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Occupational heat stress: What do we know and what do we need to do?

Considerations from an OSH perspective

Date: Monday / 01 / October / 2019

We have an essential responsibility to ensure that people go to work and come home alive, uninjured, and healthy. This year, on World Day for Safety and Health at Work, we can celebrate an important step towards this goal: **the designation of a safe and healthy working environment as a fundamental principle and right at work.**

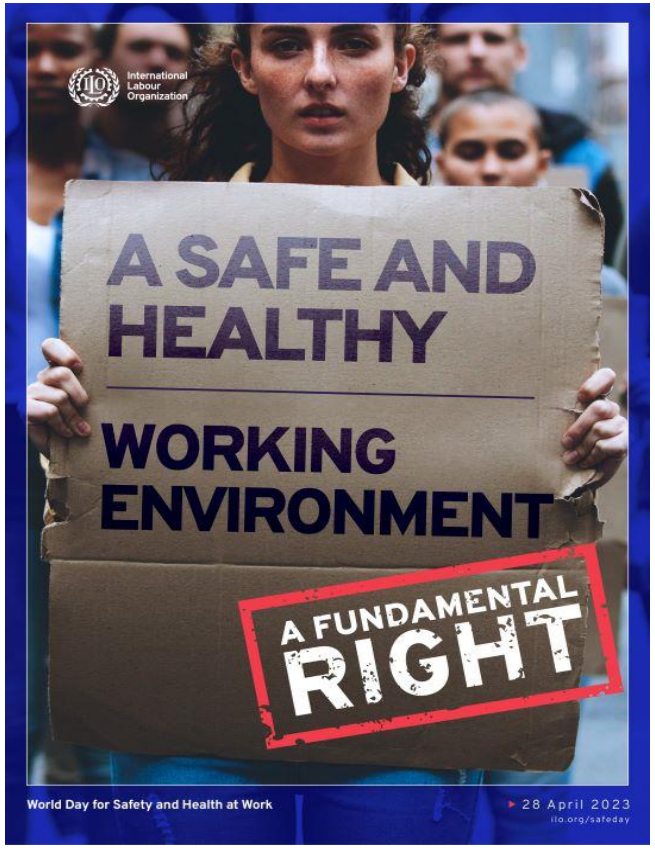
Gilbert F. Houngbo , 11th ILO Director-General

A safe and healthy working environment as a fundamental principle and right at work

- In June 2022, the International Labour Conference (ILC) decided to include “a safe and healthy working environment” in the ILO’s framework of fundamental principles and rights at work.

- The **Occupational Safety and Health Convention, 1981 (No. 155)** and the Promotional Framework for **Occupational Safety and Health Convention, 2006 (No. 187)** to be considered as fundamental Conventions

- All ILO Member States have now an obligation to promote and to realize, in good faith and in accordance with the Constitution, the fundamental right to a safe and healthy working environment, **whether or not they have ratified the relevant Conventions.**



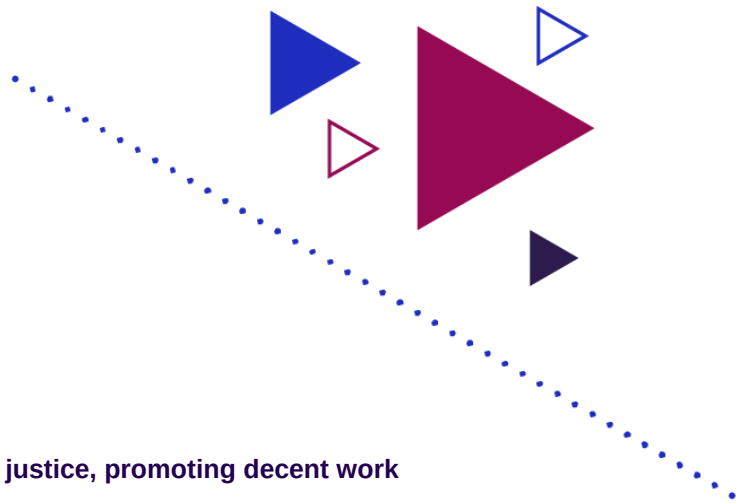
The fundamental OSH Conventions

Convention No. 155

- Policy approach to OSH
- Actions required at both national and enterprise levels

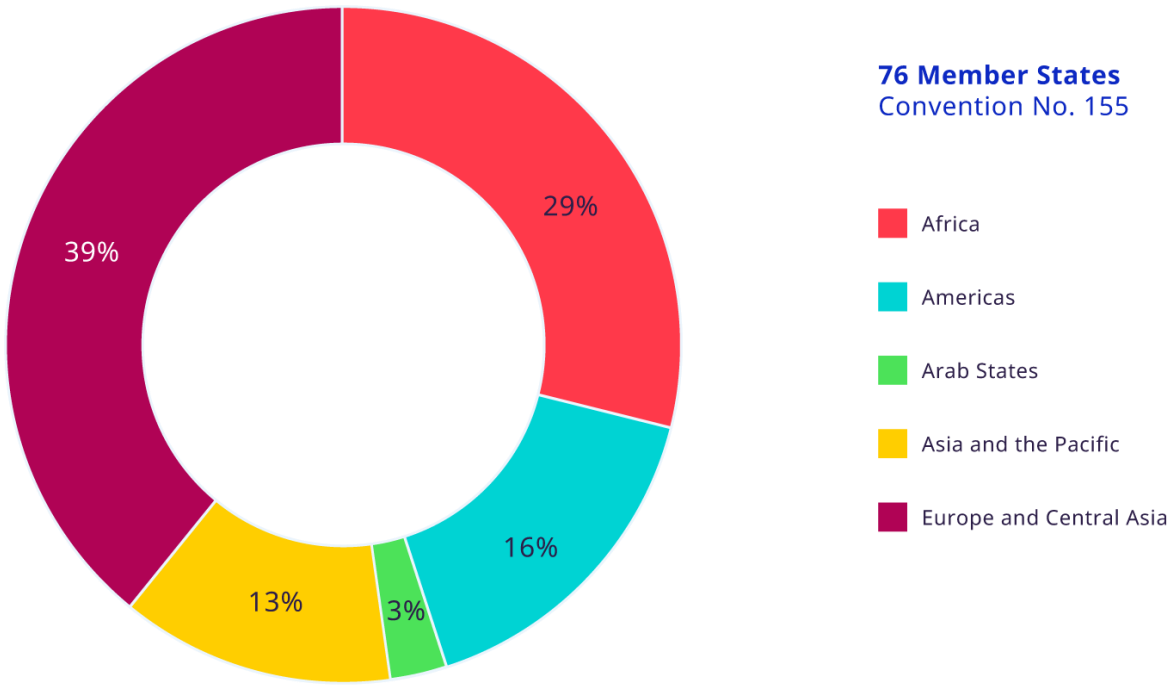
Convention No. 187

- Continuous improvement of OSH and progressive achievement of a safe and healthy working environment through a national policy, national system and national programmes
- National preventive safety and health culture

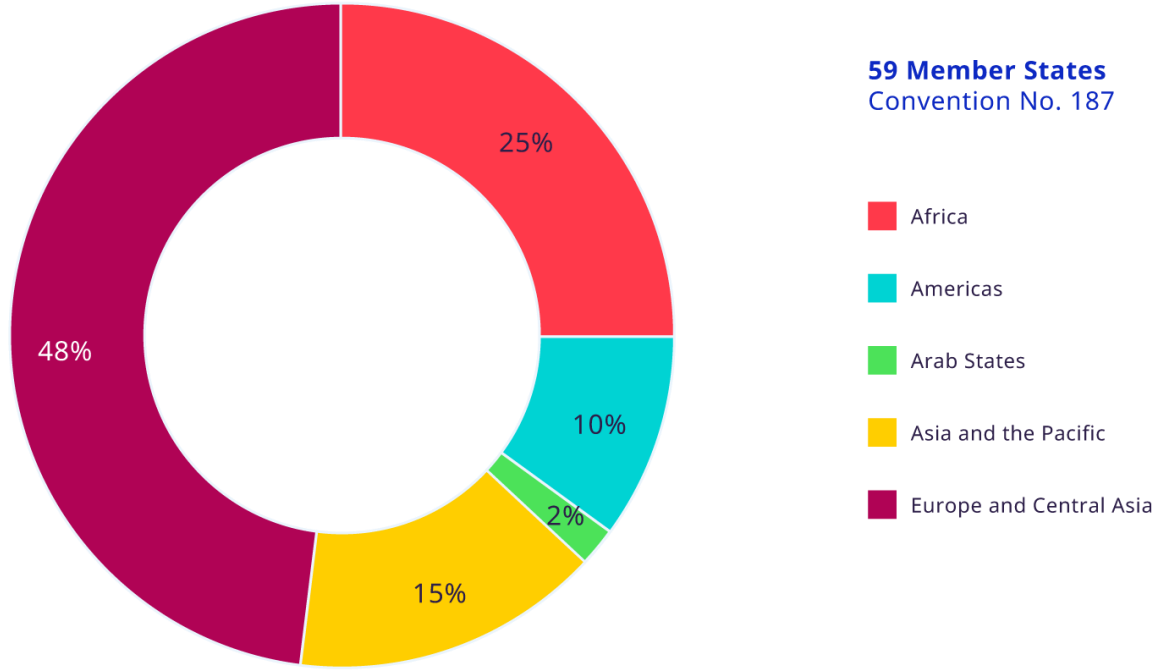


Distribution of Member states that have ratified the fundamental OSH Conventions

Convention No. 155

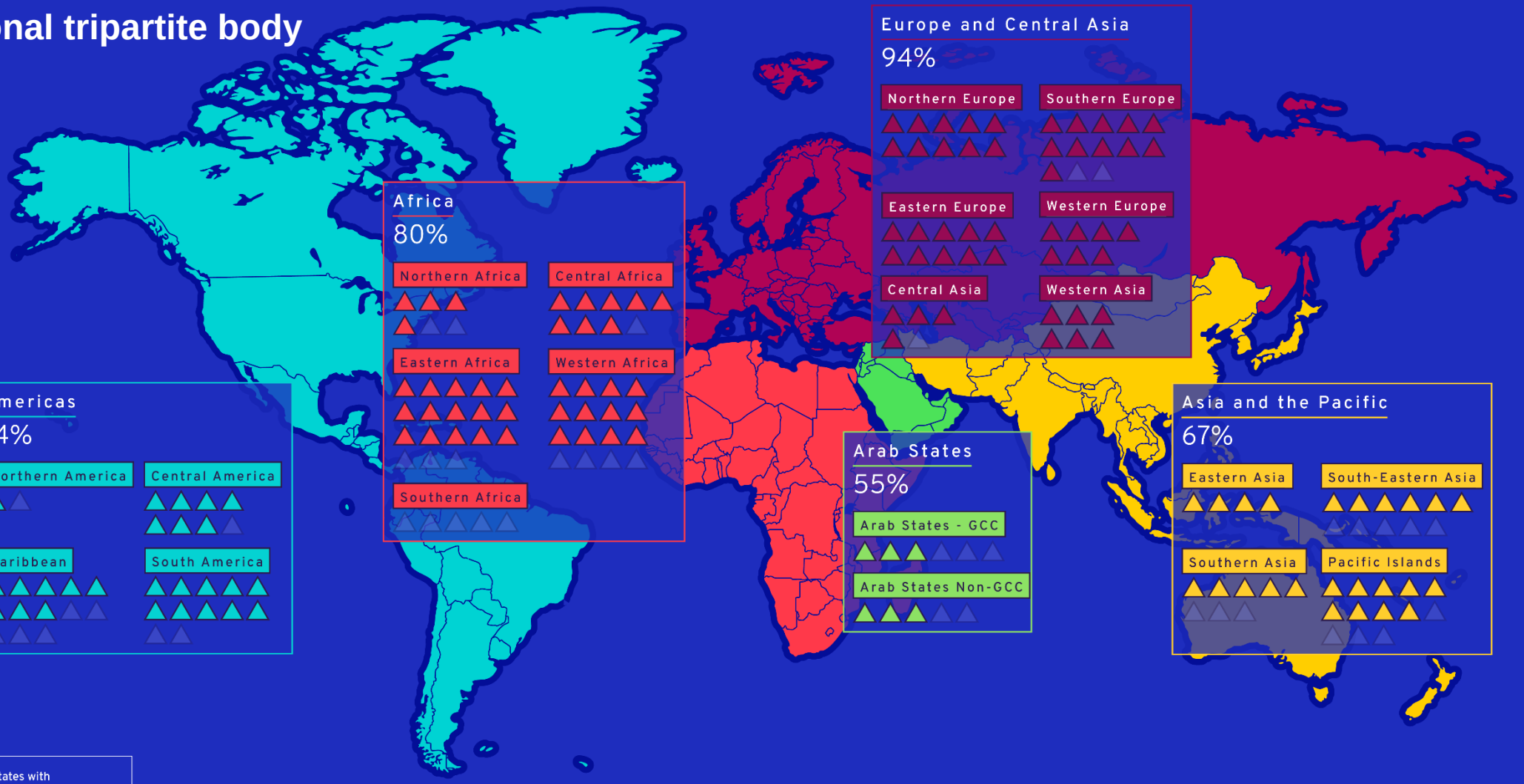


Convention No. 187



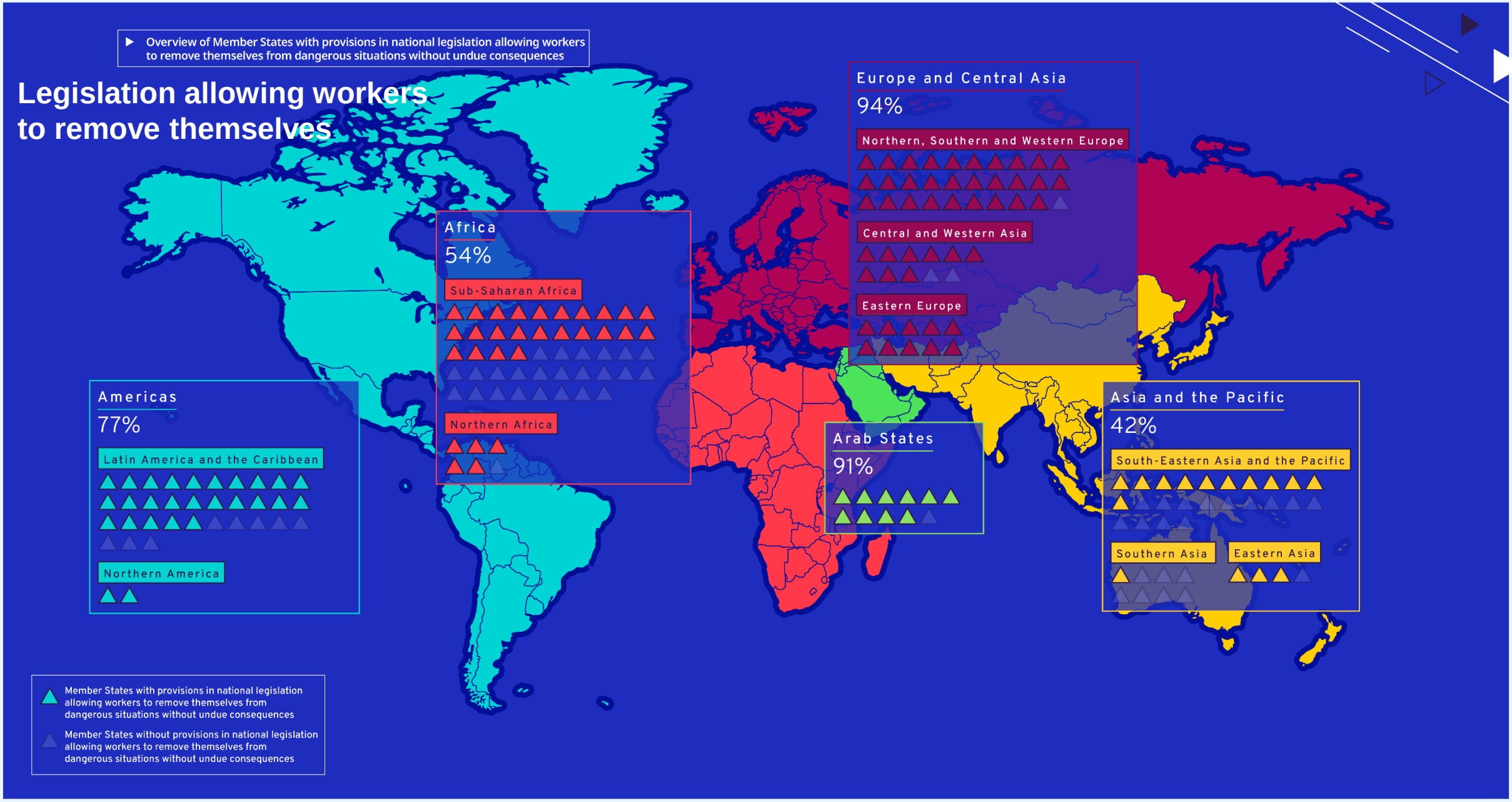
Overview of Member States with a national tripartite body

National tripartite body



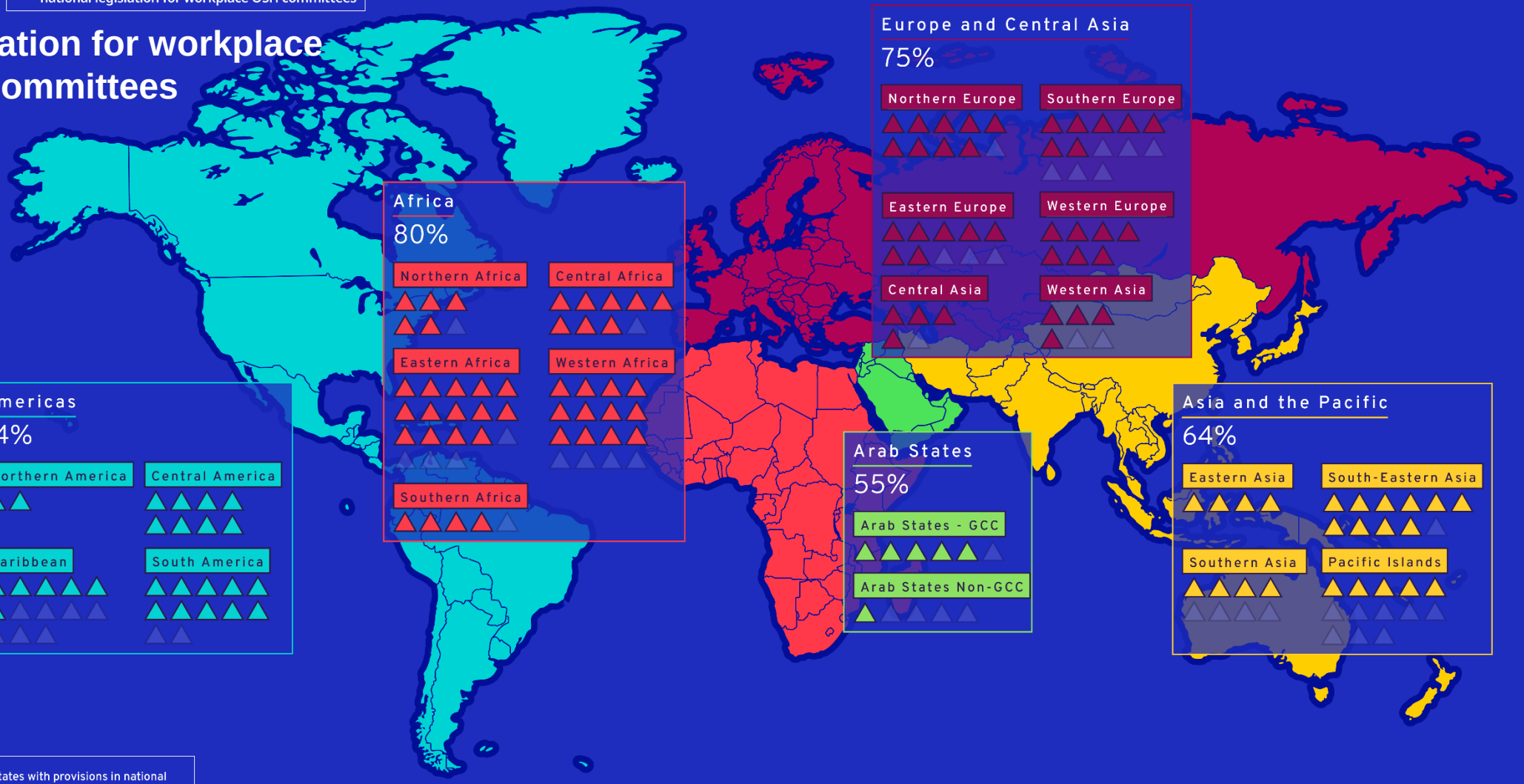
Member States with a National tripartite body on OSH

Member States without a National tripartite body on OSH


Overview of Member States with provisions in national legislation allowing workers to remove themselves from dangerous situations without undue consequences
Legislation allowing workers to remove themselves
Europe and Central Asia
94%
Northern, Southern and Western Europe
Central and Western Asia
Eastern Europe
Africa
54%
Sub-Saharan Africa
Northern Africa
Americas
77%
Latin America and the Caribbean
Northern America
Arab States
91%
Asia and the Pacific
42%
South-Eastern Asia and the Pacific
Southern Asia
Eastern Asia
Member States with provisions in national legislation allowing workers to remove themselves from dangerous situations without undue consequences
Member States without provisions in national legislation allowing workers to remove themselves from dangerous situations without undue consequences

Overview of Member States with provisions in national legislation for workplace OSH committees

Legislation for workplace OSH committees

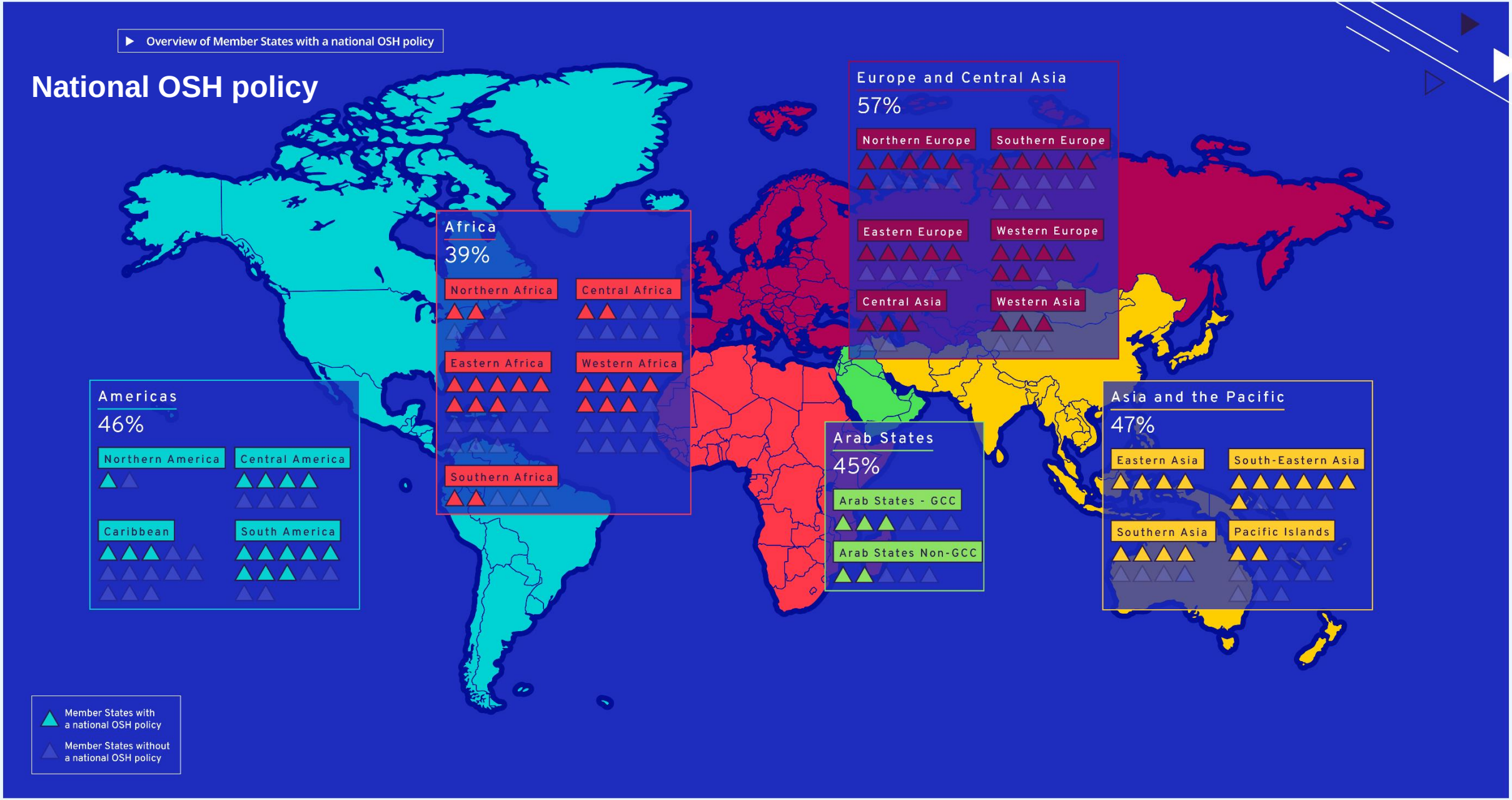


Member States with provisions in national legislation for workplace OSH committees

Member States without provisions in national legislation for workplace OSH committees

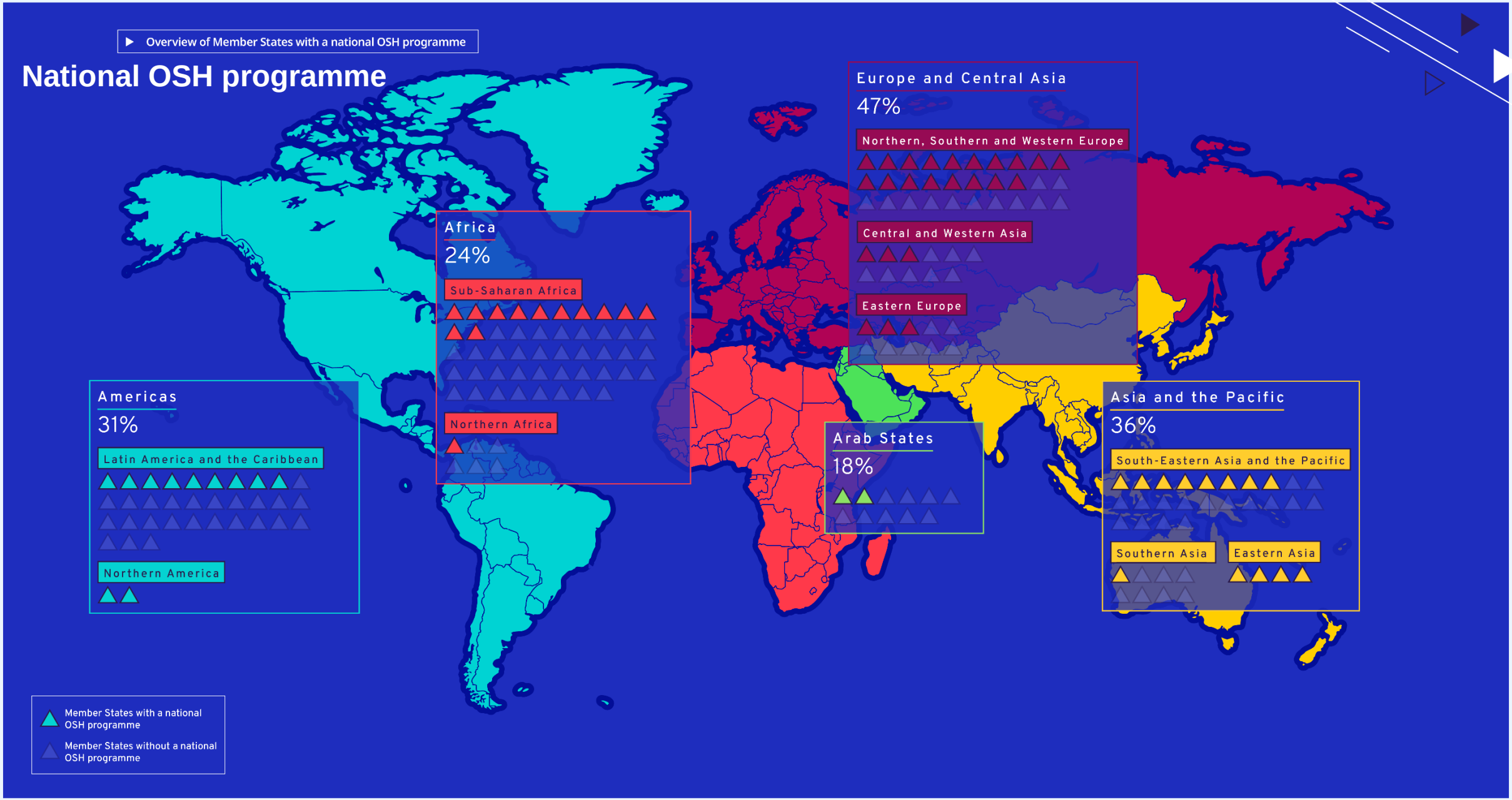
Overview of Member States with a national OSH policy

National OSH policy



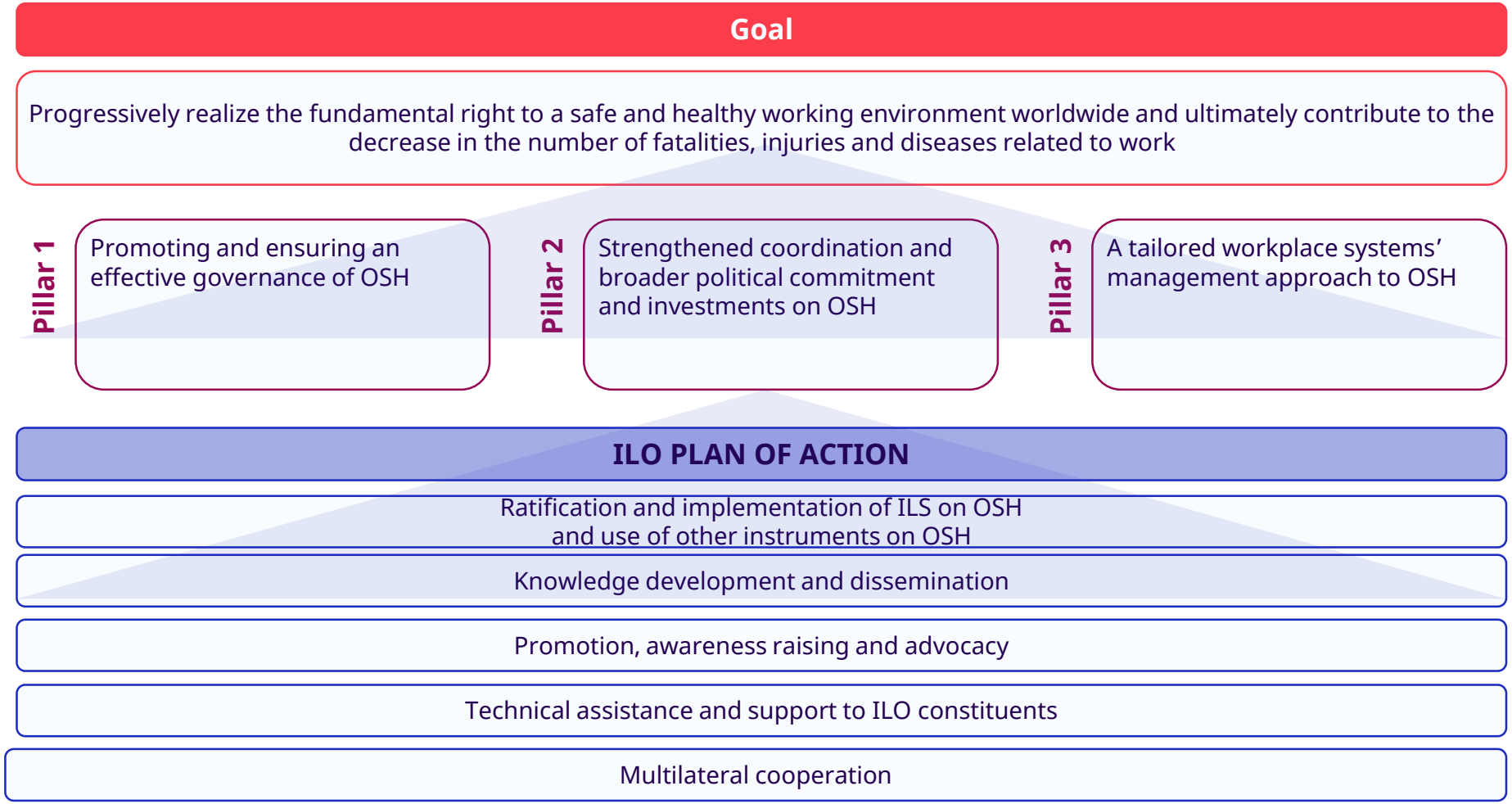
Overview of Member States with a national OSH programme

National OSH programme



Global Strategy on Occupational Safety and Health 2024–30

Strategical framework endorsed by the GB in March 2023



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Working on a warmer planet: Implications for OSH

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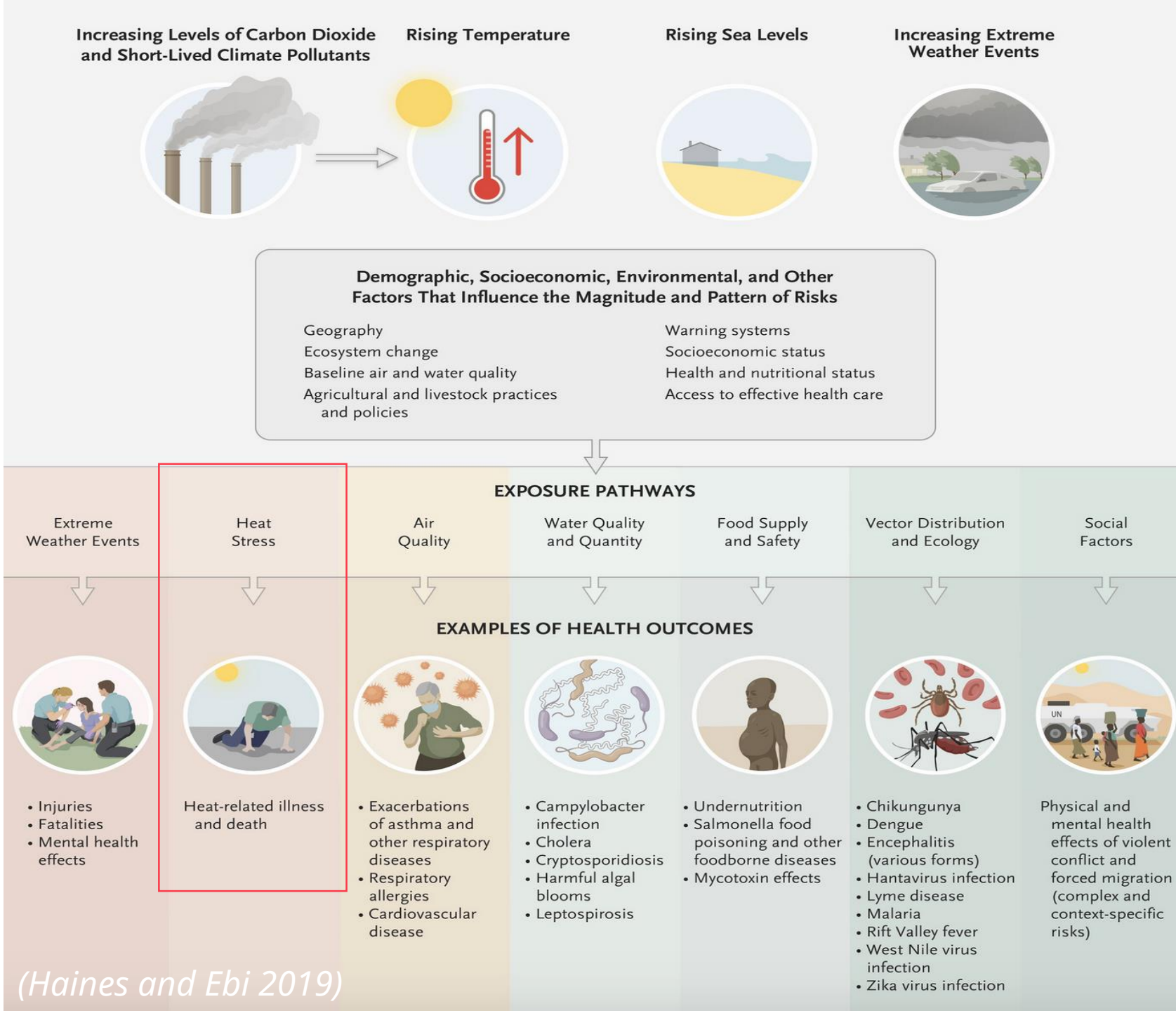
Climate change: a multidimensional threat to OSH

- Increased risk of injury, disease and death for workers due to: heat stress; ***but also*** extreme weather events; exposure to hazardous chemicals; air pollution; infectious diseases, among others.
- Important to consider multiple, concurrent exposures.



(Haines and Ebi 2019)

Main occupational health risks associated with climate change *(Ansah et al. 2021)*

- Heatstroke
- Fatigue
- Sleeplessness
- Fainting
- Heavy sweating
- Exhaustion
- Headache
- Kidney diseases
- Chemical poisoning
- Zoonotic infections
- Injuries
- Respiratory conditions
- Asthma
- Immune dysfunction
- Cardiovascular disease
- Cancer

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Why are workers most at risk?

- Workers are particularly at risk because:
  1. They are often the **first to be exposed** to the effects of climate change.
  2. They may be exposed for **longer durations** and at **greater intensities**.
  3. They are often exposed to conditions that the general public can **choose to avoid** *(Kiefer et al. 2016)*.

Heat stress

Heat stress and health

- The rise in global temperatures will make '**heat stress**' more common.
- Heat stress refers to **heat received in excess of that which the body can tolerate** without suffering physiological impairment.
- Heat stress during work restricts a worker's **physical functions and capabilities**, **work capacity** and **productivity**.
- Excessive heat can increase **OSH risks and workers' vulnerability**, impacting **physical**, as well as **mental health**.
- It can lead to heat stroke, heat exhaustion, rhabdomyolysis, heat syncope, heat cramps, heat rash and even death *(NIOSH n.d.)*.

Workers most at risk of heat stress

- **Outdoor workers** in physically demanding jobs e.g. agriculture, construction and refuse collection.
- **Indoor workers** inside factories and workshops, where temperature is not regulated *(ILO 2019)*.
- Workers in **heavy clothes** or protective equipment e.g. pesticide spreaders and firefighters.
- Vulnerable worker groups are at particular risk of heat stress, for example, **child labourers** and **pregnant workers**.
- Workers **of all ages** can suffer from heat stress, even younger populations *(Ansah et al 2021)*.
- **Older workers** are particularly affected, because of their reduced heat tolerance and aerobic capacity *(Lundgren et al 2013)*.

It is a serious problem for a large proportion of the world's 1 billion agricultural workers and 66 million textile workers *(ILO 2019)*.

Chemicals and heat stress

Chemical agents can affect thermoregulatory mechanisms, which could reduce workers' capacity to adapt to thermal stress *(Johnson Rowsey et al. 2003)*.

- **Vasoconstricting substances**, such as lead and inorganic compounds, can hinder heat dissipation *(Vyskocil et al. 2005)*.
- **Organophosphorus compounds** and **carbamates** can cause acetylcholinesterase inhibition, which can modify responses associated with maintaining body temperature, such as skin blood flow, heart rate, respiration, and sweat secretion *(Leon 2008)*.
- Exposure to the **metal oxides** present in welding fumes can lead to a series of symptoms including fever (metal fume fever) *(Fine at al. 1997)*.
- **Pentachlorophenol (PCP)** can cause increases in metabolism, body temperature and sweating *(Gordon 2005)*.

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- A study in Quebec, Canada, by Truchon et al. (2014) looked at the occupations most at risk from concomitant exposure to chemicals and thermal stress.
- Risks were calculated for 136 occupations.
- Lower mean ratings were linked to higher risks.
- A risk rating equal to 1 was associated with occupations for which simultaneous exposure to thermal stress and chemicals was assessed as very high risk.
- Gold casters, roofers, casters, smelter operators and forge helpers were found to be most at risk, however all occupations show here were considered high risk.

Increasing risk

Occupations	Rating				n[4]
	Mean	S.D.	Min	Max	
Gold caster[1]	2.1	1.5	1	6	11
Roofer[2]	2.2	1.1	1	4	13
Caster[1]	2.3	1.5	1	6	13
Smelter operator[1]	2.3	1.6	1	5	13
Forge helper[1]	2.4	1.0	1	5	13
Firefighter[3]	2.4	1.8	1	7	12
Metal processing labourers[1]	2.5	1.1	1	5	13
Firing kiln labourer[1]	2.5	1.3	1	5	13
Smelting furnace helper[1]	2.5	1.3	1	5	13
Foundry labourer[1]	2.5	1,3	1	5	13
Casting helper[1]	2.5	0.9	2	5	13
Moulder[1]	2.5	1.3	1	6	13
Oven operator[1]	2.5	1.6	1	6	13
Ceramic kiln operator[1]	2.6	1.4	1	5	12
Brick kiln operator[1]	2.7	1.4	1	5	12
Metal fabricating machine operator[1]	2.7	1.6	1	6	13
Furnace operator[1]	2.7	1.7	1	6	13
Steel hardener[1]	2.8	1.5	1	6	13
Extruder[1]	2.8	1.6	1	6	12
Smelting furnace operator[1]	2.9	1.6	1	6	13
Die-casting machine operator[1]	2.9	1.6	1	6	12
Boilermaker[1]	2.9	1.5	1	5	12

[1] Non-metallic mineral product manufacturing/primary metal manufacturing/fabricated metal product manufacturing sector
[2] Construction sector
[3] Utilities/Public administration sector
[4] Number of experts who assigned a rating

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Ultraviolet radiation

- The complex interaction of greenhouse gases, climate change, and stratospheric ozone depletion, results in **increased ultraviolet (UV) radiation** that can affect all people, particularly outdoor workers.
- **Outdoor construction workers**, for example, can accumulate sufficient solar UV exposure over 30-40 years of work to more than **double their risk of non-melanoma skin cancer** *(Cherrie et al. 2021)*.
- Other high-risk occupations include **lifeguards, power utility workers, gardeners, postal workers and dock workers** *(John et al. 2020)*.
- Other health conditions include **sunburn, cataracts and melanoma** *(Wright and Norval 2021)*.

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Air pollution

Climate change and air pollution

- Various air pollutants increase **global warming** and global warming leads to formation of various **air pollutants** *(Schulte et al 2016)*.
- The most common pollutants considered in air pollution estimates include **fine (PM2.5) and course (PM10) particulate matter**, **ozone**, **nitrogen dioxide (NO_2),** and **sulfur dioxide (SO_2)**.
- Globally, **over 1.2 billion workers** spend most of their working hours outdoors, at risk for exposure to outdoor air pollution *(WHO 2018)*.
- Indoor workers are also impacted by air pollution.

450,000 deaths a year can be attributed to occupational exposure to air pollutants, although the real magnitude is likely to be much higher *(WHO 2021)*.

Air pollution and health

- The 2021 ILO Global Review linked ambient air pollution to **numerous health impacts** *(ILO 2021)*.
- Air pollution has been classified by IARC as **carcinogenic** to humans (Group 1).
- According to IARC there is sufficient evidence that air pollution can cause **cancer** of the lung *(IARC 2013a)*.
- Particulate matter, a major component of outdoor air pollution, has also been classified by IARC as **carcinogenic** to humans (Group 1) *(IARC 2013a)*.
- For **lung cancer** alone, air pollution causes 223,000 deaths/year worldwide *(IARC 2013b)*.
- Air pollution has also been linked to **stroke**, **heart disease**, **lung cancer**, and both chronic and acute **respiratory diseases**, including asthma.
- Outdoor workers in hot environments have increased respiratory rates and thus may be more affected by air pollution than other members of the general population *(Schulte et al. 2016)*.


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accidents

Climate change and major industrial accidents (MIA)

- Over the past decades, successive major accidents caused by chemicals, have caused **deaths**, **injuries**, significant **environmental pollution** and massive **economic losses**.
  - **Beirut, Lebanon (2020)**
  - Rouen France(2019)
  - Bentos Rodrigues, Brazil (2015)
  - Tianjin, China (2015)
  - West,Texas,USA (2013)
  - Gumi, Korea (2013)
- Rising temperatures and other effects of climate change have the potential to **increase the occurrence and severity of MIA**.

Rising temperatures and chemical volatility

- Rising temperatures due to climate change have the potential to **increase volatility of temperature-sensitive chemicals**, which could lead to another **serious accident** *(Truchon et al. 2014)*.
- Non-insulated, single skin chemical storage containers do not provide any form of manual temperature control. Temperatures inside these containers can reach as high as 50°C, when the ambient temperature is around 30°C.
- **'Thermal runaway'**, exponentially increased heat from a thermal reaction, can cause over-pressurisation due to violent boiling or rapid gas generation. This over-pressure may result in a plant **failing catastrophically** causing **blast or missile damage** *(HSE 2014)*.
- A release of flammable materials from the process could result in a **fire** or an **explosion**.

Climate change and natural hazards - Natech

- **Natural Hazards Triggering Technological Accidents** or '**Natech**' pose a serious risk for major industrial accidents
- A Natech event is a **technological accident triggered by a natural hazard**. These can include floods, earthquakes, lightning, cyclones and extreme temperatures.
- A **technological accident** can include damage to, and release of chemicals from, fixed chemical installations, oil and gas pipelines, storage sites, transportation links, waste sites and mines.
- Many natural disasters have led to **major damages** to hazardous installations, triggering the release of **hazardous substances**, **fires** and **explosions**.
- It is likely that the risk and impact of Natech events is increasing, due to a combination of **increasing industrialization and urbanization** coupled with a predicted **increase in hydro-meteorological hazards caused by climate change** *(WHO 2018)*.

Other impacts of severe weather events

- Climate projections point towards an **increase in the frequency and intensity of extreme weather events**, such as floods, drought, wildfires and hurricanes.
- These events put workers at **risk of physical injury**, **mental health conditions** and **death**.
- **First responders**, such as firefighters and healthcare workers, may be exposed to hazardous chemicals in the **immediate aftermath of extreme weather events**, for example if chemical storage facilities are damaged.
- Construction workers may also be exposed to chemicals during **clean-up operations.**

Case study: Construction workers and asbestos

- Intense Tropical Cyclone Idai in 2019 was one of the worst tropical cyclones on record to affect Africa and the Southern Hemisphere.
- The long-lived storm caused catastrophic damage, and a humanitarian crisis in Mozambique, Zimbabwe, and Malawi, leaving more than 1,300 people dead and many more missing.
- The cyclone left a high exposure of hazardous waste, primarily asbestos from lusalite sheets *(ILO 2019)*.
- Construction workers were particularly exposed when clearing up older damaged buildings.
- Asbestos can cause asbestosis, a chronic lung disease, and is classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1) *(IARC 2012)*.

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Wildfires and OSH impacts

- The increase in wildfires is a specific risk for firefighters as they may be exposed to **high levels of air pollution** *(Adetona et al. 2011)*.
- They will be more exposed to smoke and have a reduced firefighter recovery time between fire seasons *(Schulte et al. 2016)*.
- The base camps in which these firefighters live may contribute to their particulate matter exposures via **vehicle emissions, dust and generator use** *(McNamara et al. 2012)*.
- They may also be exposed to naturally occurring asbestos, during trail and forest road maintenance, timber stand grading, cutting fire lines, and while fighting fires *(Schulte et al. 2016)*.

Firefighters and PFAS

- Firefighters will also be increasingly exposed to hazardous chemicals **in firefighting foams - perflourinated chemicals (PFAS).**
- PFAS have been linked to cancers, with PFOA classified as possibly **carcinogenic** to humans (Group 2B) by the IARC.
- They are also known to interfere with **immune function**, **endocrine function** and **breast development**.
- Studies have shown female firefighters demonstrate an overall increased cancer risk compared to the general population *(Ma et al. 2006; Daniels et al. 2014)*.

PRIORITY ACTIONS:
Policy responses

Global trends: review of policy responses

- Overall **global lack** in policy response
- Most national policies developed in **European countries**
- **Around 70%** of identified responses published **during the last 5 years**
- Heat stress in relation to OSH often **anchored in climate change adaptation policies**
- Reviewed responses are in **half of the cases practical tools**, such as guides, action plans or risk analyses; besides strategies or legal provisions
- Various entities have published responses: e.g. Ministries of Labour, Ministries of the Environment, Ministries of Health, national OSH institutes (or similar)
- **More than the half** of reviewed responses **focus on heat stress** in particular

Australia: Australian Work Health and Safety (WHS) Strategy 2023-2033

Australia: Managing the risks of working in the heat

Austria: The Austrian strategy for adaptation to climate change

Bulgaria: National Climate Change Adaptation Strategy and Action Plan

Canada: Extreme Heat Events Guidelines: Technical Guide for Health Care Workers

Chile: Guía para la implementación de planes de reducción del riesgo de desastres

Chile: Guía para la implementación del plan para la reducción de riesgo de desastres (…) de la micro, pequeña y mediana empresa

Costa Rica: Reglamento para la prevención y protección de las personas trabajadoras expuestas a estrés térmico por calor

Cyprus: Code of Practice for Thermal Stress of employees

France: Le plan national d'adaptation au changement climatique

Germany: Climate change and Occupational Safety and Health

India: National Programme on Climate Change & Human Health

Luxembourg: Stratégie et plan d'action pour l'adaptation aux effets du changement climatique au Luxembourg 2018-2023

North Macedonia: Climate change health adaption strategy and acition plan

Peru: Ley del régimen laboral agrario y de incentivos para el sector agrario y riego, agroexportador y agroindustrial

Romania: National Health Strategy 2014-2020

Slovakia: Adaption strategy to climate change of the Slovak Republic

Spain: Plan Nacional de Adaptación al Cambio Climático (2021 - 2030)

Spain: Plan Nacional de actuaciones preventivas frente a los efectos del cambio climático en la salud de los trabajadores

Spain: Recomendaciones para que las empresas identifiquen impactos potenciales del cambio climático sobre la salud de los trabajadores

Spain: Programa de trabajo (2021-2025) Plan Nacional de Adaptación al Cambio Climático

Sweden: Health consequences of climate change in Sweden: A risk and vulnerability analysis

Switzerland: Adaptation aux changements climatiques en Suisse (2020-2025)

Türkiye: Turkey's National Climate Change Adaptation Strategy and Action Plan

Türkiye: National Program and Action Plan for Reducing the Negative Effects of Climate Change on Health

Uruguay: Decreto 38/022

Policy response – Country example: Australia

- Australian Work Health and Safety Strategy 2023-2033 - Vision: Safe & healthy work for all
- **Climate-related risks** have been identified as **emerging challenges**
- Acknowledging **danger of heat**, flooding and extreme weather events for workers
- By 2033 effective responses to structural workforce factors and impact of climate change

- Safe Work Australia has developed practical **guidance material on managing the risks of working in heat**
- Defines **duties of workers and employer**, provides overall criteria of **risk assessment** (e.g. air movement at workplace, ambient conditions, humidity, breaks to cool, fitness of workers), as well as a **first aid fact sheet** including symptoms (e.g. of dehydration, heat cramps, fainting)

Policy response – Country example: Cyprus

- Code of Practice for Thermal Stress of employees & Guide for implementation
- Especially on hot days, employers shall consult the **Code** which provides **measures** and **parameters** to protect workers' health
- A table which includes **the relation between of work change/ rest per hour and recording temperature as well as humidity** has been developed and provides a basis to calculate the workload
- **Example**: Workplace temperature: 38°C; Humidity 30%

- Light work: shall be continuous
- Moderate work: 75% work and 25% work/ change of work shall be applied
- Heavy work: 50% work and 50% of work/ change of work shall be applied

Policy response – Country example: Uruguay

- After death of a rural worker (struck by lightning of an electrical storm), Decree 38/022 for **work in adverse weather conditions in rural areas** has followed
- Diverse natural events may increase due to climate change, therefore there is a need for greater protection of workers' health
- During adverse weather conditions, **work tasks shall be suspended**
- In line with Convention 155 (Art. 13), **workers possess the right to remove themselves from dangerous situation** according to Decree 38/022
- Examples of covered extreme weather: winds, thunderstorms, **heat waves**

Additional policy level actions

Ratify and implement International Labour Standards

Occupational Safety and Health Convention, 1981 (No. 155) and Recommendation, 1981 (No. 164)
Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)
Occupational Health Services Convention, 1985 (No. 161)
Chemicals Convention, 1990 (No. 170) and Recommendation, 1990 (No. 177)
Major Industrial Accidents Convention, 1993 (No. 174) and Recommendation, 1993 (No. 181)
List of Occupational Diseases Recommendation, 2002 (No. 194)
Working environment (air pollution, noise and vibration) convention, 1977 (No. 148) and recommendation, 1977 (No. 156)
Asbestos Convention, 1986 (No. 162) and Recommendation, 1986 (No. 172)
Safety and health in agriculture convention, 2001 (No. 184) and recommendation, 2001 (No. 192)
Safety and health in construction convention, 1988 (No. 167) and recommendation, 1988 (No. 175)
Safety and health in mines convention, 1995 (No. 176) and recommendation, 1995 (No. 183)

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Additional policy options to consider

- **Integrate climate change issues as a fundamental component of OSH policy and practice.** Adaptation measures should be integrated into policies, programmes and risk assessments at all levels, using an OSH management systems approach, based on the ILO Guidelines on occupational safety and health management systems (ILO–OSH 2001).
- **Develop occupational exposure limits (OELs) for proxy measures of climate change.** For example, some countries have already adopted specific regulations to protect workers from heat exposure and ensuing heat stress. These include maximum temperatures to which workers may be exposed. There are currently no harmonized international standards for work in hot environments or other adverse weather conditions.
- **Ensure that workers have appropriate training and skills development for resilience-building and adaptation processes.** This will help displaced workers move to sectors with employment growth, thus protecting them against income losses, as well as promoting innovation, investment and competitiveness. Anticipating and monitoring skills needs related to climate change adaptation are crucial first steps in skills development. The active participation of the social partners helps identify skills gaps and implement training.
- **Mainstream gender into OSH policy and practice.** This should be done specifically in relation to climate change concerns.
- **Provide government funding to promote research and development work.** This should focus on climate change adaptation and the impact of climate change on chemical safety.
- **Carry out effective labour inspection services.** Inspectors should be provided with the means, qualifications and training to fulfil their duties, especially as they related to emerging risks due to climate change

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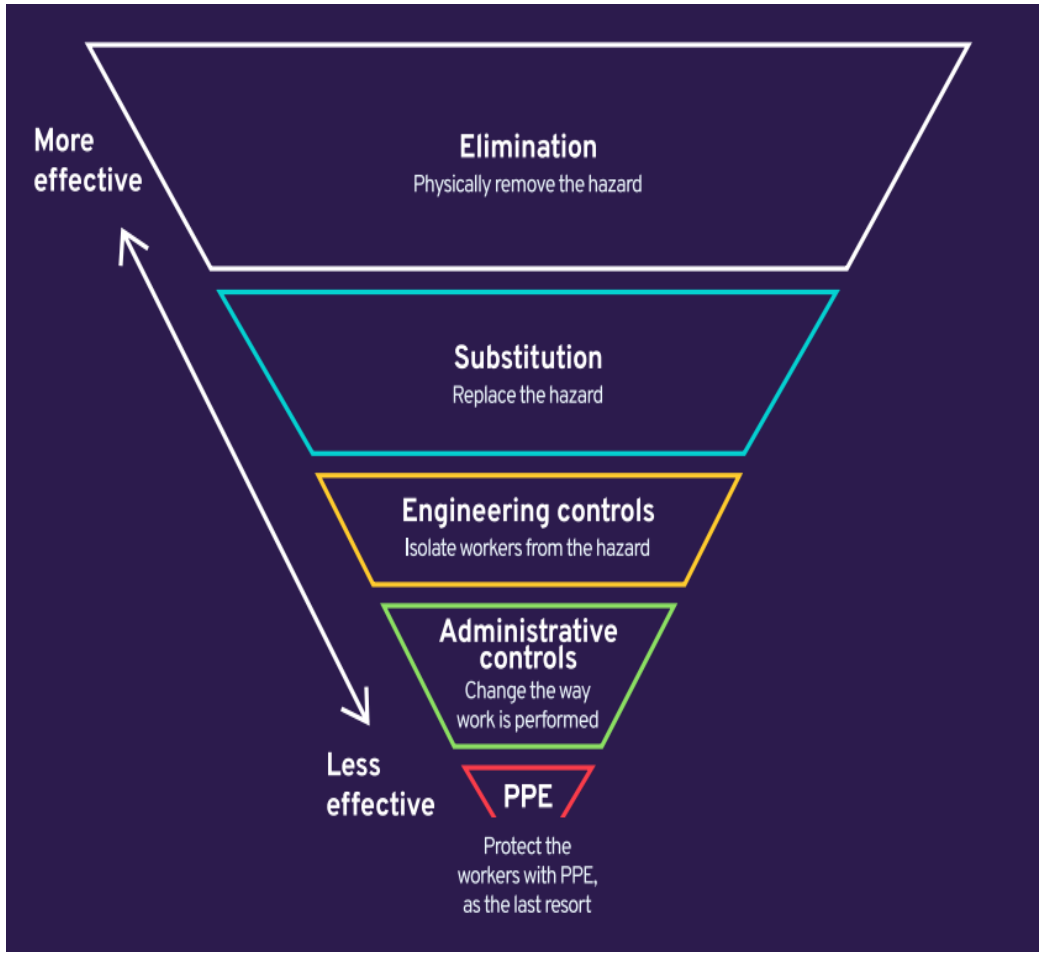
Enterprise level measures



Engineering controls (OSHA n.d.)

- Air conditioning (such as air-conditioned crane or construction equipment cabs, air conditioning in break rooms).
- Increased general ventilation.
- Cooling fans.
- Local exhaust ventilation at points of high heat production or moisture (such as exhaust hoods in laundry rooms).
- Reflective shields to redirect radiant heat.
- Insulation of hot surfaces (such as furnace walls).
- Elimination of steam leaks.
- Cooled seats or benches for rest breaks.
- Use of mechanical equipment to reduce manual work (such as conveyors and forklifts).
- Misting fans that produce a spray of fine water droplets.

Administrative controls (NIOSH n.d.)

- Limit time in the heat and/or increase recovery time spent in a cool environment.
- Reduce the metabolic demands of the job.
- Use special tools to minimize manual strain.
- Increase the number of workers per task.
- Train supervisors and workers about heat stress.
- Implement a buddy system where workers observe each other for signs of heat intolerance.
- Require workers to conduct self-monitoring and create a work group (i.e. workers, a qualified healthcare provider, and a safety manager) to make decisions on self-monitoring options and standard operating procedures.
- Provide adequate amounts of cool, potable water near the work area and encourage workers to drink frequently.
- Implement a heat alert program whenever the weather service forecasts that a heat wave is likely to occur.
- Institute a heat acclimatization plan and increase physical fitness.

Heat stress training programme for workers (NIOSH n.d)

- Employers should provide a heat stress training programme for all workers and supervisors about the following:
  - Recognition of the signs and symptoms of heat-related illnesses and administration of first aid.
  - Causes of heat-related illnesses and the procedures that will minimize the risk, such as drinking enough water and monitoring the color and amount of urine output.
  - Proper care and use of heat-protective clothing and equipment and the added heat load caused by exertion, clothing, and personal protective equipment.
  - Effects of nonoccupational factors (drugs, alcohol, obesity, etc.) on tolerance to occupational heat stress.
  - The importance of acclimatization.
  - The importance of immediately reporting to the supervisor any symptoms or signs of heat-related illness in themselves or in coworkers.
  - Procedures for responding to symptoms of possible heat-related illness and for contacting emergency medical services.

Case study: Heat stress and heavy PPE

- A study by Havenith et al. (2011) looked at improvements to protective clothing to alleviate heat strain, whilst maintaining protection against chemicals.
- Selectively permeable membranes with low vapour resistance were compared to textile-based outer layers with similar ensemble vapour resistance and also layers with increased air permeability.
- Heat strain was shown to be significantly higher with selectively permeable membranes compared to air permeable ensembles.
- Air permeability of the textile version improved ventilation and allowed better cooling by sweat evaporation.
- This was reflected in lower values of core and skin temperatures, and heart rate.
- Based on protection requirements, it is concluded that increased air permeability can reduce heat strain levels allowing optimization of chemical protective clothing.

A final word...

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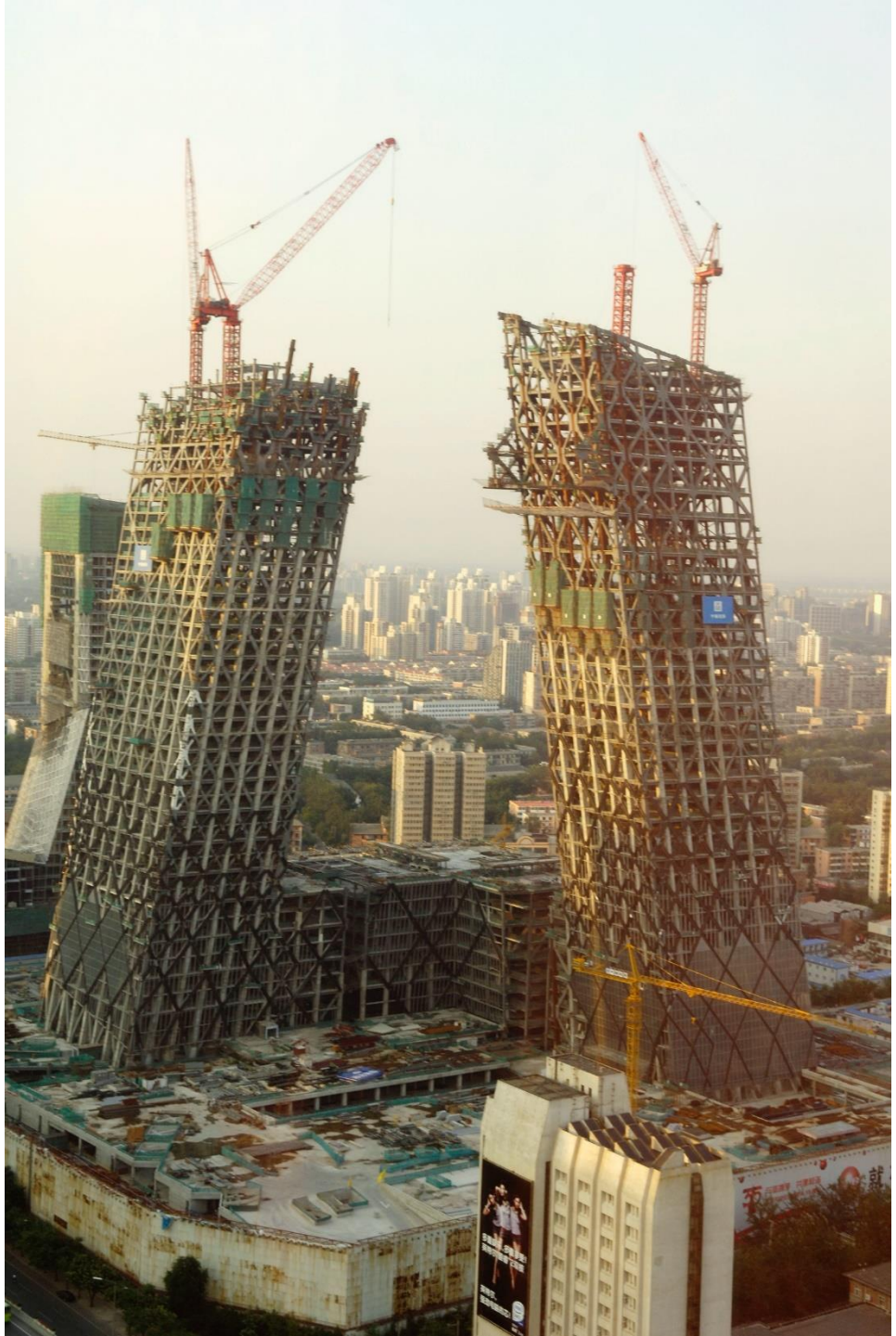
A rapidly changing world of work

- Emerging risks such as climate change will impact the world of work and **challenge existing OSH priorities.**
- **Key is to apply known frameworks** for addressing emerging risks – provisions of **C155 and C187**
- Instilling a **preventative safety and health culture** for emerging risks like climate change
- An **integrated approach** is essential to ensuring that climate change concerns are streamlined into OSH policies and programmes
- **Social dialogue provides a foundation** for action, especially for emerging OSH risks that may not yet have a framework for response



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Key ILO resources

- Working on a warmer planet: The effect of heat stress on productivity and decent work (2019).
- Exposure to hazardous chemicals at work and resulting health impacts: A global review (2021).
- World Employment and Social Outlook: Greening with Jobs (2018).
- The employment impact of climate change adaptation: Input document for the G20 Climate Sustainability Working Group (2018).
- The Sound Management of Chemicals and Waste in the World of Work (2019).
- Diagnostic and exposure criteria for occupational diseases - Guidance notes for diagnosis and prevention of the diseases in the ILO List of Occupational Diseases (revised 2010) (2022).

REFERENCES TO SCIENTIFIC STUDIES ON EACH SLIDE IN NOTES – AVAILABLE UPON REQUEST

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Thank you

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