fit for purpose in a fast-changing world shaped by climate pressures, technological disruption, and evolving forms of work.

To maintain public trust and support, regulations are designed to be efficient and outcome-oriented. They are guided by principles such as the Pareto 80/20 Rule (Dunford *et al.*, 2014)—the idea that roughly 80% of outcomes stem from 20% of causes. This approach helps policymakers focus on the “vital few” issues that deliver the greatest and most visible benefits for workers, businesses, and society. By targeting high-impact areas, regulation becomes not only more effective but also more persuasive to those who may otherwise view it as burdensome.

Regulatory frameworks now reflect the evolving legal and social definitions of “worker” and “employer” to account for the diverse realities of modern employment, including self-employed individuals, platform workers, freelancers, and others in non-traditional or precarious roles. This inclusive approach not only ensures that all workers—regardless of contract type—are afforded appropriate protections in this fast-changing times but also provides greater clarity and consistency for employers navigating complex labour arrangements.

6.6 Focus on the affected groups

By 2050, Europe ensures that **vulnerable workers and organisations**, such as migrant, gig and informal economy workers, and SMEs, are actively supported through inclusive policies and tailored communication strategies. These measures are designed to prevent social division and systematic neglect, ensuring that no one is left behind in the green transition.

The approach to vulnerability is guided by the capability approach, a framework developed by economist Amartya Sen (Dang, 2014). Rather than focusing solely on income or material resources, this model emphasises a person’s real freedom and opportunity to live a life they value. In practice, this means addressing structural barriers—such as language, legal status, or access to training—and creating conditions that allow all workers to participate meaningfully and safely in the workforce.

Inclusive dialogue is central to this effort. Policymakers, employers, and intermediaries engage directly with affected groups to understand their needs and co-create solutions. Communication strategies are no longer generic or one-size-fits-all. Instead, they are culturally sensitive, linguistically appropriate, and designed to empower. For example, translated materials take into account not just language but also cultural understanding of safety and climate, literacy levels, and preferred communication formats. Workers are given safe and accessible channels to express concerns, ask questions, and contribute to decision-making.

This inclusive approach **extends to SMEs, which often lack the resources of larger organisations**. Targeted support, such as simplified compliance tools, financial incentives, and access to expert guidance and knowledge networks, helps them meet OSH and climate requirements without too much burden.

6.7 Human-centred and sustainable technology and AI

By 2050, Europe has harnessed technology ethically and responsibly to serve both the planet and people. Technological innovation, particularly in AI, is no longer viewed only as a driver of efficiency or productivity. It is recognised as a double-edged sword: capable of enabling transformative change, but also of introducing new risks, inequalities, and ethical dilemmas. The design and implementation of technology is governed by human-centred principles, ensuring that **technology is used to serve people, not control them**. Furthermore, recognising that technology, especially AI, can contribute to climate change through high energy and resource consumption, concerted efforts have been made to ensure its development and deployment are **environmentally sustainable**.

This means that technological advancements are developed and applied with the explicit aim of supporting climate goals and OSH. AI, for example, is mobilised to reduce bureaucratic burdens, enhance early-warning systems, and improve exposure detection—always with safeguards in place to protect privacy, autonomy, and dignity. Technology is treated as a means to achieve broader societal objectives, not as an ultimate endpoint.

7 Barriers, tensions and trade-offs

Achieving the Shared Vision for 2050—where climate action and OSH are jointly prioritised—will require navigating a complex landscape of competing interests, limited resources, and difficult decisions. While the vision offers a compelling direction, progress will not be linear. The following themes reflect some of the key tensions and trade-offs that may shape Europe’s journey toward a just and resilient future. These are not exhaustive, but they highlight recurring challenges across the four scenarios explored in this project and reflect the barriers that were discussed by participants during the second workshop.

7.1 Competing priorities and short-termism

One of the most persistent tensions lies in balancing immediate needs with long-term goals. Europe faces multiple pressures—from geopolitical instability and economic uncertainty to pandemics, demographic shifts, and technological disruption. These crises often demand urgent attention, diverting resources and political focus away from preventative measures like OSH reform or climate adaptation.

Short-term decision-making is not always a result of poor governance—it can reflect genuine economic constraints. For example, during a pandemic or a border crisis, governments may prioritise emergency spending over long-term investments in worker safety or climate resilience. The challenge is maintaining sustained political will and funding for OSH and climate action, even when other priorities seem more pressing.

7.2 Resistance to behaviour change

Achieving a more sustainable future will require significant shifts in behaviour. This might mean flying less, eating less meat, choosing second-hand goods over new ones, and paying higher taxes to offset carbon footprint. These changes are not easy to adopt, and inertia remains a strong barrier, especially if the benefits feel distant or abstract. Governments may urge citizens and organisations to adopt sustainable practices, but this would reduce their freedom and autonomy.

On the OSH side, behaviour change is equally important. Workers will need to take an active role in protecting their own safety—by attending training, engaging with regulations, and reporting risks. For employers, while many organisations recognise the importance of OSH, it is still common to treat it as a bureaucratic ‘tick-box exercise’ rather than a strategic priority.

7.3 Profitability vs Safety

For employers, the tension between profitability and safety is long-standing—and may intensify under future resource constraints. In times of economic pressure, investments in OSH may be viewed as optional or postponed in favour of short-term financial gains. Employers aiming to adopt both sustainable and safe practices—such as implementing “safe by design” principles, choosing green technologies only after thorough testing, or replacing hazardous materials with safer alternatives—might face delays, higher upfront costs, and operational disruptions. These pressures can lead to difficult trade-offs, such as reducing wages or cutting back on training budgets, which may in turn affect worker safety and wellbeing.

7.4 Europe alone cannot drive global change

Even if Europe succeeds in aligning OSH and climate goals, global challenges remain. Greenhouse gas emissions from other regions far exceed Europe’s share, and international supply chains often rely on labour conditions that fall short of European standards. Protecting workers across borders—especially in countries with weaker regulations—will be difficult without coordinated global action.

Europe’s efforts can lead by example, influencing global norms and supply chain practices through procurement choices, trade agreements, and diplomatic engagement. But the reality remains: climate and OSH progress in Europe alone will not be enough to secure a just transition worldwide.

7.5 Lack of political will and shifting priorities

Political will can be volatile. As governments change and public opinion shifts, priorities may be redefined. Climate denial, misinformation, and attacks on science can undermine progress towards integrated climate and OSH strategies, eroding support for long-term resilience planning. At the same time, emerging tensions—such as those involving migration or resource scarcity—may complicate efforts to build inclusive policies.

7.6 The good and the bad of AI and technological transformation

Technology and AI offer powerful tools for managing climate and OSH challenges—from predictive risk modelling to smart safety systems. However, their deployment is not without risks. AI systems can contribute to environmental harm through energy-intensive processes, and they may be used for surveillance or control rather than empowerment. Decisions about whether and how to use these technologies are not merely technical—they are daily choices that citizens, workers, employers and government must make, balancing convenience, safety, privacy, and environmental impact.

7.7 Creating adaptive, but democratic, regulations

Another significant barrier to achieving adaptive, pragmatic and inclusive regulations is the challenge of democratic legitimacy. It is naïve to assume that democratically elected politicians can simply implement sweeping regulatory changes without robust debate and public engagement. Such an approach risks the perception of a “technocratic elite” making decisions behind closed doors, believing they know best for everyone else. Lack of transparency and inclusivity might not only undermine public trust, but also fuel resistance to change, particularly when complex issues like climate adaptation and social justice are at stake.

8 The roadmap from vision to action: implications for stakeholders

Achieving the Shared Vision for 2050, where climate action and OSH are equal priorities for Europe, requires coordinated, sustained effort from all sectors of society. This chapter describes suggested actions stakeholder groups might want to consider to realise that vision, mapping a trajectory from present-day challenges to future resilience.

Here, implications are tailored for five core stakeholder groups, each with distinct roles and responsibilities:

- **Governments and policymakers:** Including national governments, health and safety inspectors, EU institutions, and supranational bodies responsible for shaping and enforcing the regulatory environment.
- **Employers and employers' representatives:** The primary implementers of policy, tasked with embedding OSH and sustainability into daily operations and long-term strategies.
- **Workers and workers' representatives:** The primary stakeholders as their health, safety, and wellbeing are central objectives of this study and form the foundation for climate resilience.
- **Intermediary bodies:** Including social partner dialogue, civil society organisations, professional associations, and health and safety inspectors, these bodies facilitate dialogue, translate knowledge, and advocate for inclusive change.
- **Researchers and innovators:** Providers of the evidence base, foresight, and technological tools needed to anticipate emerging risks and guide adaptive responses.

These stakeholder implications are based on the expert discussions with participants during the second online workshop.

8.1 Governments and policymakers

To achieve the objectives outlined in the Shared Vision for 2050, where climate action and worker health and safety receive equal consideration, governments and policymakers influence the regulatory, institutional, and cultural frameworks that support coordinated and inclusive progress. Their responsibilities include governance, regulation, public engagement, innovation, and preparedness.

Stronger communication and alignment between OSH and climate governance

A key insight from participants was the persistent lack of communication and coordination between departments responsible for climate change response and those focused on OSH. Integrating OSH into sustainability strategies, such as national and European climate risk assessments (e.g. EUCRA), could help ensure that the health, safety and wellbeing of workers are considered in climate preparedness and response planning. Participants also suggested establishing formal coordination mechanisms across government agencies, such as joint task forces or interdepartmental committees, to align OSH and climate agendas. Real-time data-sharing platforms could further support this alignment. At the international level, cross-border collaboration can support joint planning and coordination of emergency responses to climate-related disruptions affecting labour markets and supply chains—for example, through EU-wide agreements on the rapid deployment of emergency response workers during extreme weather events, or coordinated stockpiling and distribution of essential protective equipment during heatwaves or wildfires.

Invest in multidisciplinary research to identify emerging risks

Governments might consider supporting research and innovation that explicitly addresses the indirect OSH risks of climate action. This could include funding toxicology surveillance for new materials, developing EU-wide registries for accidents linked to green technologies, and piloting predictive tools for emerging risks. Multidisciplinary collaboration—bringing together a variety of stakeholders including OSH professionals, climate scientists, ethicists, AI engineers, and urban planners—may be key to designing workplaces that are both sustainable and safe. Most importantly, a just transition can only

succeed if these innovative approaches also prove economically viable. If Europe cannot demonstrate that safety and sustainability can go hand in hand with competitiveness, other regions may be reluctant to adopt similar models—and Europe risks falling behind in global markets.

Evolve regulation to reflect disruption and support vulnerable workers

Policymakers may wish to explore regulatory frameworks that are flexible enough to respond to the indirect disruptions of climate action—such as the rapid deployment of green technologies, emergence of new materials, and rise of non-standard work. These frameworks could be designed to anticipate risks from climate strategies, from deployment of climate-surveillance systems, biodegradable compounds, and novel construction practices.

As climate action reshapes the labour market, targeted support for vulnerable groups may help reduce disparities in exposure to risk. Inclusive policy and regulatory approaches could be co-developed with affected communities and worker representatives and tailored to reflect specific vulnerabilities. These groups might include migrants, older workers, manual labourers, and workers in sectors undergoing significant transformation or decline—such as emergency response personnel and those impacted by the phase-out of fossil fuel industries. These co-development practices must be approached thoughtfully, guided by rigorous and sensitive principles of ethical engagement, inclusivity, and transparency. It is essential to ensure that all relevant stakeholders are actively consulted and that diverse perspectives are respected throughout the process. This includes establishing clear channels for open communication, safeguarding confidentiality where appropriate, and promoting mutual trust.

Revisiting and broadening the definition of “worker” and “employer” could also help ensure that protections extend to gig workers, freelancers, and those in informal or precarious roles.

8.2 Employers and employers’ representatives

Employers and organisations, regardless of size, are the primary implementers of OSH and climate strategies. Their commitment must move beyond compliance to embrace ethical leadership and proactive risk management.

Align OSH and sustainability goals in corporate responsibility frameworks

Alignment between OSH and sustainability is as relevant at the organisational level as it is for governments. There are many steps that organisations can take to ensure that worker health and safety are considered when developing sustainability initiatives. For instance, when launching a new green building project, companies might include OSH risk assessments in the early design phase to ensure that energy-efficient materials and construction methods do not introduce unforeseen hazards. In Environmental, Social, and Governance (ESG) reporting, firms could report on both carbon reduction and improvements in workplace air quality. Similarly, sustainability audits might include indicators for ergonomic design, heat stress mitigation, or safe handling of biodegradable compounds used in green manufacturing. Developing and implementing proactive, preventive OSH indicators that are aligned across borders might help build a more coherent and credible approach to corporate responsibility—one that demonstrates to investors, regulators, and workers that sustainability and safety are not competing priorities but mutually reinforcing pillars of long-term business resilience.

Engage in research to monitor emerging risks

As climate action drives the adoption of new materials and technologies, organisations are often the first to encounter their practical implications, including unpredicted risks. By working closely with research institutes and public bodies, organisations may strengthen their internal capacity to monitor, assess, and respond to these emerging challenges. Data collection and analysis can support safer implementation, inform operational improvements, and contribute to the development of good practice. Sharing insights with the wider public and regulatory bodies may also help build collective understanding of the safety implications of green innovations, such as biodegradable compounds, AI-powered systems, or novel construction materials, ensuring that sustainability does not come at the expense of workers safety and health. Employers, in collaboration with universities and research institutes, might seek funding from public sources and governments through research grants, innovation incentives, or

specific government funding programmes aimed at supporting safe and sustainable workplace transformations.

Support all workers through tailored and inclusive measures

As highlighted throughout this report, some groups of workers are more exposed to the impacts of climate change than others. These vulnerabilities may vary widely depending on the organisation's size, sector, and geography. It is up to the employers to assess which workers are most at risk, whether due to age, health status, employment conditions, or exposure to climate-sensitive tasks, and to offer tailored support, including role-specific risk assessments and flexible working arrangements.

In some cases, the most affected workers may not be part of the organisation's direct workforce at all. For example, workers in third-country supply chains may face unsafe conditions linked to environmental degradation or unregulated green production practices. By leveraging procurement decisions and client influence, organisations can play a role in promoting higher standards of worker protection and environmental responsibility across their supply chain.

It is also important to consider how OSH guidance and training are designed, implemented and communicated. Language barriers, cultural differences, and neurodiversity can all affect how information is received and understood. Adapting materials to reflect these differences—through translation, visual aids, or alternative formats—can help ensure that all workers are aware of climate-related risks and the protective measures available to them. As highlighted in a recent EU-OSHA policy brief on the effects of the circular economy on OSH (European Agency for Safety and Health at Work, 2023), establishing knowledge networks that connect vulnerable workers, especially in SMEs, with OSH professionals and policymakers could further provide technical assistance, share best practices, and ensure that OSH guidance is consistent and inclusive across regions and sectors.

8.3 Workers and workers' representatives

Workers are not only the beneficiaries of climate and OSH policies, but they are active agents of change. Their engagement, insight, and advocacy are essential to building resilient, inclusive workplaces and communities. To realise the Shared Vision, workers must be equipped, empowered, and encouraged to participate fully in shaping the future of work and sustainability efforts.

Make your voice heard in policy and governance

Worker participation in policy development is critical. Workers should ensure their voices are included in climate and OSH governance, particularly through tripartite negotiations, union involvement, and workplace committees. Strong representation in corporate climate strategies helps ensure that policies reflect real-world conditions and worker needs. By co-creating new standards and technologies, workers contribute to solutions that are both practical and inclusive.

Raise awareness within communities and informal sectors

Workers have a unique role in raising awareness about OSH and climate action within their communities, especially in informal or gig economy sectors where formal protections may be limited. Acting as **ambassadors**, they can share knowledge, promote safe practices, and help build a culture of prevention and sustainability both within and beyond the boundaries of traditional employment.

Monitor risks and contribute to early-warning systems

Workers are often the first to observe emerging hazards in the workplace, whether related to new materials, changing work conditions, or climate-related disruptions. Reporting these risks and sharing observations may support adaptive risk management and help shape responsive workplace policies. For example, anonymised worker reports could feed into national or sector-specific OSH databases, enabling trend analysis and early detection of systemic issues, such as heat-related incidents in outdoor work or injuries linked to new green technologies. Digital platforms or mobile apps could facilitate real-time reporting, and joint safety committees could use this data to adjust protocols or escalate concerns. Feeling confident and supported in raising concerns can make a meaningful difference in keeping workplaces safe and future-ready.

8.4 Intermediary bodies

Intermediary bodies—including social partner dialogue, employers' organisations, trade unions, industry associations, professional organisations, and civil society—are critical in translating high-level policy into practice, bridging knowledge gaps, and ensuring that the worker voice is heard.

Co-develop sectoral roadmaps for sustainable transformation

Trade unions and employers' and industry associations may wish to collaborate on sector-specific roadmaps to guide the transition to green, sustainable business models, like the regenerative business models developed at The Hague University², which aim to positively impact both the environment and society, moving beyond simply reducing harm. Including OSH considerations from the outset could help ensure that worker health and safety are embedded throughout the transition. These strategic plans—developed at national and EU levels—can offer clarity, direction, and accountability, helping sectors align with climate goals while safeguarding workforce wellbeing.

Advocate for inclusive and forward-looking policies

Intermediary bodies are well positioned to lead advocacy efforts that promote inclusive, future-oriented approaches to OSH and climate governance. This may involve supporting collective bargaining, lobbying for the inclusion of social partners in decision-making processes, and encouraging investors to consider OSH and sustainability criteria. By amplifying worker perspectives and offering support networks, intermediaries can help individuals articulate the importance of safe, healthy, and meaningful work in a climate-altered economy. By gathering and disseminating robust evidence, showcasing examples of best practices, and sharing compelling success stories, intermediary bodies can also inform and influence both policymakers and employers, fostering the adoption of forward-thinking policies and practical measures that prioritise worker health, safety and wellbeing as well as environmental responsibility.

Facilitate dialogue and share practical knowledge

Creating and sustaining platforms for exchange between OSH and climate actors may help bridge gaps between public and private sectors. These spaces can support shared learning, joint problem-solving, and the co-creation of inclusive strategies that reflect real workplace conditions. To support employers and workers—especially those with limited internal capacity, such as SMEs—intermediary bodies might consider producing accessible guidance on climate-related risks, emerging green materials, and promoting knowledge networks to share OSH best practices. Educational resources, such as illustrated safety manuals, multilingual video tutorials, mobile apps with interactive hazard identification, or peer-led workshops, could be tailored to diverse audiences, including migrants and non-native speakers, with communication strategies that go beyond translation to incorporate cultural sensitivity and practical relevance.

8.5 Researchers and innovators

Researchers, academics, and innovators (such as individuals involved in research and development within organisations or start-ups) are central to Europe's ability to anticipate, understand, and manage the complex interplay between climate change and OSH. Their work provides the evidence base, foresight, and technological tools needed to guide policy, shape practice, and support inclusive innovation.

Advance interdisciplinary research and support evidence-informed decision-making

Identifying emerging risks and designing safer, climate-resilient systems call for interdisciplinary collaboration across fields such as architecture, engineering, climate science, public health, behavioural science, and OSH. This could include the development of metrics and tools, such as toxicovigilance systems and monitoring and evaluation frameworks, that assess how new materials, technologies, and work arrangements are impacting workers. Research can also generate robust evidence on the

² [Sustainable Business Models | The Hague University of Applied Sciences](#)

economic and social value of OSH. For example, studies that quantify the return on investment of heat mitigation strategies—like shaded outdoor workstations or adaptive scheduling—can help employers and policymakers prioritise interventions that protect workers while maintaining productivity. Similarly, behavioural research might explore how workers respond to early-warning systems or how communication strategies can be tailored to different cultural and neurodiverse groups. Translating these insights into accessible, actionable formats is equally important. Synthesised findings, visualised data, and scenario-based guidance can support informed decision-making by policymakers, employers, and the public.

Develop ethical and sustainable technologies that support both climate and OSH goals

Tools for exposure detection, risk monitoring, and OSH management could be developed with attention to privacy, autonomy, and equity. AI applications that reduce bureaucratic burdens, enhance early-warning systems, and support decision-making—while remaining human-centred and sustainability-oriented—may offer valuable contributions to resilient workplace futures. For example, AI-powered workplace safety software have been developed to use real-time video analytics to detect and prevent serious injuries and fatalities, while explicitly committing to ethical and human-centred principles such as transparency, fairness, privacy, and human oversight in all aspects of its technology design and deployment. Similarly, there are tools that integrate predictive analytics with OSH dashboards to support SMEs in digitising OSH processes to reduce administrative burdens, while aligning with human-centred and ethical principles.

These principles are in line with the EU-OSHA *Safe and Healthy Work in the Digital Age* campaign³, which promotes a human-centred approach to digitalisation, ensuring that technological innovation improves working conditions while safeguarding health and safety.

³ [Campaign materials | Healthy Workplaces - Safe and healthy work in the digital age 2023-2025](#)

9 Conclusions

This study set out to explore the **complex and indirect effects of climate change on workers' health and safety** and the wider European world of work by 2050. Through the development of four scenarios, we examined different pathways that could emerge depending on the strength of climate governance and OSH governance. These scenarios are not predictions, but structured explorations of possible futures. They highlight the trade-offs, risks, and opportunities that may arise as Europe grapples with the dual challenge of addressing climate change and safeguarding workers.

What emerges clearly is that climate change is not only an environmental issue, but also a profound social and economic disruptor. It will reshape labour markets, transform industries, and create new risks and vulnerabilities for workers. At the same time, OSH is revealed as a critical enabler of resilience: without safe, healthy, and supported workers, the green transition cannot succeed. Addressing climate change is essential for our survival as a species, but it is equally essential to ensure that the people in the workforce driving this transition are protected, empowered, and able to thrive.

This foresight exercise demonstrates the value of looking ahead. By exploring current and future trends, we can better recognise drivers of change, anticipate challenges, identify emerging risks, and prepare for the unexpected. Foresight does not provide definitive answers, but it helps us ask better questions and equips governments, organisations, and workers to make more informed, strategic choices today.

At the same time, there are limitations to this study. The question we are asking is broad: how climate change related developments and crises will impact the future of work and OSH in Europe. What's more, the answers that this study provides to it will inevitably be subjective, shaped by our participants' personal perspectives and biases. At this stage, we can only provide high-level insights rather than detailed responses. Our approach has been to look around, listen, and capture what people are already thinking and worrying about. This is a first step: a way of mapping the landscape of concerns and possibilities, rather than offering ready-made solutions.

The importance of this step lies in providing the groundwork for what comes next. Governments, organisations, and social partners will need to take these broad insights and apply them to their own contexts— including specific geographies, sectors, and workplaces. Only then can tailored solutions be designed, tested, and implemented to meet the diverse needs of workers and societies across Europe.

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Annex A – Detailed methodology

Identification of key factors and drivers of change

Literature review

To develop future scenarios describing potential indirect implications of climate change on OSH and the world of work in the next 25 years, an important step of the methodological approach was to identify a set of factors that are likely to be the intermediaries in the pathway linking climate change to OSH and other workplace outcomes. During March and April 2025, the research team conducted a scoping literature review, drawing on previous EU-OSHA foresight reports, relevant academic and grey literature, and news articles, published within the last ten years. A PESTLE framework was used to organise factors identified from the scoping review. PESTLE stands for Political, Economic, Social, Technological, Legal and Environmental and it is a strategic framework to explore different influencing areas. The PESTLE framework was adopted as a way to explore the literature in a structured way. Separate searches were conducted for the each of the PESTLE elements, except Environmental, which was already captured through terms related to climate change. For the remainder of this report, the framework will therefore be referred to as PESTL. The key search terms used for identifying relevant articles and documents is provided in Table A. Searches were conducted on Google, Google Scholar, as well as using online AI tools such as RAND Chat⁴, Litmaps⁵, Inciteful⁶, Consensus⁷, Co-Pilot⁸, and Scispace⁹. The study included the most recent relevant academic and grey literature publications, as well as news articles, available in English, as the sources.

Table A. Search terms used to identify relevant literature

Terms related to climate change and the world of work		Terms specific to each PESTL element	
("climate change" OR "environ**" OR "sustainability") AND ("occupational health and safety" OR "risk" OR "workplace" OR "work*" OR "job") AND ("impact" OR "implication" OR "consequence")	Political		(politic* OR geopolitic* OR election* OR electoral* OR international relation*)
	Economic		(econom* OR finance* OR labo*r market OR labo*r supply OR job growth OR unemploy* OR business OR inflation OR investment)
	Social	AND	(social OR societal OR attitude* OR behavio*r* OR cultur* OR lifestyle OR demographic*)
	Technological		(technolog* OR innovation* OR automation OR AI OR artificial intelligence OR ditigal*)
	Legal		(legislation* OR law* OR regulatory*)

⁴ RAND Chat is RAND's private and secure implementation of a ChatGPT-like Large Language Model interface based on Microsoft's Azure OpenAI service.

⁵ <https://www.litmaps.com/>

⁶ <https://inciteful.xyz/>

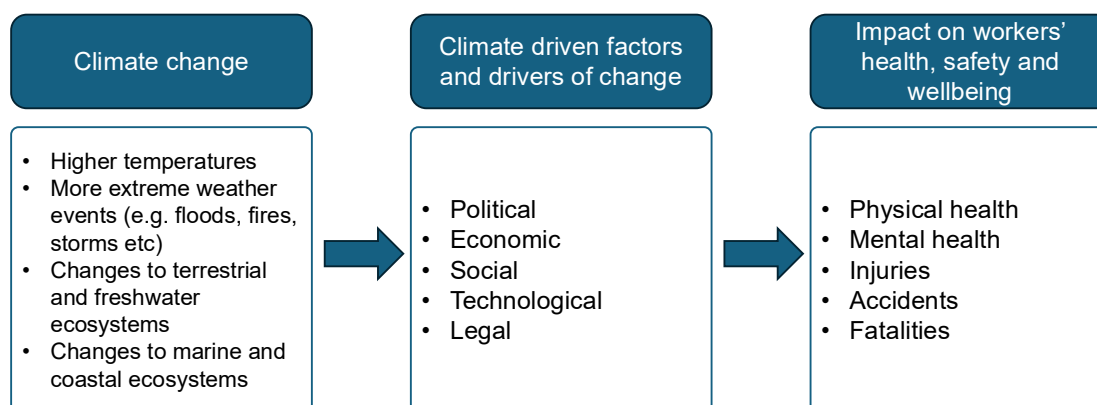
⁷ <https://consensus.app/>

⁸ <https://copilot.cloud.microsoft>

⁹ <https://scispace.com/>

Based on the scoping literature review, an initial list of 24 factors was compiled. These factors can be described as intermediaries that are influenced by climate change and, in turn, affect OSH and the world of work, as shown in Figure A. 1. The factors were identified by reading and reviewing relevant literature and news articles for each of the PESTL element. Key findings were then summarised and were refined through several iterations and presented to a workshop with EU-OSHA. The factors are described in Chapter 3.

Figure A. 1 Pathway to identify the indirect impact of climate change on workers' health, safety and wellbeing



Survey

After identifying factors from the review of the literature, an online survey was conducted with expert stakeholders. The aim of the survey was to gather expert input on the impact of each of the initial factor and how these might interact to form potential indirect pathways linking climate change to OSH and other workplace outcomes. Insights gained from the survey helped determine the most critical factors for the scenario-development process in the later workshops.

The survey was designed in consultation with EU-OSHA. Stakeholders with expertise in climate change, OSH, and/or future and foresight methods were identified through the networks and contacts of both the research team and EU-OSHA. Of the 76 stakeholders invited to participate, 30 completed the survey (response rate: 39.5%). Their areas of expertise spanned from OSH (80% of respondents), climate change, environment or sustainability (46%), future and foresight methods (26%), industry (23%), and other areas (4 responses: evaluation/education/psychology; human capital management; a mix of the mentioned expertise; and transitions and changes of work life and work/ participatory development).

The survey was administered via the online platform SmartSurvey and remained open between the 25th April and 7th May.

In the survey, participants were presented with the 24 factors identified through the literature reviewed and were asked one question about each of the factors: "If this factor or event were to occur, how significant do you think its impact would be on OSH and the world of work in Europe over the next 25 years?". The full text of the survey can be found in Annex D.

Participants were asked to answer on a five-level Likert scale from "Extremely impactful" to "Not at all impactful", with a "Don't know" option available. Participants were also encouraged to provide their additional comments in an open text box after each category of factors.

Participants were also asked an open-ended question: "Do you have ideas on how these or other factors interact to influence OSH and workplace outcomes? Are any factors missing? Any additional comments?"

Closed survey responses helped prioritise key factors for scenario development, while open text responses formed the basis of the scenarios elements discussed in the next section.

Scenario ingredients

Here are the scenario ingredients that were presented to participants during the first workshop. These were developed by the project team based on the climate-related factors and uncertainties highlighted in the literature, PESTL analysis, and survey feedback. The ingredients served as prompts to stimulate discussion and were intended to help participants explore possible future developments by either adopting, challenging, or expanding on them. Each of the figure below is relevant for one of the four scenarios.

Figure A. 2. Ingredients presented for the high climate - high OSH governance scenario discussion



Figure A. 3. Ingredients presented for the low climate - high OSH governance scenario discussion



Figure A. 4. Ingredients presented for the high climate - low OSH governance scenario discussion

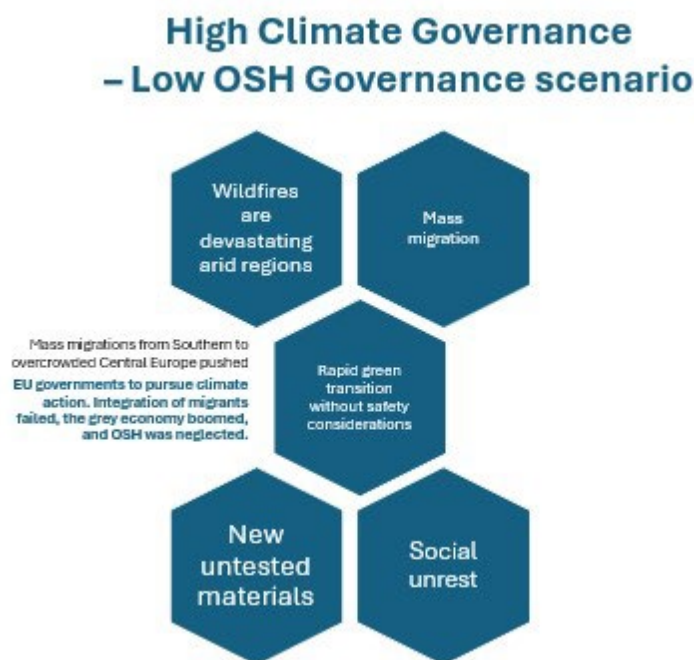
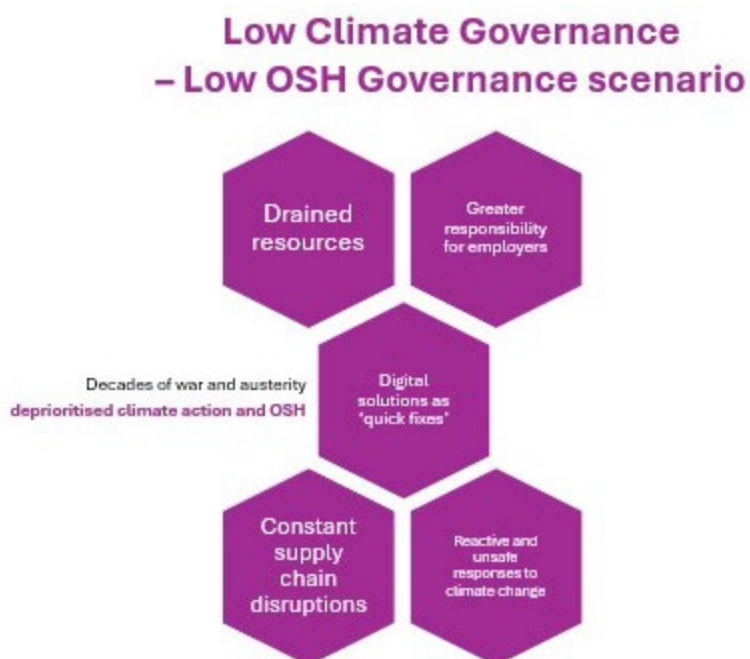


Figure A. 5. Ingredients presented for the low climate - low OSH governance scenario discussion



Scenario development workshops

In person workshop

The first scenario workshop was held on the 2nd and 3rd of June at the EU-OSHA office in Bilbao. A total of 20 participants attended the workshop along with members of the project team and representatives from EU-OSHA. The workshop agenda can be found in Annex C, Table C.1.

The objective of the first workshop was to co-develop four future scenarios with participants through a creative and participatory exercise facilitated by the project team. Summaries of the four scenarios are given in Section 5. The workshop began with a brief introduction by the project team, which included an overview of the project, the workshop's aims, and the description of the key dimensions for the scenarios, described in Section 2.3.1. Participants were then split into two groups, ensuring a balance of expertise and backgrounds within each group. Over the course of two 2-hour sessions, each group worked to co-develop two scenarios (low OSH-low Climate governance and high OSH-high Climate governance on Day 1, low OSH-high climate governance and high OSH-low climate governance on Day 2) by considering the key content of each scenario. To stimulate the discussion, the project team presented examples of the scenario 'ingredients' described in Section 2.3.2. During the workshop, participants were encouraged to comment on these ingredients and generate more. Participants were also asked to comment on each scenario's risks, opportunities/benefits, impact on enterprises, and impact on vulnerable workers. Participant contributions were made both orally and in writing on Post-it notes.

Contributions made by participants were documented through note-taking and transcription of written inputs through Post-its. Recurring and significant themes (according to the participants) were identified, analysed, and synthesised by the project team to develop fully-fledged narratives for each scenario.

10.1.1 Scenario first drafts

An initial draft of the scenarios was prepared by the research team during the summer of 2025, informed by all data collected up to that stage, particularly input from stakeholders at the first workshop. These drafts were subsequently submitted to EU-OSHA for review and distributed to participants in advance of the second workshop.

Online workshop - Session 1

The second workshop comprised two virtual sessions, each lasting two hours and conducted via Microsoft Teams. We chose to separate the second workshop into two sessions to facilitate engagement with the participants. The same participants who attended the first in-person workshop were invited, alongside an additional participant who was invited as a substitute. Draft scenario narratives were shared with participants one week prior to the first session of the second workshop, and written feedback was welcomed. A dedicated Mural board¹⁰ was designed for each session to guide discussions and facilitate contributions.

The first session was held on Microsoft Teams on September 24th 2025. A total of 18 participants attended the workshop along with members of the project team and representatives from EU-OSHA. The session was transcribed for note-taking purposes. The workshop agenda can be found in Annex C, Table C.2.

The objective of the first session was to validate and refine the four future scenarios and to draw consensus around elements of a desirable future for Europe in 2050. The session started with a brief introduction by the project team, including a review of the research question and objectives. This was followed by interactive plenary discussions facilitated via Mural. For each scenario, the project team presented a brief overview of Europe's outlook in 2050, the world of work, and the implications for OSH. Participants were then invited to respond to three guiding questions:

¹⁰ Mural (www.mural.co) is a free digital collaboration platform that enables teams to brainstorm, plan, and visualise ideas using virtual whiteboards, sticky notes, diagrams, and templates in real time.

1. What is missing from the scenario?
2. Are there any incoherent or contradictory elements?
3. Which aspects of the scenario are desirable, and which are undesirable?

Feedback was collected through virtual Post-it notes on the Mural board, contributions in the Microsoft Teams chat, or verbal input. The session concluded with a revisit of the cross-cutting themes identified in the first workshop, and participants were encouraged to contribute further reflections using virtual Post-it notes.

First draft of a Shared Vision for 2050

Drawing directly from the participants' input on the desirable and undesirable elements of each scenario, the research team synthesised a draft of a Shared Vision for 2050. This vision articulates the collective ambition for the future, defining the desired state concerning OSH and the world of work. The first draft of the vision was presented to participants during the second workshop (second session) for validation and feedback.

Online workshop - Session 2

The first session was held on Microsoft Teams on September 30th 2025. A total of 14 participants attended the workshop along with members of the project team and representatives from EU-OSHA. The session was transcribed for note-taking purposes. The workshop agenda can be found in Annex C, Table C.2.

The second session focused on road mapping the journey towards a shared vision for 2050 and identifying implications for key OSH actors: government and policymakers, organisations and employers, intermediary bodies (e.g., trade unions, civil societies), workers and researchers. The session began with a brief recap of the first session, followed by a plenary discussion facilitated by the project team using the Mural board. These questions guided the discussion:

1. What is missing from the shared vision for 2050?
2. What are the enablers and barriers to achieving it?
3. Who is responsible for what actions to realise this vision?

As in the first session, participants were encouraged to share their thoughts via virtual Post-it notes on the Mural board, Teams chat, or direct verbal input. All contributions were collated and examined using thematic analysis. Findings fed into the drafting of the Shared Vision for 2050 (section 6), barriers and tensions (section 7) and implications for stakeholders (section 8).

Annex B – List of participants

Table B. 1. List of participants

Name	Organisation
Arja Ala-Laurinaho	Finnish Institute of Occupational Health, Finland
Aude Cefaliello	Europe Trade Union Institute (ETUI), Belgium
Bengt Jarvholm	Umeå University, Sweden
Carina Strömberg	Toyota Material Handling, Campaign Partner
Christopher Davis	Institution of Occupational Safety and Health (IOSH), UK
David Hansen	University of Southern Denmark, Denmark
Delfina Gabriela Garrido Ramos	University of Minho, Portugal
Fabiana Victoria Iovino	Connect Europe, Belgium
Karin Reinhold	Tallinn University of Technology, Estonia
Lefteris Kretsos	Brunel University London, UK
Lode Godderis	KU Leuven, Belgium
Marc Malenfer	National Institute for Research and Security (INRS), France
Marouane Laabbas el Guennouni	Europe Trade Union Institute (ETUI), Belgium
Monika Eigenstetter	Niederrhein University of Applied Sciences, Germany
Regine Mägerlein	ZF automotive industry, Campaign Partner
Quiann Barnard	ZF automotive industry, Campaign Partner
Sascha Wischniewski	Federal Institute for Occupational Safety and Health (BAuA), Germany
Simona Del Ferraro	National Institute for Insurance against Accidents at Work (INAIL), Italy
Szabó Gyula	Óbuda University, Hungary
Tim Carter	Finnish Environment Institute, Finland
Yuri Bruinen de Bruin	German Federal Institute for Risk Assessment (BfR), Germany

Annex C – Workshop agendas

Table C. 1. Agenda - Workshop 1 (in person)

Location: European Agency for Safety and Health at Work, Bilbao, Spain.

Date: Monday 2nd, 14:00 – 18:00 (CET)

Time (CET)	Activity
14:00- 14:45	Greetings and introductions
14:45 – 15:15	Research team presentation: Overview of the project and aims for the day Interim findings from the literature and the survey
15:20 – 15:30	Comfort break
15:30 - 17:30	Scenario discussions
17:30 – 18:00	Brief plenary and conclusions
18:00 – 20:30	Free time
20:30	Social dinner

Tuesday 3rd June, 09:00 – 12:00 (CET)

09:00 – 9:15	Greetings
9:15 – 11:30	Scenario discussions
11:30 – 12:00	Brief plenary and conclusions
	END

Table C. 2. Agenda – Workshop 2 (online)

Location: Online, Microsoft Teams

Session 1: Wednesday 24th September 14:30 – 16:30 (CET)

Time (CET)	Activity
14:30 – 14:45	Greetings, reminder of the study and objectives for the workshop
14:45 – 15:05	Plenary discussion – Feedback and refinement of Scenario 1
15:05 – 15:25	Plenary discussion – Feedback and refinement of Scenario 2
15:25 – 15:45	Plenary discussion – Feedback and refinement of Scenario 3
15:45 – 16:05	Plenary discussion – Feedback and refinement of Scenario 4
16:05 – 16:25	Emerging cross-cutting themes
16:25 – 16:30	Closing remarks

Location: Online, Microsoft Teams

Session 2: Tuesday 30th September, 14:30 – 16:30 (CET)

14:30 -14:45	Greetings, objectives of the day and recap Presentation: Shared vision for 2050
14:45 – 15:30	Plenary discussion: ▪ Feedback and priorities ▪ Enablers and barriers
15:30 – 16:15	Plenary discussion: ▪ - Actions and Roles of different OSH stakeholders
16:15 – 16:30	Conclusions, thanks and next steps

The European Agency for Safety and Health at Work (EU-OSHA) contributes to making Europe a safer, healthier and more productive place to work. The Agency researches, develops and distributes reliable, balanced and impartial safety and health information, and organises pan-European awareness raising campaigns. Set up by the European Union in 1994 and based in Bilbao, Spain, the Agency brings together representatives from the European Commission, Member State governments, employers' and workers' organisations, as well as leading experts in each of the EU Member States and beyond.

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