Evolving the well-established

Project „Cement Skills 2030 to 2050“ – Final Report

Adam Aach, Dennis Behrouzi, Vanessa Griebling,
Manuel Mohr, Stefan Schäfer, Christina Schall

Dusseldorf, January 2025

Funded by
the European Union

Project overview

Abstract

Job profiles: Working in the cement industry – The skills project

The decarbonisation of cement production will require completely new qualification requirements and job profiles in the future. These must be taken into account in the training and further education of employees in the future.

In a new study commissioned by the European Federation of Building and Construction Workers' Unions (EFBWW) and CEMBUREAU, VDZ (the Association of German Cement Manufacturers) is analysing the extent to which the use of new technologies and production processes for the green transformation (including CCUS, hydrogen, new cements) will affect employment requirements in the cement industry. The project is funded by the European Commission.

The study, will first outline the requirements of the EU Green Deal and describe the industry's CO_2 reduction strategies. Based on expert workshops and interviews, case studies will be developed for six EU Member States (Belgium, France, Germany, Greece, Poland, Spain) to show the status quo of qualification and training structures as well as future training needs. The study provides recommendations for action for social partners and policy makers.

EUROPEAN FEDERATION OF BUILDING AND WOODWORKERS

CEMBUREAU The European Cement Association

Funded by the European Union

Table of contents

Evolving the well-established

Executive Summary – Project „Cement Skills 2030 to 2050“

Executive Summary: Objectives of the project & guiding questions

External (political) context	▪ The cement industry is undergoing multiple transformations - decarbonisation, digitalisation, demographic change. ▪ A wide range of policy and regulatory frameworks are impacting companies and their employees. ▪ Which parts of the regulatory and policy framework are most relevant to the cement industry? ▪ What skills requirements can be derived from this external context?
Status quo and future skills' requirements	▪ To manage these changes, the cement industry and its social partners need to identify strategies to prepare the workforce for this changing environment. ▪ What are the specific skills requirements from a technical, digital and regulatory compliance perspective? ▪ How can the existing workforce be reskilled and upskilled, while attracting new talent to the sector?
Future training requirements	▪ The use of new technologies, materials and managing the CCUS value chains, requires a new range of skills and competences. ▪ To what extent do companies' training concepts need to be adapted? ▪ What training approaches can help to successfully deliver new content and meet the needs of workers of different ages and cultural backgrounds? ▪ How can the social partners contribute these changes?
Policy recommendations	▪ From the results of the analysis, recommendations can be made on where existing training strategies, training provision and policy frameworks need to be refocused and made fit for purpose. ▪ What are the key take-aways for company management & HR departments, for trade unions & works councils and also for policy makers to make this transformation a success for employers, employees and society as a whole?

EU Green Deal and the cement sector

Cement manufacturing and products are affected by almost all policy areas

- The cement industry is affected by almost all elements of the Green Deal with the EU Emissions trading scheme (EU ETS) including the Innovation Fund and the Carbon Border Adjustment (CBAM) being the key policy areas for the transformation and competitiveness of the sector in Europe.
- Zero pollution policies also have a strong impact on the success of the transition, especially with regard to the Industrial Emissions Directive as the basis for permitting procedures.
- The increasing complexity of the regulatory framework and reporting requirements is challenging cement producers across Europe, placing a heavy administrative burden on companies and requiring new skills and personnel to comply with new regulations.
- Looking at the whole value chain of cement and concrete, new requirements and skills for the use of building materials, the whole life cycle carbon footprint of buildings, the development of lead markets for low carbon and near zero building products are becoming increasingly important for the industry.

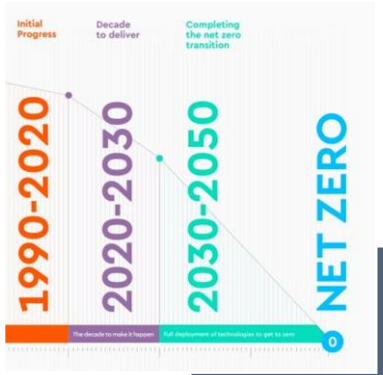
European skills‘ policies and the cement sector

Executive Summary

Various strategies and action plans with fairly limited positive impact on companies

- European Skills Agenda provides overall framework for skills policy in the EU. A number of action plans and measures have been launched as a result. However, the impact "on the ground" in the cement industry is limited. Policies should be more tailored to industry-specific needs and realities to make EU support more actionable.
- There is a lack of wider understanding of how to take advantage of available support schemes or benefit from concrete actions at national level. The initiatives and actions are often complex, with varied eligibility criteria, application processes and specific sectoral requirements that can be challenging for companies to navigate.
- EU and national skills policies should in future be more responsive to the specific needs of enterprises and workers, in order to ensure transparency about what is actually being done and how enterprises' education, lifelong learning, retraining and upskilling strategies can actually benefit from the instruments at their disposal.

Transition pathways and the cement sector



From roadmaps to implementation – a net zero industry is possible

- Various roadmaps at national, EU and global level identify the key levers for decarbonisation. They are all based on the so-called 5C approach, which looks at the entire value chain from clinker, cement and concrete to construction and (re)carbonation (= uptake of CO_2 in concrete structures).
- Approximately two thirds of the emissions from clinker and cement production can be reduced through conventional measures such as higher energy efficiency, alternative fuels and the efficient use of clinker in cement, cement in concrete and concrete in construction.
- To achieve climate neutrality the use of carbon capture, transport, storage and utilisation (CCS) is a necessity. It involves high costs and new infrastructure across Europe.
- Therefore, the cement industry is dependent on a regulatory framework that enables the deployment of CCUS and the build-up of transport and storage infrastructure in the 2030s.
- At the same time, decarbonisation requires collaboration along the cement and concrete value chain, using the full leverage of process and product innovation.

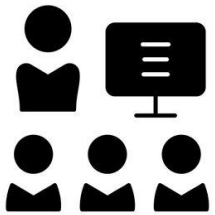
Concept of skills used in the study

Skills requirements, education & training today and tomorrow

- As decarbonization is the most crucial and challenging transformation process in the cement industry, the study design focuses specifically on an in-depth analysis of the professional skills requirements.
- In parallel, the development and implementation of innovative technologies in the industry will inevitably lead to an increase in new digital systems and programs, which require new skills of the work force.
- Language and interpersonal skills will also become increasingly important. However, the study's focus is exclusively on the professional and digital skills.
- A clear classification of occupations in the cement industry is essential. For the purpose of the study, the International Standard Classification of Occupations 2008 (ISCO-08) was used, which provides internationally comparable definitions.

Executive Summary

1st Workshop‘s results at a glance



Summary of key findings

- High demand for specialists in risk management, automation, environmental technologies and communication, particularly in areas like chemicals and new technologies.
- Important soft skills such as empathy, adaptability, creativity, and leadership are crucial for successful project implementation and stakeholder engagement.
- Growing importance of AI and new technologies: Training on safety and AI-driven processes is essential across all occupational groups.
- Lifelong learning becomes increasingly important: Develop tailored, hands-on training programs for different target groups to ensure skills transfer.
- Enhancing sector attractiveness through social dialogue, improved working conditions, and intergenerational collaboration.
- Addressing demographic challenges to tackle skilled labor shortages through educational cooperation and industry-specific training programs.

Online Survey / Status quo analysis

Summary of key findings – Skills, education & training today

- Majority of companies with training strategy in place or in development, 20% mention no specific plan.
- Collective agreements between the social partners on employee training with different status across countries. Individual training programmes at company level are mainly determined by HR departments.
- Participation in training programmes varies for the following reasons: 1) training needs; 2) employee motivation; 3) time for training; 4) cost of training; 5) no suitable offers. The level of participation in training also appears to vary partly by occupation or age group.
- Training topics today dominated by health & safety in all countries, higher variation among other topics, i.e. environment & climate protection, soft skills, quality assurance & analytics.

Executive Summary

Online Survey / Status quo analysis

Summary of key findings – Training formats & image of the sector today

- External in-person training courses and e-learning are the most commonly used training formats. Most participants were satisfied with the training materials provided, but still room for improvement.
- Personal interaction is the most important form of internal communication about changes, new technologies and associated health & safety topics.
- The cement industry has a rather negative image as a place to work. However, this perception is dynamic, i.e. the image is changing either positively (decarbonization) or negatively.
- Shortage of skilled labour already today, especially technicians, associate professionals & machine operators - negative trend expected in coming years.

Executive Summary

Online Survey / Future skills and training analysis

Summary of key findings – Future skills and training requirements (Part 1)

- Carbon capture, transport, handling and digitalisation will become most relevant professional skills.
- Digital process control, data safety and literacy as most pressing digital skills.
- Emissions trading, circular economy and sustainability monitoring as key compliance skills.
- Priority topics for future training programmes are decarbonisation technologies, new SCMs, alternative fuels & biomass, and circularity & digitalisation. Emerging issues such as cyber security, plant safety and stakeholder management with lower ratings but increasing relevance.

Executive Summary

Online Survey / Future skills and training analysis

Summary of key findings – Future skills and training requirements (Part 2)

- On-the-job and blended learning are seen as most promising training approaches for the future, with specific recommendations: expand blended learning programs by integrating e-learning with in-person training
  - invest in internal trainers and mentors by establishing a structured mentoring program
  - highlight the benefits of training by clearly linking it to career growth and development opportunities.
  - implement skills management programs to track progress and provide feedback.
- Training providers are expected to offer collaboration, hands-on workshops, and flexible learning formats.
- Trade unions expected to provide advice & information, collective agreements & partnerships in training.

Executive Summary

Case studies at a glance

Spotlight on some key findings

- Collective agreements on employee training appear to have a very different status in the various countries. France, Belgium and Greece in particular rely more heavily on this instrument. Other dedicated agreements on training between companies and other institutions seem to exist in all countries to some extent, showing a particular importance in Spain.
- Health and safety issues arising from the use of new technologies are already part of communication activities at company level according to the majority of respondents in Spain, but much less so in other countries.
- Overall, there are similar priorities for future skills, training topics and formats in all countries, most of which are related to the decarbonisation of industry, i.e. carbon capture technologies and CO_2 management. There are only minor differences in the lower-ranked skills and training topics, such as knowledge of electrical infrastructure, cyber security, hydrogen and leadership. In terms of training formats, mentoring programmes are considered more important only in Greece.
- Attractiveness of the sector is reported to be positive or rather neutral in Greece and Poland. In all other countries the cement industry is, by the majority of respondents, not perceived to be an attractive sector to work in.

1 Project overview

- The project team
- VDZ – at a glance
- Timeline
- Objectives

The project team

Project Coordinators

Slavica Uzelac – EFBWW

Miette Dechelle – CEMBUREAU

Project Steering Committee

Around 20 representatives from EFBWW and CEMBUREAU affiliates (countries: DE, FR, PL, ES, GR, IT, NL, BE)

Consultants (all VDZ)

Manuel Mohr
- Political scientist, Master in EU-studies, law and economics
- Head of political and economical affairs department in VDZ
- 12 years experience in the sector
- Coordinator of social partner initiative in Germany

Christina Schall
- Master in pedagogy
- Junior manager education and training department of VDZ

Dennis Behrouzi
- Economist
- 11 years with VDZ
- Data- and market analyses, construction policies, natural resources, wastes, circular economy, resource efficiency

Stefan Schäfer
- Chemist
- Head of environment and plant technology department in VDZ
- 25 years experience in the sector
- Head of education and training

Vanessa Griebling
- Master in pedagogy
- Junior manager education and training department of VDZ

Adam Aach
- Master in Politics and Public Administration
- Junior manager climate and energy policy

VDZ – at a glance

Globally recognized research and competence center for cement and concrete

Service & Consulting

As an international technical and scientific service provider for the cement and building materials industry, VDZ provides full services in cement, concrete and environmental protection. With our interdisciplinary team of experts, we cover the entire value chain from one source.

Research

VDZ pools the joint activities of German cement manufacturers to promote knowledge, technology and research and development in the field of manufacture and use of hydraulic binders. Innovations drive our daily objective: To shape the future of the cement and concrete industry.

Certification

Certification is a separate, independent and non-partisan area supplementary to VDZ's service portfolio. It is performed by the recognised autonomous certification body VDZ Cert. This ensures the independent monitoring and certification of construction products to satisfy the protective purposes of the Construction Products Regulation and the Federal State Building Codes.

The Association

VDZ (Verein Deutscher Zementwerke) is the economic, technical and scientific association for the German cement industry. Its aim is to uphold and promote the joint economic interests of the cement industry and to promote technology and science, including pre-competitive research and development in the field of manufacture and use of hydraulic binders.

Project overview

Contents and guiding questions

External Context

- European Green deal
- Just Transition Mechanism
- European Skills Agenda
- Transition pathways

Status Quo and Future Skills Requirements

- Focus: Professional and digital skills

Education and Requirement for Training in the Future

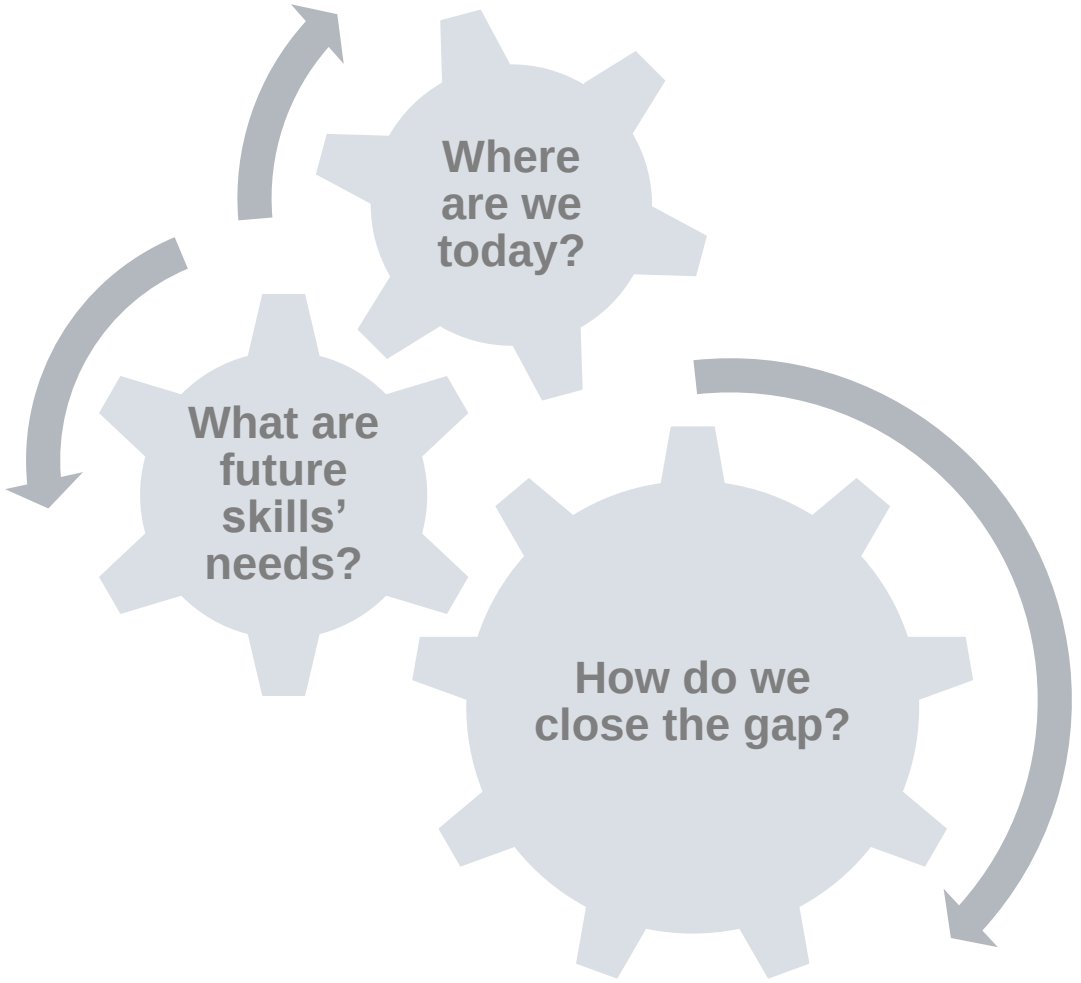
- Future education, training and new leadership
- Demographic change and attractiveness of the sector

Case Studies

- Belgium, France, Germany, Poland, Greece, Spain

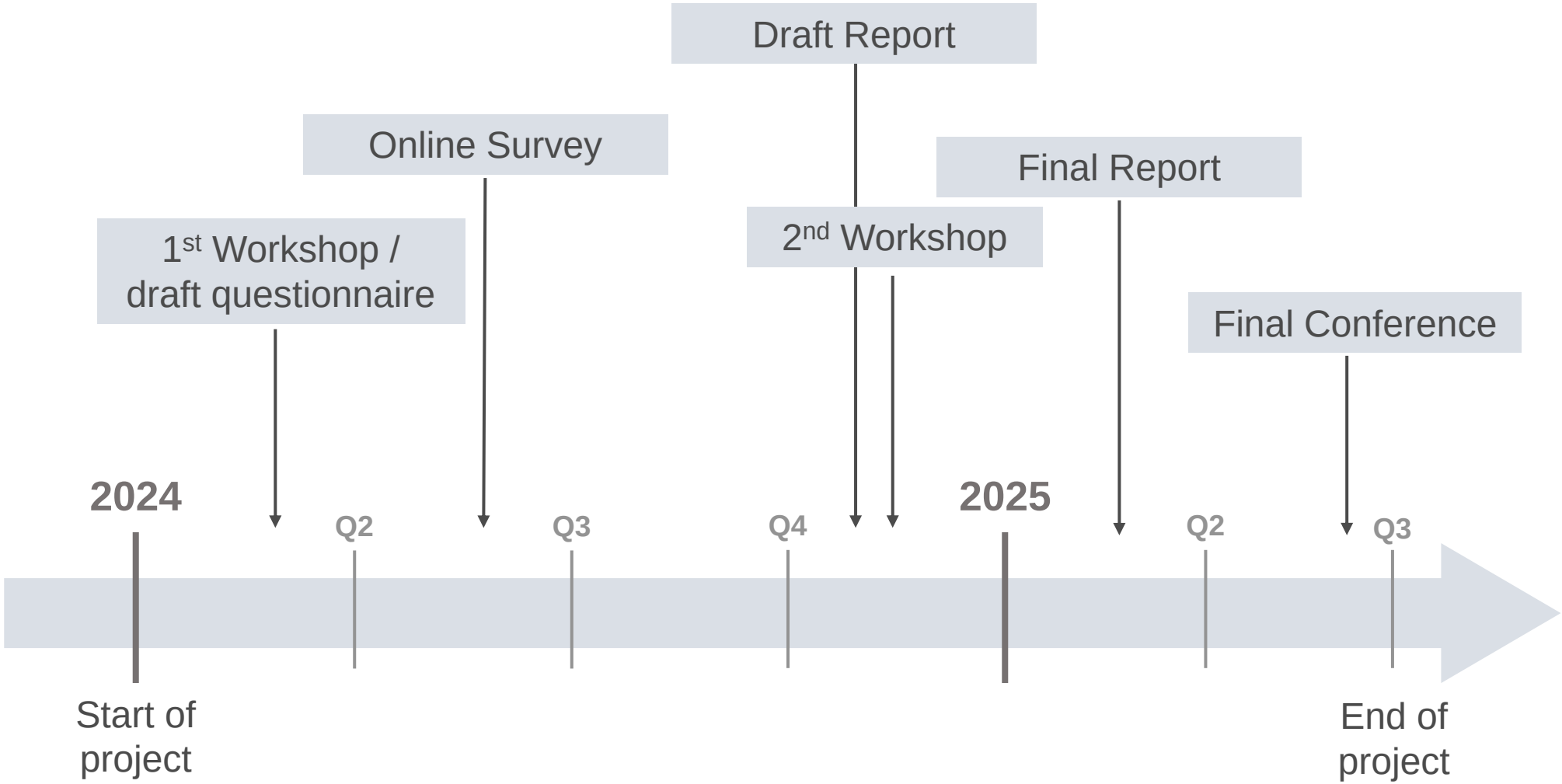
Workshops, Online Survey & Report

Policy Recommendations



Project overview

Timeline and milestones



2 The transformation(s) of the cement industry – external context

- European Green Deal
- Just Transition Mechanism
- European Skills Agenda
- Transition pathways

2.1 EU Green Deal

European Green Deal

Overview

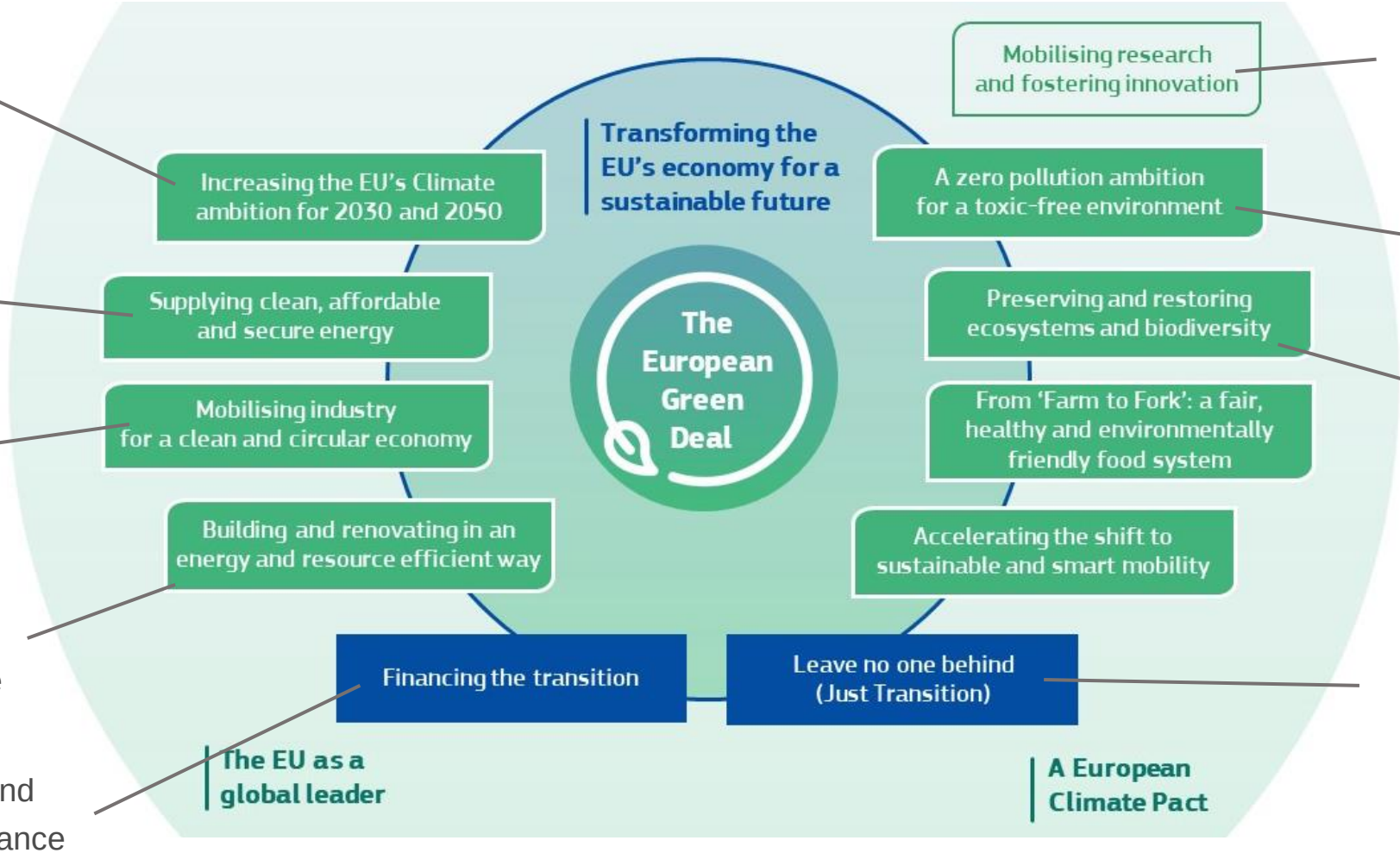
Climate Targets
Emissions Trading, Carbon Border Adjustment

Renewable energies and energy efficiency

Circular Economy Action Plan

Renovation Wave
Energy Performance and Buildings Directive

Innovation Fund
Sustainable Finance



Innovation Fund
Net Zero Industry Act

Zero Pollution Action Plan

Industrial Emissions

Sustainability reporting

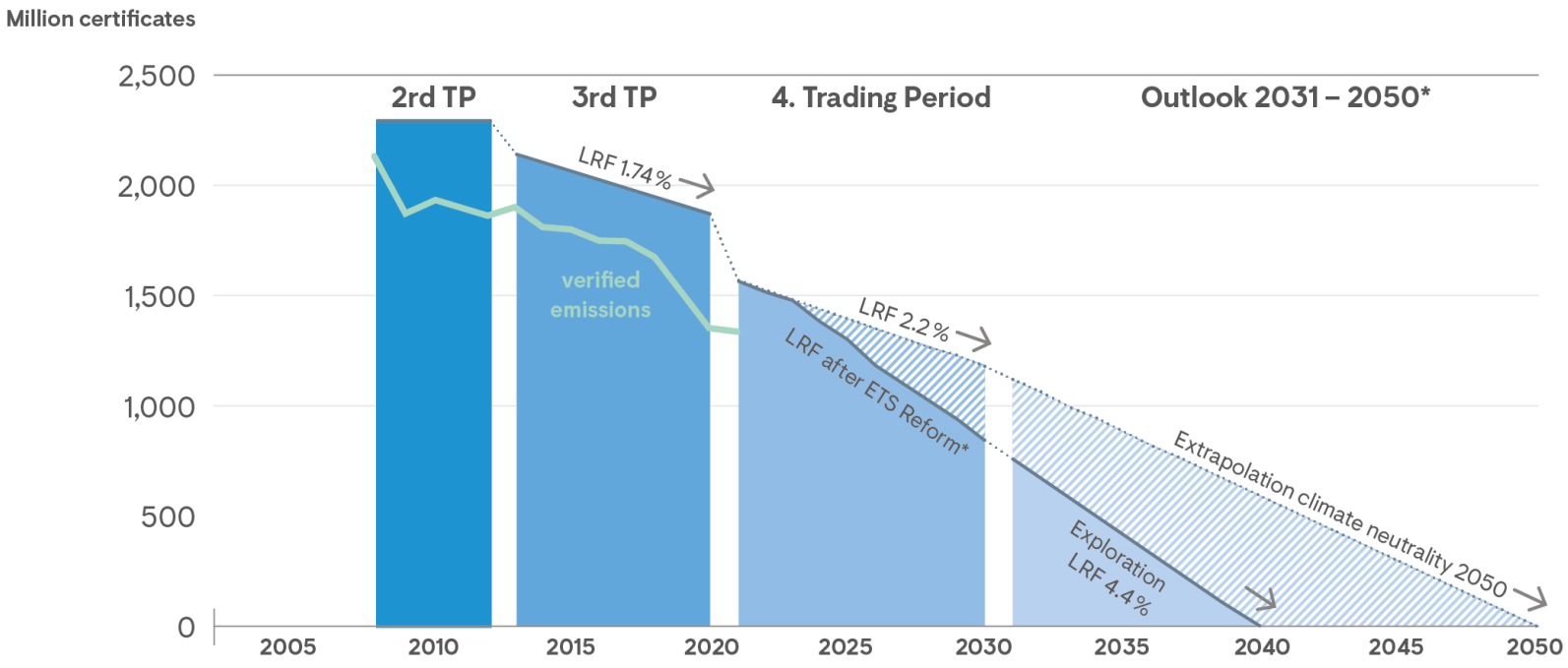
Just Transition Fund

Source: European Commission

Emission Trading System (ETS)

Evolution of emission budget – „pacemaker“ for the decarbonisation of the cement sector

- The cement industry (clinker production) is covered by the EU ETS.
- The EU ETS sets an overall emissions budget that decreases over time at increasingly stringent annual reduction rates.
- With the latest reform, free allocation to the cement sector will end from 2034, and the EU ETS requires climate neutral production, with the emissions budget reaching zero around 2040.



Sources: VDZ based on Federal Environment Agency, EU Commission, EU ETS Directive
* Assumptions for projection: Update of the original reduction path (linear reduction factor LRF 2.2% p.a.) with climate neutrality in the EU ETS by 2050; update of the current reduction path in the EU ETS (LRF 4.3% from 2024 and 4.4% p.a. from 2028) leads to climate neutrality around 2040. Effects not taken into account: Market stability reserve, inclusion of waste incineration plants from 2028 onwards, possible inclusion of ETS 2 (transport, buildings, other industrial plants); possible offsetting of negative emissions

Emission Trading System (ETS)

Most relevant provisions for the cement industry

Climate targets and overall cap

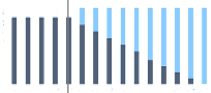
- New 2030 climate target for ETS sectors: -62% instead of -43% compared to 2005
- Continued disproportionate contribution of ETS sectors to EU climate targets

Conditionalization of benchmark allocation

- Linking benchmark allocation to investments in energy efficiency
- Transformation plans for "worst performers"

Accounting of CCS and CCU

- CCS recognised as CO_2 reduction
- CCU only with „permanent binding“
- Negative emissions: Review request for offsetting, report by 31 July 2026



Benchmark allocation and CO_2 border adjustment

- Multi-year, gradual transition
- Start of BM meltdown 2026, end of BM allocation 2034 (for CBAM sectors)

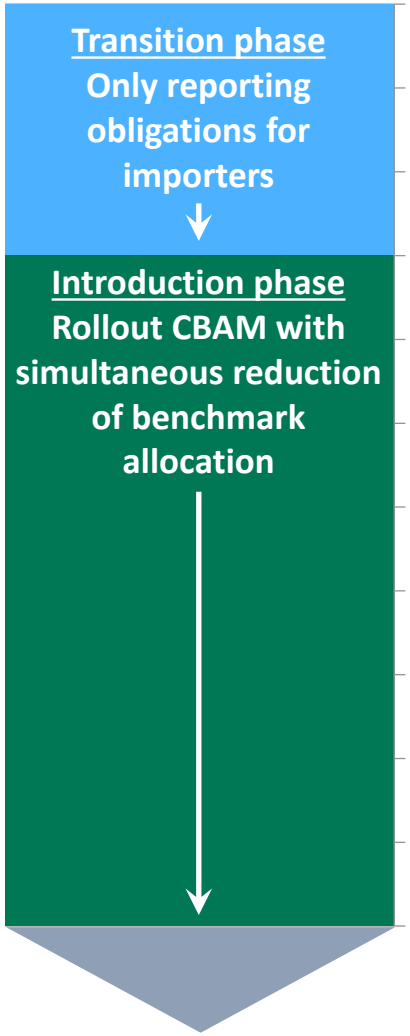
Expansion of CO_2 pricing to other sectors

- New ETS 2 for buildings, transport; non-ETS industry expected from 2027
- Expansion of maritime transport from 2024, waste incineration expected from 2028

Source: VDZ based on the EU ETS Directive (EU 2023/959)

Carbon Border Adjustment Mechanism (CBAM)

Overview – imports of clinker and cement to the EU covered by the new regulation

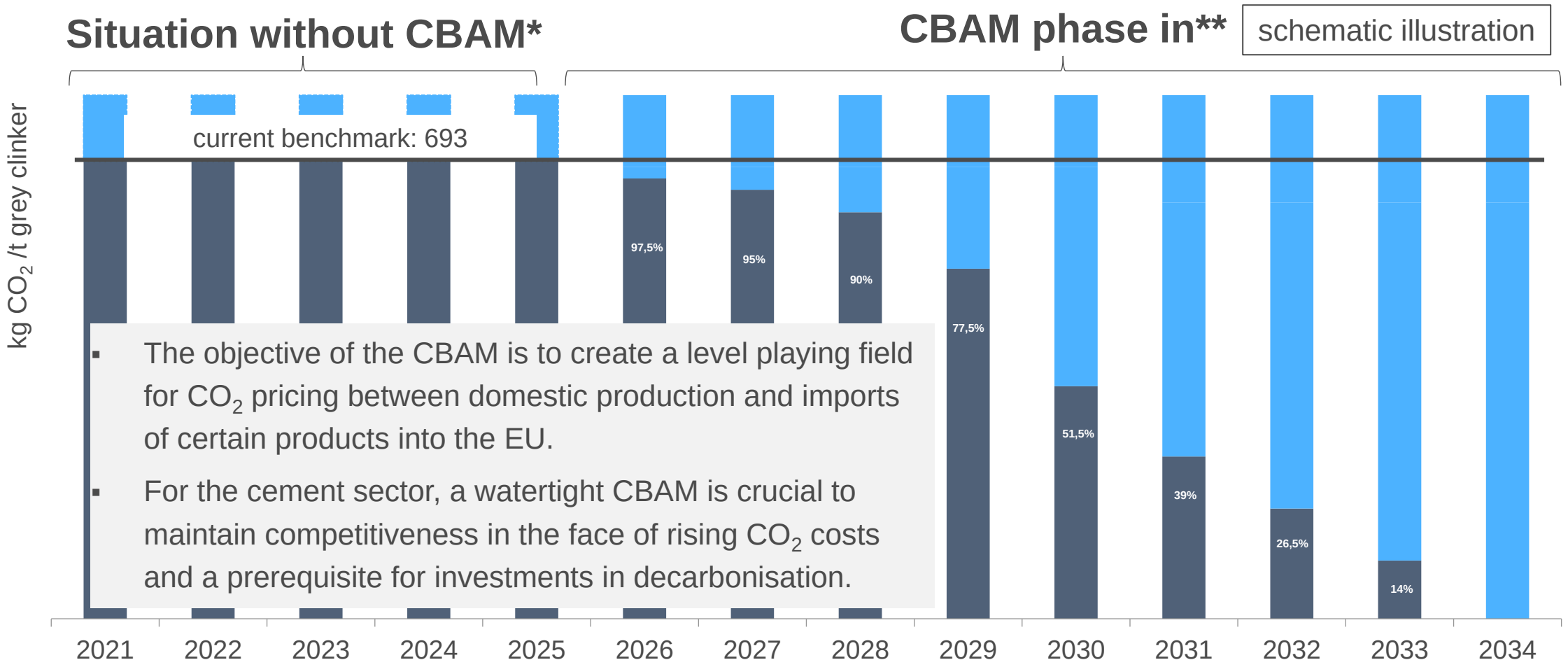


2023	Products: Cement and clinker, electricity, fertilizer, steel, aluminium, H_2 Direct and (depending on the sector) indirect emissions
2024	
2025	Obligations for importers: registration, CO_2 reporting, surrender of CBAM certificates analogous to "allocation gap"
2026	
2027	CBAM certificate price is based on auction prices in the EU ETS
2028	
2029	Recognition of CO_2 prices in the country of origin possible (proof)
2030	
2031	Enforcement: National customs and CBAM authorities + EU Commission
2032	
2033	Sanctions in the event of non-compliance + Check in the event of indications of circumvention
2034	

Source: VDZ based on the CBAM-Regulation (EU 2023/956)

Carbon Border Adjustment Mechanism (CBAM)

Phase-out of free allocation by 2034 requires watertight CBAM to maintain competitiveness



- The objective of the CBAM is to create a level playing field for CO_2 pricing between domestic production and imports of certain products into the EU.
- For the cement sector, a watertight CBAM is crucial to maintain competitiveness in the face of rising CO_2 costs and a prerequisite for investments in decarbonisation.

*) CBAM pilot phase from 2023 only includes reporting obligations for importers without verification, purchase/submission of CO_2 certificates, no reduction in benchmark allocation
**) Assumption benchmark 2026-2030: 684 kg CO_2 /t grey clinker; assumption benchmark 2031-2035: 630 kg CO_2 /t grey clinker; no CSCF
Source: VDZ based on the CBAM-Regulation (EU 2023/956) and the EU ETS Directive (EU 2023/959)

EU Innovation Fund

The EU fund for climate policy, with a focus on energy and industry

Source: European Commission

- The EU Innovation Fund is designed to support the development and deployment of innovative low-carbon technologies in Europe by providing substantial financial support for breakthrough innovations in sectors that are crucial to this transition.
- It supports projects that can contribute significantly to reducing greenhouse gas emissions, as well as those that promote a circular economy and enhance energy efficiency.
- The fund is geared toward large-scale projects of energy-intensive industries, renewable energy, energy storage, carbon capture, utilization, and storage (CCUS), and low-carbon hydrogen.

EU Innovation Fund

Selected* Projects in the cement industry

*only approved projects are considered

HOLCIM

C2B – Carbon2Business
Lägerdorf, Germany

Heidelberg Materials

GeZero
Geseke, Germany

HOLCIM

GO4ZERO
Obourg, Belgium

CEMEX

CLYNGAS
Alicante, Spain

HOLCIM

KOdeCO net zero
Koromačno, Croatia

CEMEX

CO2LLECT
Rüdersdorf, Germany

HOLCIM

GO4ECOPLANET
Bielawy, Poland

DEVNYA CEMENT
HEIDELBERGCEMENT Group

ANRAV
Devnya, Bulgaria

HERACLES GENERAL CEMENT CO.

OLYMPUS
Milaki, Greece

TITAN CEMENT GROUP

IFESTOS
Elefsina, Greece

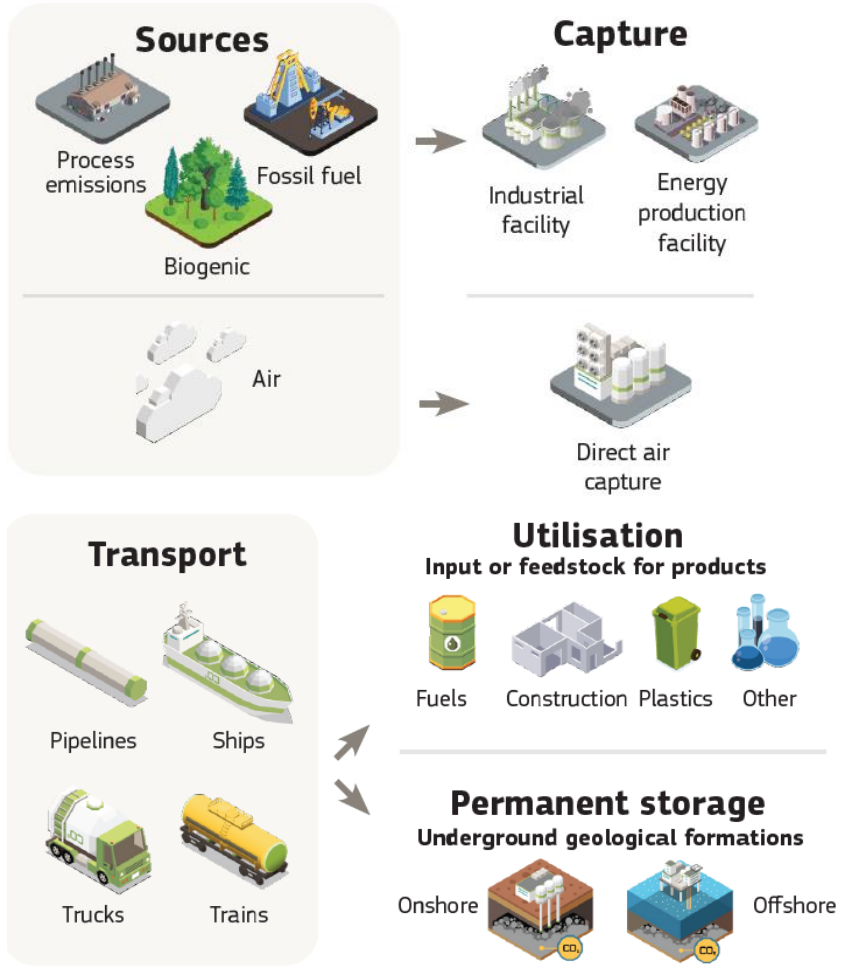
Source: VDZ / Logos and project images of the companies / European Commission

Source: https://www.cembureau.eu/innovation/map-of-innovation-projects/

EU Industrial Carbon Management Strategy (ICMS)

Important foundation for CCUS deployment in the cement sector – but implementation is key

- Sets out the framework, objectives and areas for action for CO_2 capture, transport, storage and utilisation (CCS/CCU), including negative emissions ("carbon removals").
- Targeted capture volumes in the EU ~50 million tons/year by 2030, from 2040 ~280 million tons/year and from 2050 ~450 million tons/year of CO_2 in the EEA
- By 2030, capture of CO_2 from process emissions ~90% of total capture volume. By 2040, ~45% process emissions and ~45% biogenic & atmospheric CO_2 of total capture volume. By 2050 biogenic CO_2 and direct air capture (DACCS) expected to dominate with share of ~60%.
- CCU for production of synthetic fuels, chemicals, polymers or minerals
- Multimodal, cross-border CO_2 transport by pipeline, rail, road, ship with first hubs by 2030. From 2040 preferably through pipeline infrastructure, estimated to be 19,000 km long and costing €16 billion in 2040
- Comprehensive regulatory package and demand platform planned, including accounting rules for transport & use in products by 2026



Source: European Commission (COM/2024/62 final) Towards an ambitious Industrial Carbon Management for the EU;

Carbon Management – other Initiatives

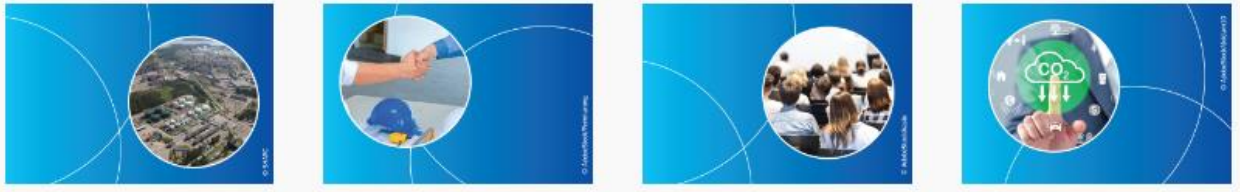
Important EU initiatives for deploying and scaling CCUS projects in Europe

Net Zero Industry Act (NZIA)

- Promotes domestic production of net-zero technologies to achieve climate targets and strengths Europe's international leadership in green industrial technologies
- Sets target of 50 Mio. t annual injection capacity in strategic CO_2 storage sites in the EU by 2030
- Establishes CO_2 capture and storage (CCS) as an economically viable climate solution, in particular for hard to abate energy-intensive sectors
- Accelerates permitting procedures for the deployment of strategic decarbonization technologies

Source: European Commission

CCUS Forum



Source: European Commission

Renewable Energy Directive (RED)

Relevant for the use of biomass, CCU and hydrogen in clinker production

Biomass waste

- Defines sustainability requirements for biomass crediting
- RED I: Only GHG calculation required for liquid waste
- RED II: Extension to solid and gaseous waste

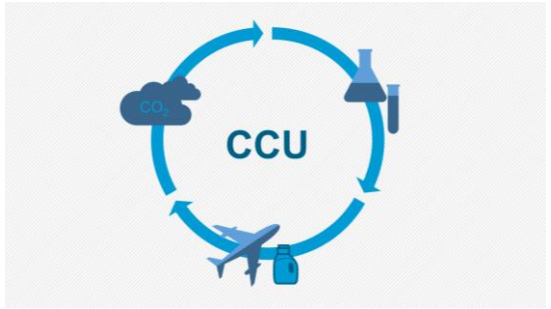
Carbon Capture & Utilization (CCU)

- Sets requirements for industrial carbon sources (Delegated Act)

Green hydrogen – Rules for the production of RFNBO

- *Additionality* (Art. 5): Simultaneous increase of renewable electricity
- *Temporal correlation* (Art. 6): Electricity must be consumed by the electrolyser in the same hour as it was fed in
- *Geographical correlation* (Art. 7): The renewable energy plant is located in the same bidding zone as the electrolyser

Source: Vecoplan



Source: Umweltbundesamt

Source: European Commission

Source: European Commission

Zero Pollution Action Plan

Air pollution in focus – with significant effects on industrial permitting procedures

- In May 2021, the EU Commission adopted its Action Plan: "Towards a Zero Pollution for Air, Water and Soil“ including a zero pollution vision for 2050 (see illustration).
- During the publication of this plan, the EU revised two important directives: the Industrial Emissions Directive (IED) and the Ambient Air Quality Directive (AAQD).
- The IED is the most important regulatory basis for the authorization, operation, monitoring and decommissioning of environmentally relevant industrial installations, such as cements plants. With its revision it introduces mandatory environmental managements systems and a more ambitious approach for limiting air pollution.
- In addition, the AAQD sets new immission limit values for dust, nitrogen oxide and sulphur dioxide to be applied by 2030. Both directives tend to make industrial transformation more challenging regarding permitting procedures.

- **Air**: reduce by more than **55%** premature deaths caused by air pollution;
- **Water**: reduce waste, plastic litter at sea by **50%** and microplastics released into the environment by **30%**;
- **Soil**: reduce nutrient losses and chemical pesticides' use by **50%**;
- **Biodiversity**: reduce by **25%** the EU ecosystems where air pollution threatens biodiversity;
- **Noise**: reduce by **30%** the share of people chronically disturbed by transport noise;
- **Waste**: reduce significantly total waste generation and by **50%** residual municipal waste.

The zero pollution vision for 2050:
Air, water and soil pollution is reduced to levels **no longer harmful to health and natural ecosystems** thus creating a toxic free environment.

Source: European Commission

Zero Pollution Action Plan

Another focus on the reduction of harmful chemicals

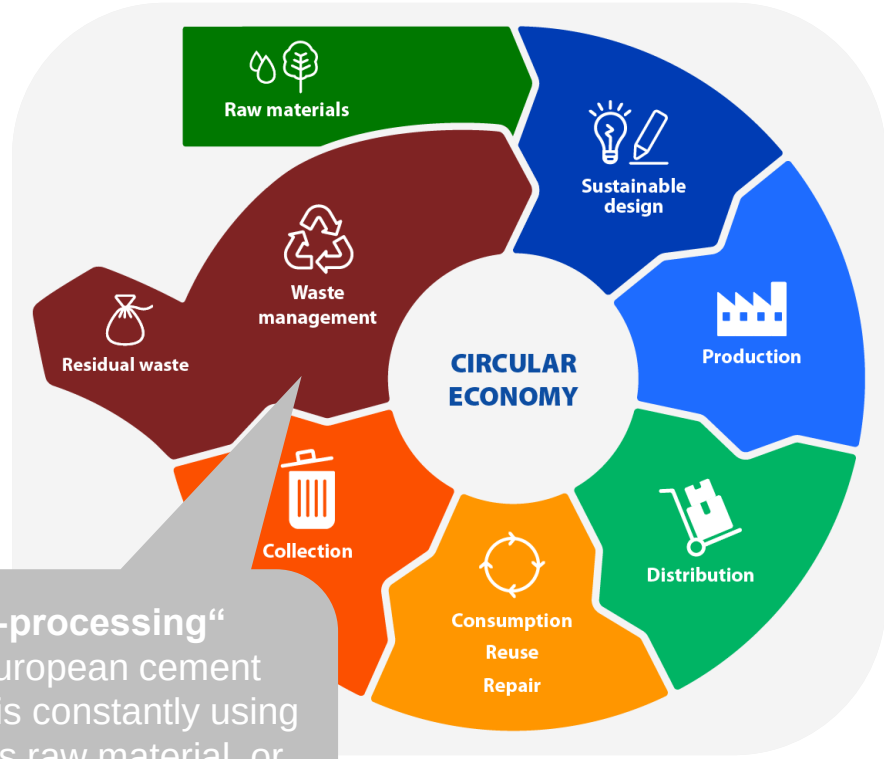
- The EU's Zero Pollution Ambition also focuses on harmful chemicals and aims to stimulate innovation by promoting the use of safer and more sustainable chemicals - part of the EU’s Chemicals Strategy for Sustainability.
- REACH and CLP regulations are the instruments to achieve these goals and are managed by the European Chemicals Agency ECHA.
- REACH restricts the content of soluble chromium VI in cements, requiring knowledge of how to handle reducing agents.
- Phase out of per- and polyfluoroalkyl substances (PFAS) in the EU becomes more important. It is expected that fuels for the clinker burning process will contain more PFAS, which will require skills for appropriate handling and monitoring.

Source: ECHA, EU
Note: REACH = Regulation, Evaluation, Authorisation and Restriction of Chemicals; CLP = Classification, Labelling and Packaging

Circular Economy Action Plan

A strategy that has led to several adaptations of EU legislation relevant to cement and concrete.

- In March 2020 the EU Commission adopted a new circular economy action plan to create a "coherent framework" for sustainable products, a functioning EU internal market for secondary raw materials and to reduce wastes.
- On this basis several European legal acts were revised, such as the Ecodesign for Sustainable Products Regulation (ESPR) or the new Construction Products Regulation (CPR).
- While the CPR applies to EU wide harmonised products, such as cement, ESPR applies to anything else, such as concrete. It “reinforces the range of ecodesign requirements that can be set for products, which can comprise requirements relating to durability, circularity and the overall reduction of the environmental and climate footprint of products, amongst many others.” The CPR goes a similar way and requires to extend their declaration of conformity with additional information such as the CO_2 footprint.



“Co-processing“
The European cement industry is constantly using waste as raw material, or source of energy to replace natural mineral resources and fossil fuels

Source: European Commission

Energy Efficiency Directive (EED)

Obliges EU member states and companies to increase their energy efficiency

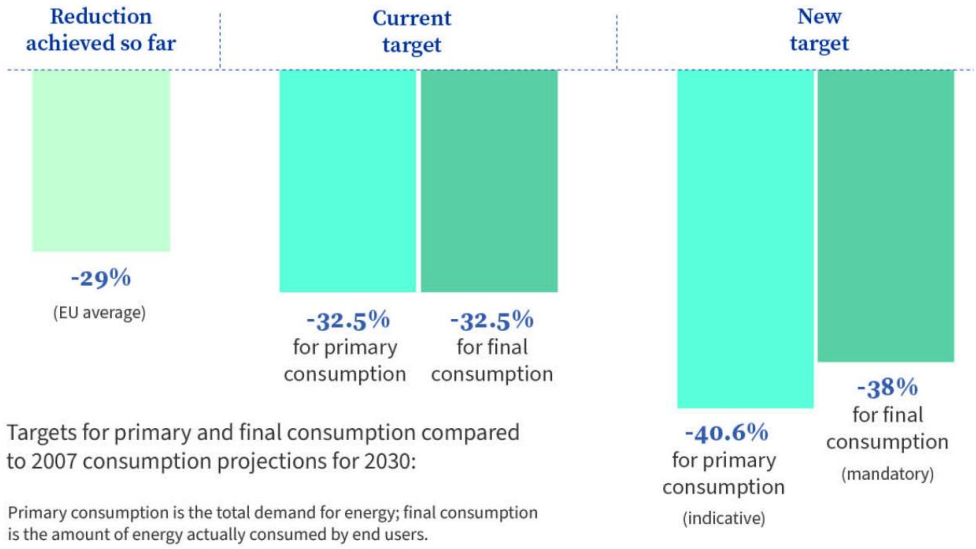
Key objectives

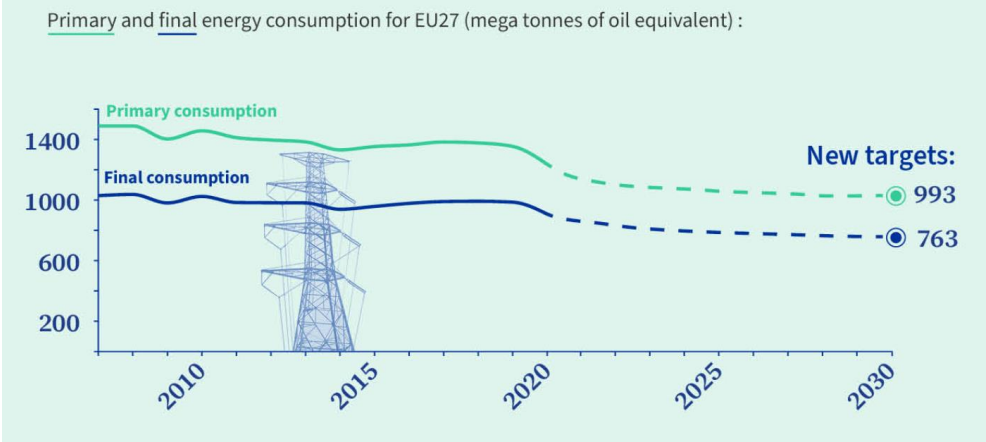
- -11.7% final energy consumption by 2030 compared to 2020
- From 2025 -1.3% p.a., gradual increase to -1.9% p.a.
- Reduction targets for primary energy consumption not binding
- 3% refurbishment rate for public areas
- -1.9% p.a. energy consumption

Relevant provisions

To improve energy efficiency, all companies in Europe should recover waste heat and are required to implement…

- Energy audits → obligation from ⌀-total consumption > 10 TJ (≈ 2.8 GWh) p.a. in the last three years, as well as
- Energy management systems → obligation from ⌀-total consumption > 85 TJ (≈ 24 GWh) p.a. in the last three years





Source: European Council

Energy Performance of Buildings Directive (EPBD)

Aims to boost the energy performance of buildings – the thermal mass of concrete can be a solution

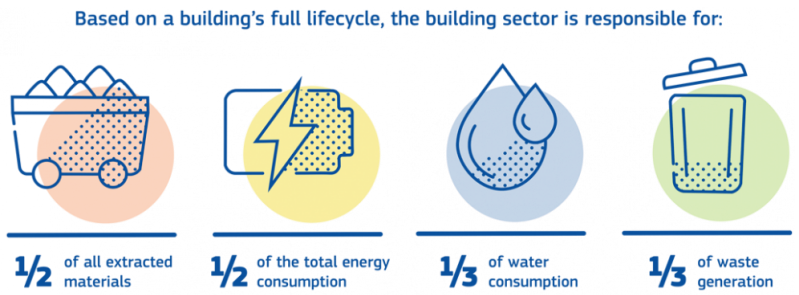
Together with the EED, the directive promotes policies that will help

- Achieve a highly energy efficient and decarbonised building stock by 2050
- Create a stable environment for investment decisions
- Enable consumers and businesses to make more informed choices to save energy and money

Source: European Commission

Level(s)

- Assess the environmental performance of buildings throughout the full lifecycle
- 16 indicators linking buildings with EU sustainability priorities
- Level(s) is divided into three areas
  1. Resource use and environmental performance
  2. Health and comfort
  3. Cost, value, and risk

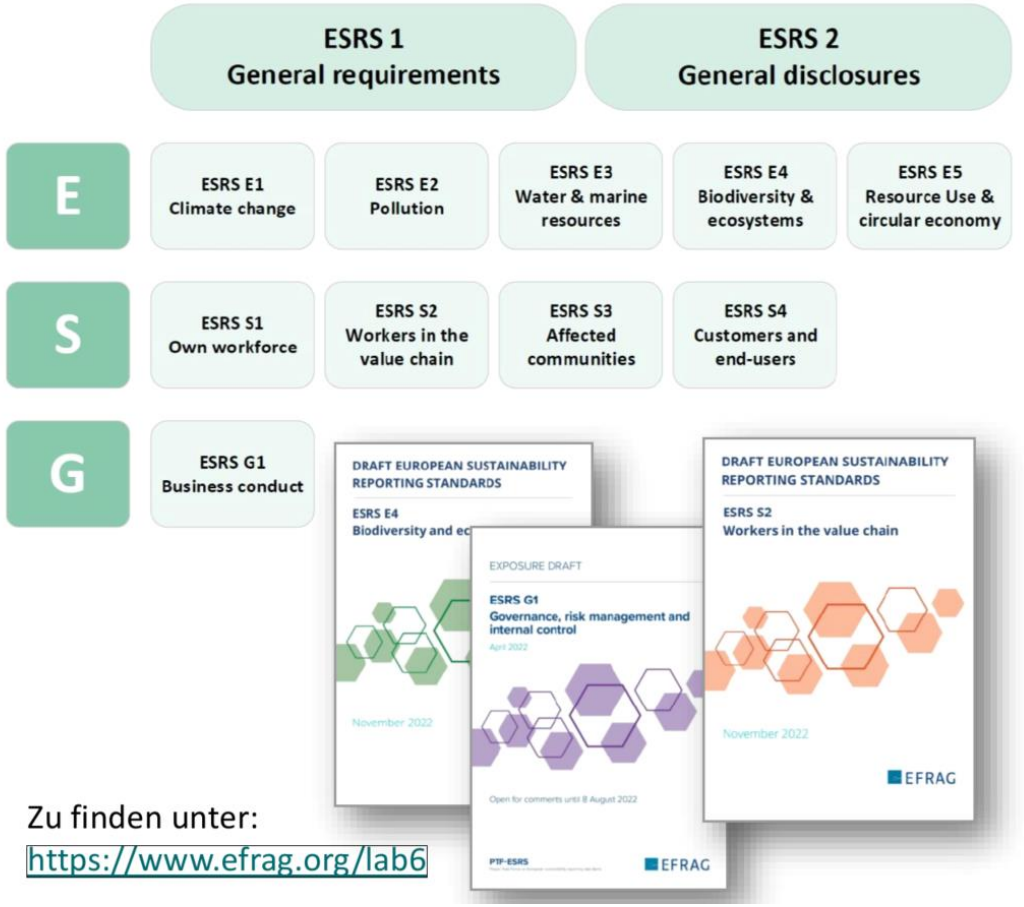


Source: European Commission

EU Sustainability Reporting

New and comprehensive reporting obligations for the European cement industry

- Almost all cement companies have to add a sustainability report to their annual management report (for financial year 2024 at the earliest, 2028 the latest – depending on the size of the company and whether possibility to opt-out is used by small and medium enterprises).
- The sustainability report must include the information required to understand the impact of the activities of the corporation on sustainability aspects and the impact of sustainability aspects on the business' financial performance.
- This includes information about ecological, social and governance sustainability aspects based on the European Sustainability Reporting Standards (ESRS) developed by EFRAG.
- Companies must perform a materiality assessment to evaluate which single data points are necessary to report.



Source: European Financial Reporting Advisory Group (EFRAG)

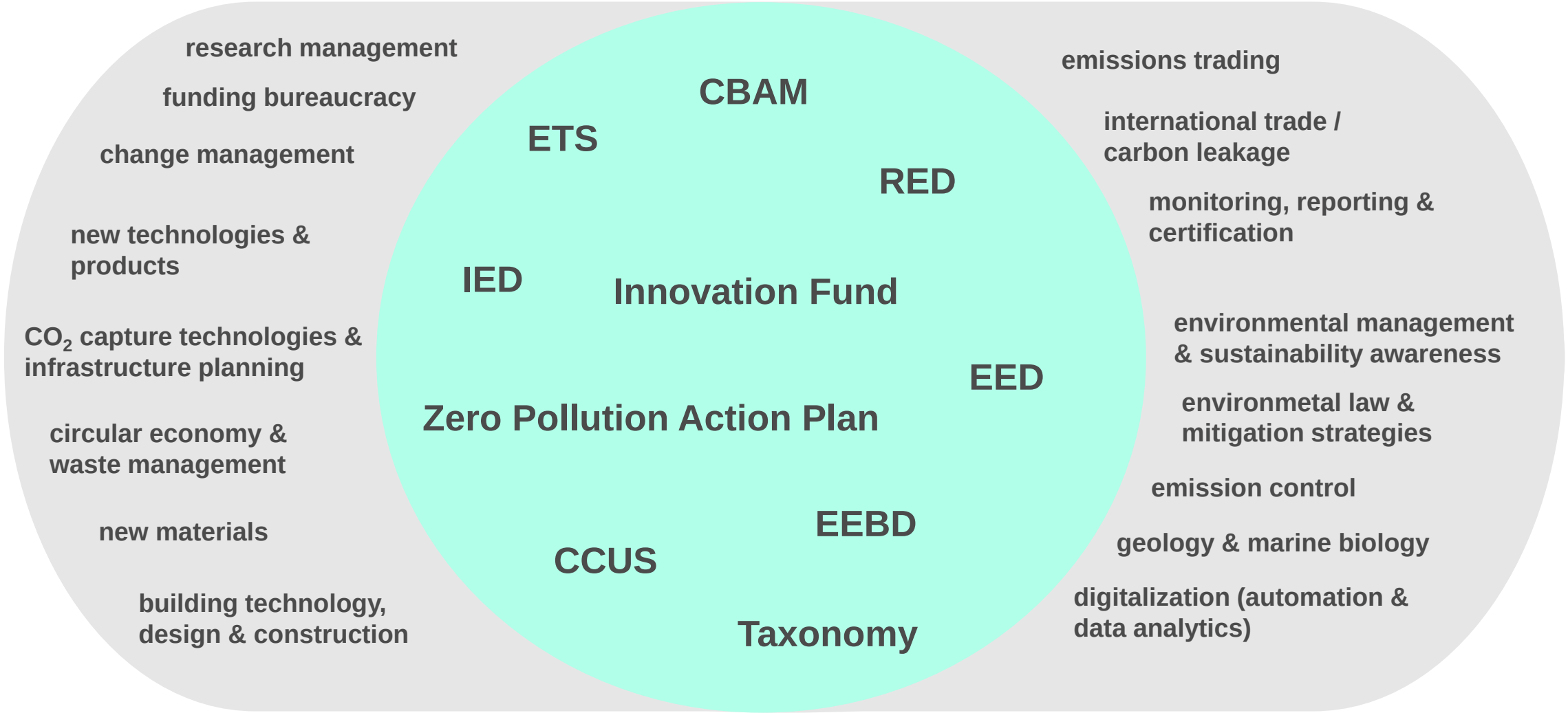
ESRS and Sustainable Finance

Reporting increasingly important for corporate lending

- The EU is examining how to make sustainability considerations an integral part of its financial policy in order to meet the targets of the Green Deal.
- Sustainability Reporting is part of this initiative to channel capital flows primarily into sustainable investments.
- Companies required to publish a sustainability report must also include information required by the EU Taxonomy Regulation, which specifically addresses the cement industry and defines, among other things, when turnover from the sale of cement and clinker complies with the regulation.
- Taxonomy compliance for the cement industry can only be achieved by reducing the carbon footprint below 469 kg CO_2 per tonne of cement or 722 kg CO_2 per tonne of clinker. In addition, cement companies must meet certain minimum social protection standards and must also comply with “Do no significant harm" criteria, e.g. for biodiversity or pollution.

Source: European Commission

The European Deal‘s Impact on Skills



EU Green Deal and the cement sector

Cement manufacturing and products are affected by almost all policy areas

- The cement industry is affected by almost all elements of the Green Deal with the EU Emissions trading scheme (EU ETS) and the Carbon Border Adjustment (CBAM) being the key policy areas for the transformation and the competitiveness of the sector in Europe.
- Zero pollution policies also have a strong impact on the success of the transition, especially with regard to the Industrial Emissions Directive as the basis for permitting procedures.
- The increasing complexity of the regulatory framework and reporting requirements is challenging cement producers across Europe, placing a heavy administrative burden on companies and requiring new skills and personnel to comply with new regulations.
- Looking at the whole value chain of cement and concrete, new requirements and skills for the use of building materials, the whole life cycle carbon footprint of buildings, the development of lead markets for low carbon and near zero building products are becoming increasingly important for the industry.

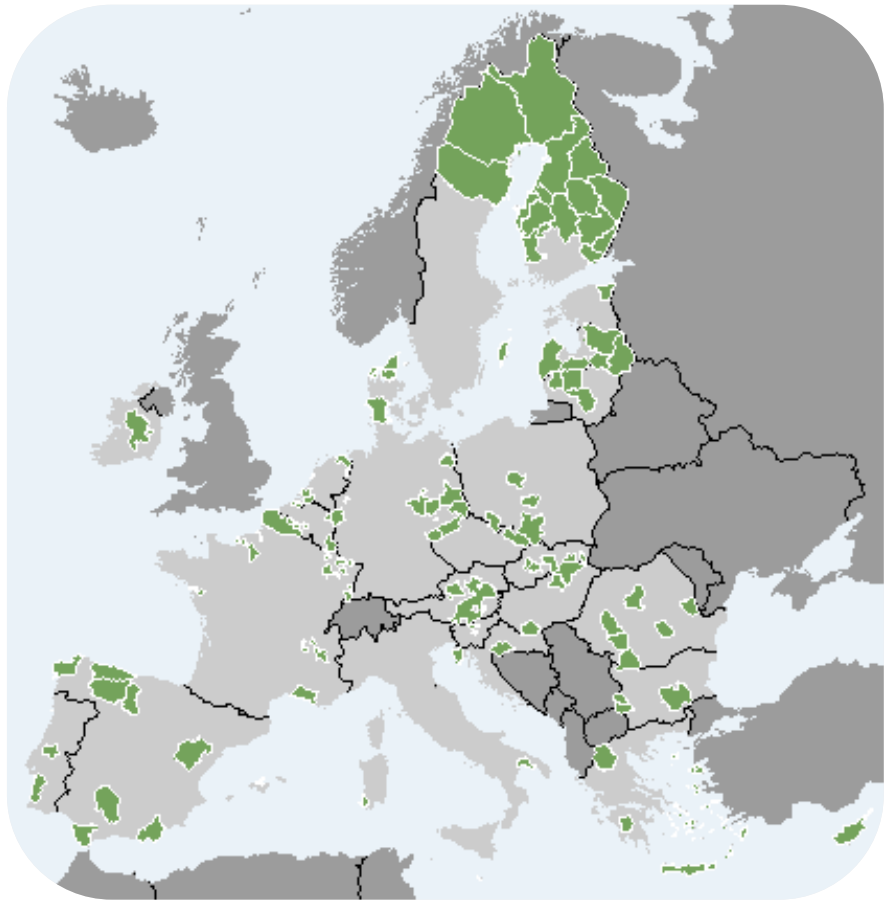
2.2 Just Transition Mechanism

Just Transition Fund (JTF)

Mitigate the socio-economic impact of the green transition with ~€55 billion between 2021-2027

- Addresses the social and economic effects of the green transition
- Focus on regions, industries and workers who will face the greatest challenges
- 67 territorial just transition plans (TJTPs)
- 93 different areas
- Coal/peat/oil shale regions + regions with carbon-intensive industries
- EUR 25.4 billion (incl. co-funding)

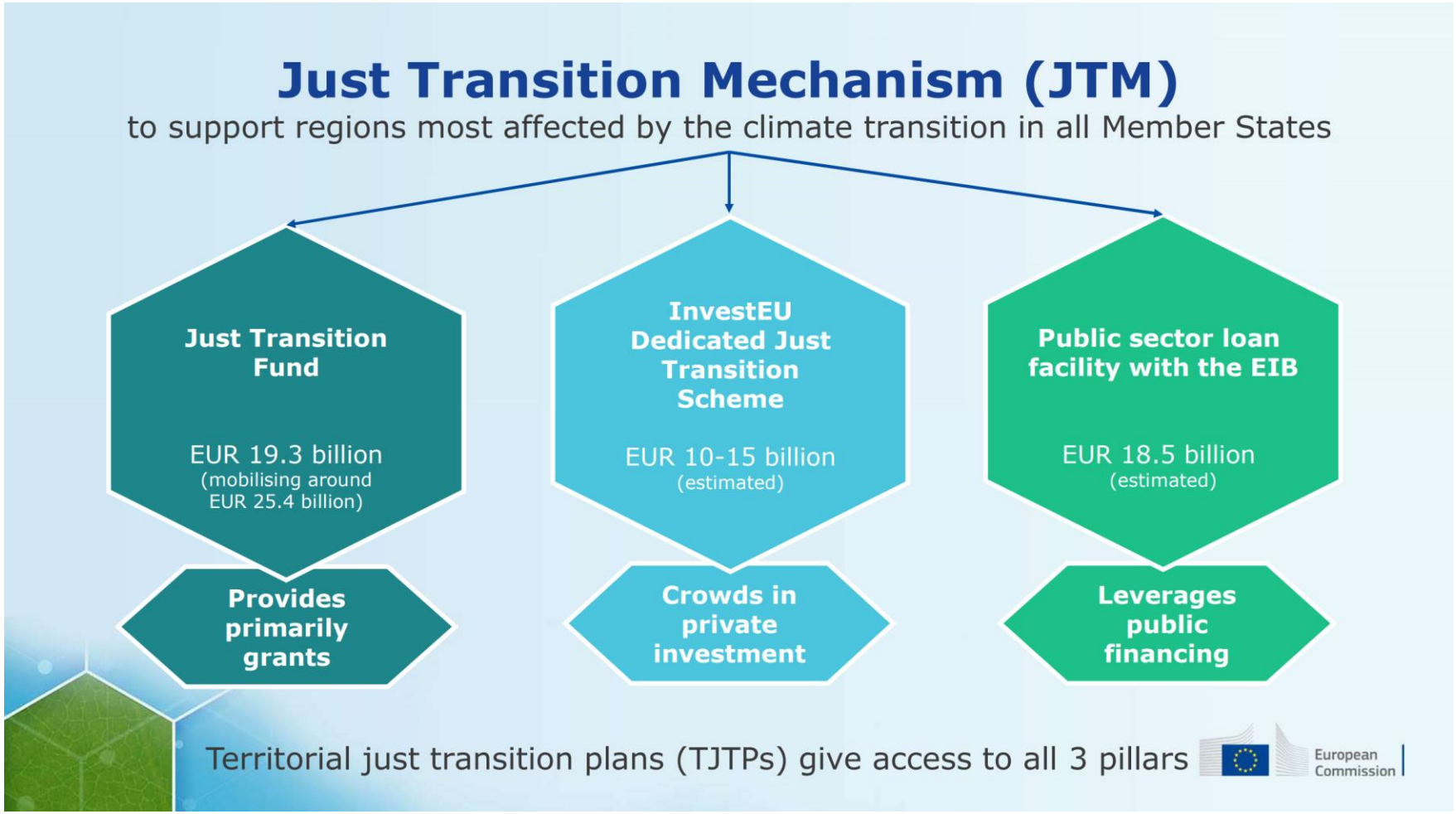
Approved territorial just transition plans



Sources: The Just Transition Mechanism; European Commission

Just Transition Fund (JTF)

Mitigate the socio-economic impact of the green transition with ~€55 billion between 2021-2027



Source: European Commission

Just Transition Fund (JTF)

Who will benefit and how?

People and citizens

- facilitate employment opportunities in new sectors and those in transition
- offer re-skilling opportunities
- improve energy-efficient housing and facilitate access to clean, affordable and secure energy

Companies and sectors

- support climate-resilient investments and jobs by creating attractive conditions
- provide easier access to loans and financial support
- invest in the creation of new firms, SMEs and start-ups as well as research and innovation

Member States and regions

- creating new jobs in the green economy
- investing in renewable energy sources, energy infrastructure, district heating and transportation
- improving digital connectivity and sustainable public transport
- providing affordable loans to local public authorities and technical assistance

Source: The Just Transition Mechanism - European Commission (europa.eu)

Just Transition Fund (JTF)

Supporting investments to reduce GHG emissions from ETS activities including in the cement sector

Funding conditions

- only for industrial installations
- to reduce GHG emissions significantly below the ETS benchmark
- when needed to protect a significant number of jobs
- investments should contribute to the just transition in the relevant territory

Cement projects included in TJTPs (i.a.)

- Istria, Croatia → *CCS*
- Gotland, Sweden → *CCS*

granted

- Antoing, Belgium → *CCS*
- Obourg, Belgium → *Circular economy*

pending

Source: European Commission; Cohesion Open Data Platform

Just Transition Fund and the cement sector

The JTF can be an additional source of funding for companies in dedicated regions

- In dedicated regions the JTF can alleviate the socio-economic impact of the green transition also in the cement sector.
- Different types of projects can be eligible for funding, especially investments in the decarbonization of cement production as well as reskilling and upskilling of employees.
- Investments in digital infrastructure and education as well as training of the workforce are also included in the JTF scope.
- Several projects in the cement industry have already secured funding, all of which focus on the technical transformation of the respective plants. Others could follow.
- Together with the Innovation Fund, the JTF forms an important EU funding framework that provides financial support to cement manufacturers in Europe on the challenging path of decarbonizing their production.
- An application or even a commitment to the JTF also increases public awareness of the respective decarbonization projects.

2.3 European Skills Agenda

European Skills Agenda

Background and context

Why a skills agenda?

Four simultaneous disruptions will influence the transition to a resource-efficient, circular, digital and climate-neutral economy and will lead to a transformation of the world of work:

D

igitalization
Use of digital data, algorithms and AI as a production factor and component of improved production process.

ecarbonisation
Tightening of climate targets through the EU Commission's Green Deal requires transformation of the cement industry through the development and application of new technologies.

emography
Decrease in the supply of skilled workers, especially STEM workers, who are relevant for innovation.

eglobalization
The weaknesses of globalized capitalism in the corona crisis must be compensated by securing supply chains and domestic production.

The shortage of skilled workers could become a serious obstacle to achieving the EU's green transition: Employees having the right skills will be the key to success!

Sources: European Comission; Institut der deutschen Wirtschaft; Organisation for Economic Co-operation and Development

European Skills Agenda

Overview and objectives

- Launched in 2020 (updated in March 2023) to support individuals and businesses in developing new the right skills in a changing work environment.
- Demographic change, artificial intelligence, robotics, twin and digital transitions are expected to create new jobs while other jobs will change or disappear: Lifelong learning is crucial for long-term and sustainable growth, productivity, and innovation; it is a key factor for the competitivness of businesses.
- The Skills Agenda sets ambitious goals: 78% employment rate by 2030 and at least 60% adult participation in training yearly, requiring training for around 50 million additional workers annually.
- It is closely coordinated and aligned with the European Pillar of Social Rights, the European Industrial Strategy, and the European Green Deal.

Call for collective action to mobilize businesses, social partners, and stakeholders for collaboration within the EU's industrial ecosystems.

Defines a clear strategy to ensure that skills lead to jobs.

Helps people build their skills throughout life in an environment where lifelong learning is the norm.

Identifies the financial means to foster investment in skills.

Sources:
European Commission. European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience.
European Commission. European Skills Agenda: progress on the 11 flagship actions (2023).

EU action plans based on the European Skills Agenda

Accelerating implementation of initiatives and maximising the potential of EU funding is essential

Pact for skills

- promoting cross-sector skills partnerships to develop targeted training initiatives
- 20 sectoral partnerships have been set up with the pledge to upskill more than 10 million people

European skills partnerships

- support of common training standards for european labour market needs
- Establishment of specialized academies for skills in renewable energy and hydrogen technology

Upskilling Pathways

- Providing access to basic and advanced training opportunities for low-skilled adults
- Promoting lifelong learning through personalized learning pathways and qualification programs

Digital Education Action Plan

- to enhance the quality, inclusivity and accessibility to digital education,
- to support the adaptation of Member States' education and training systems to the digital era
- to increase participation in digital skills training.

Labour & Skills Shortages Action Plan

- the activation of under-represented people in the labour market;
- improving working conditions in specific sectors
- improving fair intra-EU mobility and attracting talent from outside the EU

European year of skills

- Supporting collaboration among EU countries to exchange best practices in skills development
- Over 2,000 events and 190 initiatives, including the establishment of EU Skills Academies in key areas such as solar energy and cybersecurity.

Source: European Commission. Labour and skills shortages in the EU: an action plan

The role of the cement sector in the context of the EU skills agenda

Steps to align with EU initiatives and action plans

- The New Skills Agenda serves as the foundation for several EU initiatives and action plans.
- The implementation of the initiatives must be accelerated and the potential of EU funding opportunities has to be better utilized.

- Define a clear strategy and analyze which future and professional skills will be crucial for the transition
- Collect infomation on skill requirements and skill mismatches to develop competence objectives
- Design individual learning concepts for different target groups instead of one size fits all solution

1 Fist step: Gap Analysis

- Where are we on education, skills and training of employees in the cement industry today?
- What are the future skills‘ needs?
- How do we close the gap?

2 Second Step: Policy Recommendations and future training concepts

- How do we close the gap?
- How do we manage to train the right skills?

European skills‘ policies and the cement sector

Various strategies and action plans with fairly limited positive impact on companies

- European Skills Agenda provides overall framework for skills policy in the EU. A number of action plans and measures have been launched as a result. However, the impact "on the ground" in the cement industry is limited. Policies should be more tailored to industry-specific needs and realities to make EU support more actionable.
- There is a lack of wider understanding of how to take advantage of available support schemes or benefit from concrete actions at national level. The initiatives and actions are often complex, with varied eligibility criteria, application processes and specific sectoral requirements that can be challenging for companies to navigate.
- EU and national skills policies should in future be more responsive to the specific needs of enterprises and workers, in order to ensure transparency about what is actually being done and how enterprises' education, lifelong learning, retraining and upskilling strategies can actually benefit from the instruments at their disposal.

2.4 Transition Pathways

What are the main levers to reduce CO_2?

Effectively reducing the industry's carbon footprint will include the whole value chain

- **Clinker**: Improving thermal efficiency and replacing fossil fuels by alternative fuels with biogenic content. Beyond that the decarbonisation requires to capture the CO_2 that cannot be reduced otherwise.
- **Cement**: Reducing clinker content through substitution with supplementary cementitious materials (SCMs), such as fly ash, ground granulated blast-furnace slag or calcined clay and using new binders with smaller CO_2 footprint.
- **Concrete**: Increasing the efficient use of binders in concrete, e.g. by optimisation of mix design and a more industrialised production. Using SCMs in concrete.
- **Construction**: Increasing the material efficiency, e.g. by using hollow ceilings, carbon concrete, by increasing service life of building structures or a re-use of construction materials.
- **CO_2-Uptake / Recarbonation**: During its lifetime concrete is binding CO_2. That process can also be actively accelerated.

Full decarbonisation requires breakthrough technologies, i.e. Carbon Capture and Utilisation / Storage

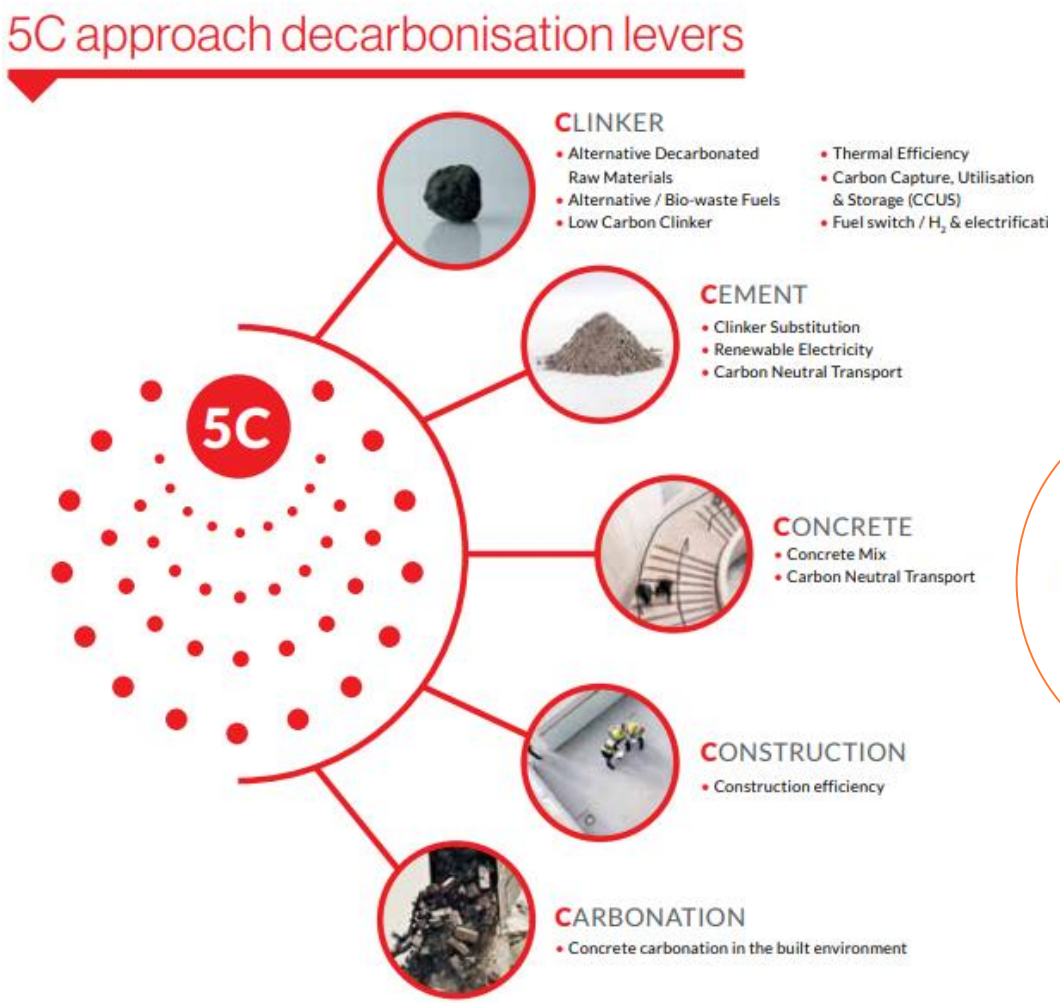
Transition pathways in the cement sector

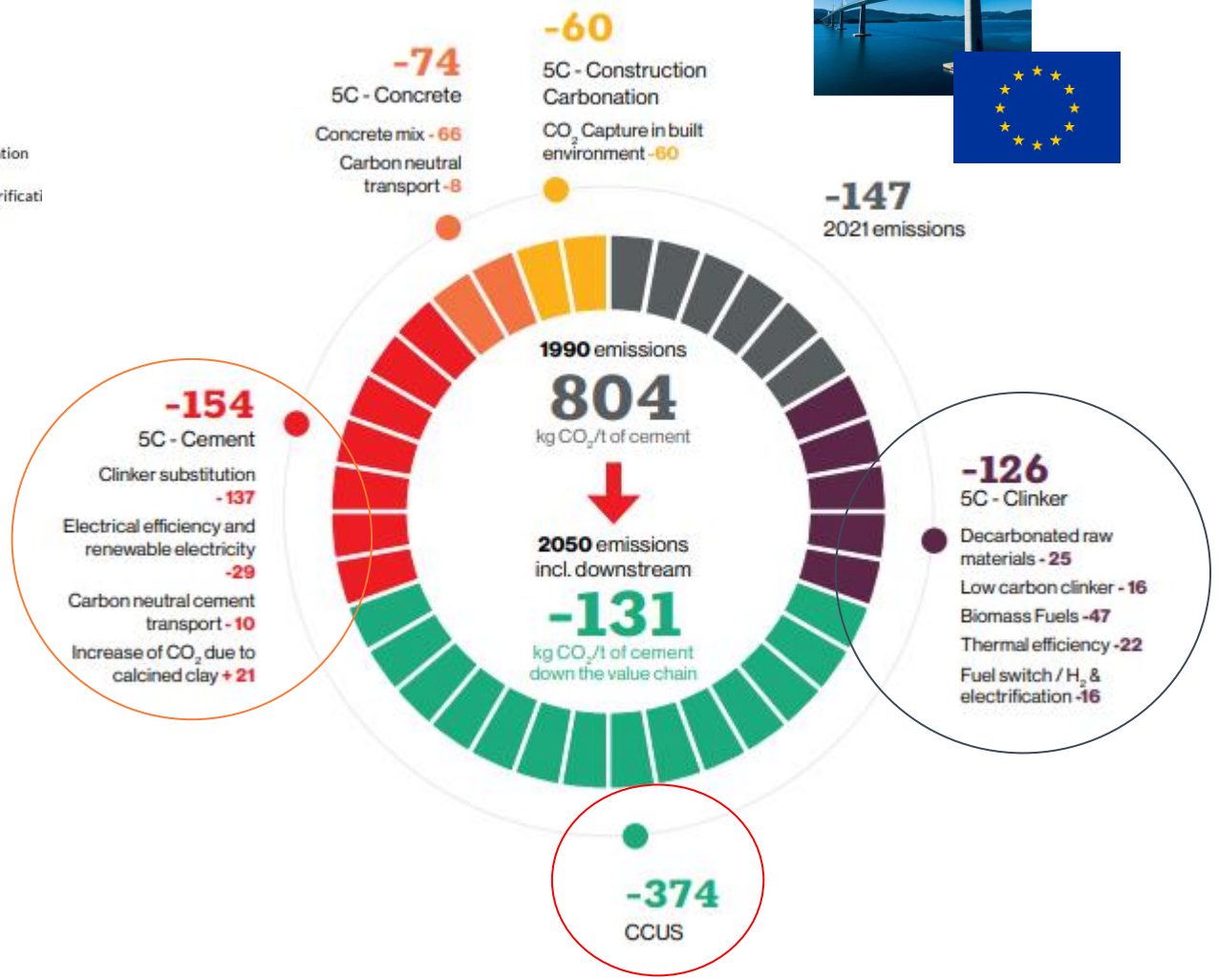
Various decarbonization roadmaps already point the way to carbon neutrality

Sources: VÖZ, VDZ, GCCA, CEMBUREAU, K. Lakowski, M. Giers, France Ciment

CEMBUREAU: 2050 Roadmap

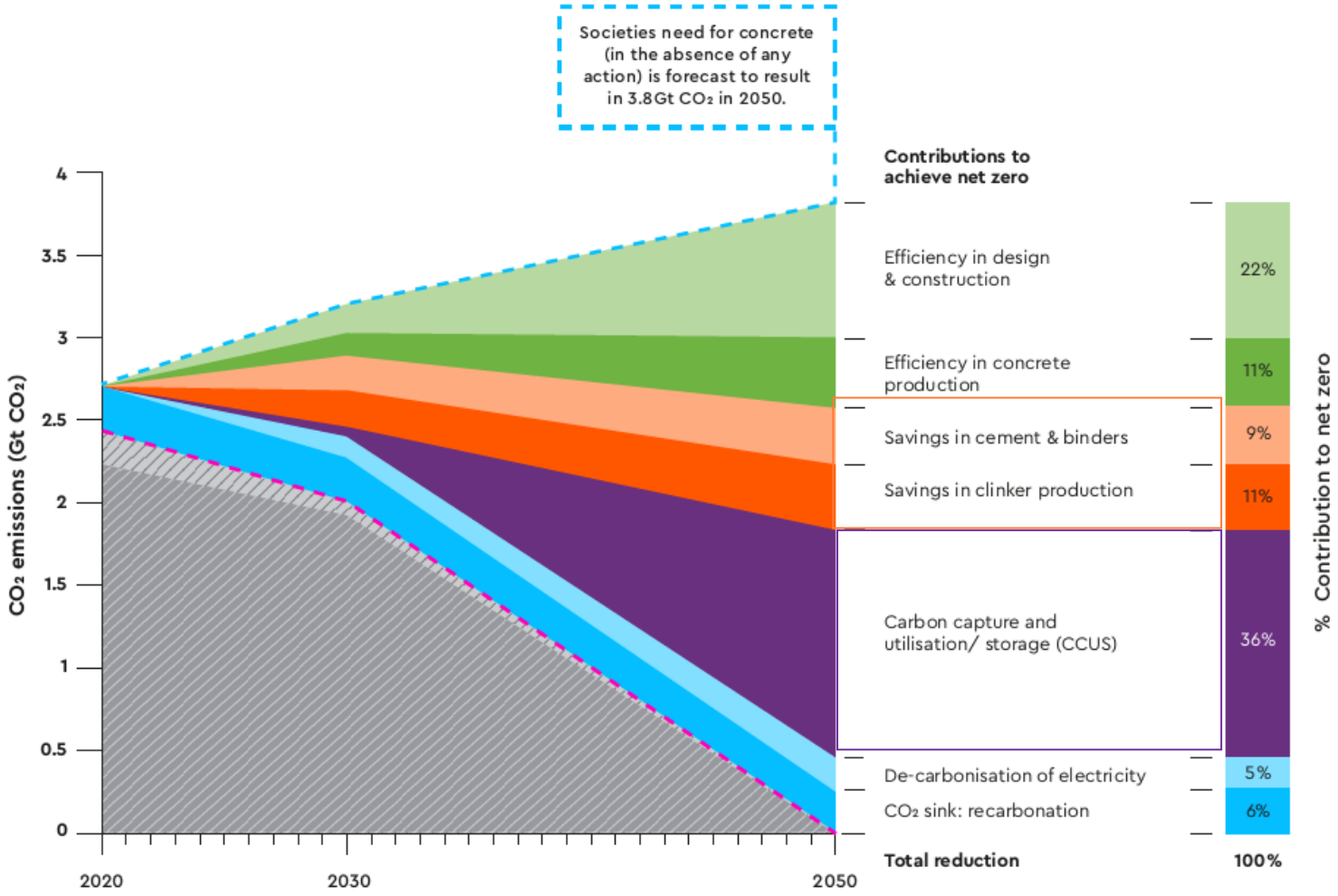
CO_2 reductions along the value chain

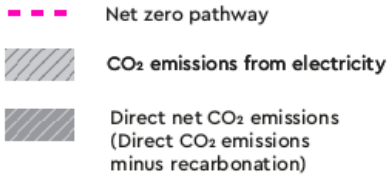




Source: Cembureau / updated in 2024

A Net-zero pathway for the global cement industry





Source: Global Cement and Concrete Association

GCCA: Large share of actions to net-zero future in cement plants

Clinker production

- thermal efficiency
- savings from waste fuels ("alternative fuels")
- use of decarbonated raw materials
- use of hydrogen as a fuel

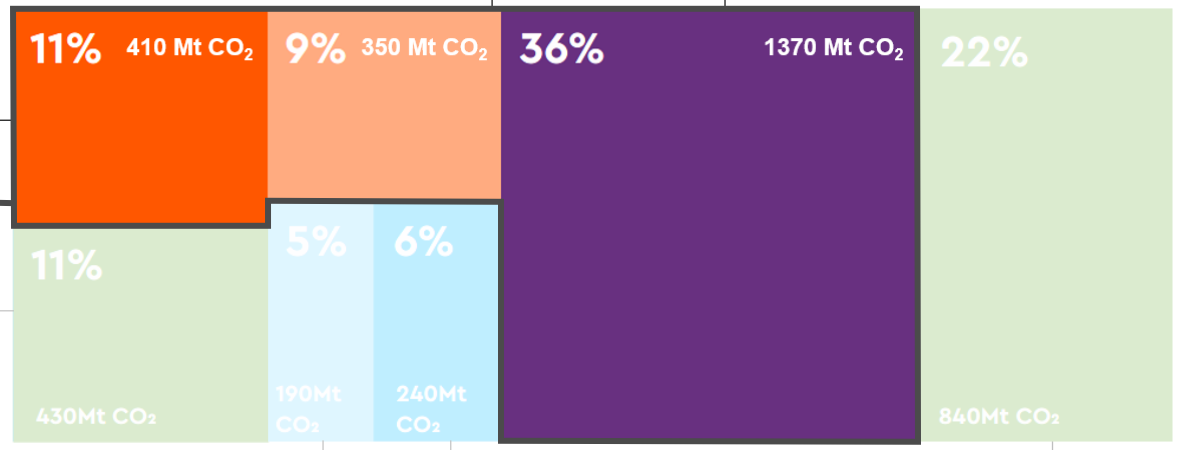
Cement and binders

- Portland clinker cement substitution. Also expressed through clinker binder ratio
- alternatives to Portland clinker cements

CCUS

- carbon capture at cement plants

PERCENTAGE CONTRIBUTION TO NET ZERO AND CO_2 EMISSION SAVINGS IN 2050



56% share of CO_2 saving

Efficiency in concrete production

- optimised mix design
- optimisation of constituents
- continue to industrialise manufacturing
- quality control

Decarbonisation of electricity

- decarbonisation of electricity used at both cement plants and in concrete production

CO_2 sink: recarbonation

- natural uptake of CO_2 in concrete – a carbon sink

Efficiency in design and construction

- client brief to designers to enable optimisation
- design optimisation
- construction site efficiencies
- re-use and lifetime extension

Source: Global Cement and Concrete Association

GCCA: Large share of actions to net-zero future in cement plants

Clinker production

- thermal efficiency
- savings from waste fuels ("alternative fuels")
- use of decarbonated raw materials
- use of hydrogen as a fuel

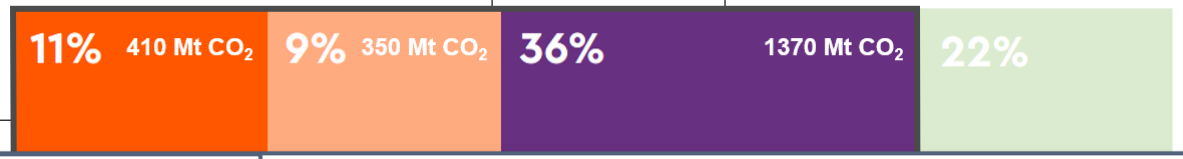
Cement and binders

- Portland clinker cement substitution. Also expressed through clinker binder ratio
- alternatives to Portland clinker cements

CCUS

- carbon capture at cement plants

PERCENTAGE CONTRIBUTION TO NET ZERO AND CO_2 EMISSION SAVINGS IN 2050



ecra
european cement research academy

MISSION POSSIBLE PARTNERSHIP

gcca

European Cement Research Academy

European Cement Research Academy GmbH
Toulouser Allee 71
40476 Duesseldorf, GERMANY
Phone: +49-211-23 98 38-0
Fax: +49-211-23 98 38-500
info@ecra-online.org
www.ecra-online.org
Chairman of the Technical Advisory Board: Ernest Jelito
Managing Director: Martin Schneider
Registration office: Duesseldorf
Court of registration: Duesseldorf
Commercial registration no.: 47580

THE ECRA TECHNOLOGY PAPERS 2022

State of the Art Cement Manufacturing

Current technologies and their future development

- 55 technologies, new and major updates
- 7 summaries and state-of-the-art perspectives
- CO_2 capture technologies with comparisons and new results from research and pilot tests
- technological readiness (TRL) perspective
- OPEX and CAPEX estimates 2030, 2050
- ecra-online.org/technology-papers

Source: Global Cement and Concrete Association; European Cement Research Academy

Achieving net zero cement, concrete and construction

Contribution of different stages of the value chain – only by working together can we succeed

- Achieving a net zero cement and concrete sector requires efforts of the whole value chain, politics and society. The table on the right side shows the degree of contribution by different actors.
- While cement producers have a direct part in reducing CO_2 emissions at the kiln and offering clinker reduced cements, they need concrete producers and contractors to request these green products.
- To increase material efficiency in building structures and thus reduce the overall binder volume, it needs architects to shape a sustainable design.
- Politics need to provide for the required framework conditions, such as renewable energies or a CO_2 infrastructure.

Contribution to achieve net zero	Cement producer	Producer of concrete / concrete components	Contractors	Designers Architects	Buildung authorities	Clients	Politics/ Society
Efficiency in design and construction	O			X	O	O	O
Efficiency in concrete production	O	X	O	O	O	O	O
Savings in cement and binder	X	X	X	O	O	O	O
Savings in clinker production	X	O	O	O	O	O	O
Carbon Capture and utilization / storage (CCUS) incl. mineralisation and use of CO_2 in concrete production	X	X	O	O	O	O	X/O
De-carbonisation of electricity							X
CO_2 sink: recarbonation				O	X		X/O

X = Active / direct contribution
O = Indirect contribution: Procurement / Support / Acceptance

Sources: VDZ, European Cement Research Academy

Transition pathways and the cement sector

From roadmaps to implementation – a net zero industry is possible

- Various roadmaps at national, EU and global level identify the key levers for decarbonisation. They are all based on the so-called 5C approach, which looks at the entire value chain from clinker, cement and concrete to construction and (re)carbonation (= uptake of CO_2 in concrete structures).
- A significant share of the emissions from clinker and cement production can be reduced through conventional measures such as higher energy efficiency, alternative fuels and the efficient use of clinker in cement, cement in concrete and concrete in construction.
- However, the use of carbon capture, transport, storage and utilisation (CCS) is necessary to achieve climate neutrality, but it involves high costs and new infrastructure across Europe.
- Therefore, the cement industry is dependent on a regulatory framework that enables the deployment of CCUS and the build-up of transport and storage infrastructure in the 2030s.
- At the same time, decarbonisation requires collaboration along the cement and concrete value chain, making full use of process and product innovation. This also includes training and new skills in the construction industry.

3. Future skills‘ requirements, training today and tomorrow & attractiveness of the sector

3.1 Defining the skills‘ concept of the study

Future skills requirements for the transition

- problem-solving, analytical and innovation competences
- cross-process, systemic and strategic thinking
- teamworking and collaborative working
- communication skills

Interpersonal skills

Professional skills

- New technologies (e.g. Oxyfuel Technology, use of hydrogen)
- CO_2 separation, storage & utilization technologies (e.g. scrubber)
- CO_2 infrastructure and transport-systems
- Thermal and mechanical engineering
- Chemical and physical properties of new materials
- Geosciences and biology
- Process optimization for energy efficiency in cement production
- Innovation and change management

- Information and data literacy
- Communication and collaboration
- Digital content creation
- Safety
- Problem solving & innovation

Digital skills

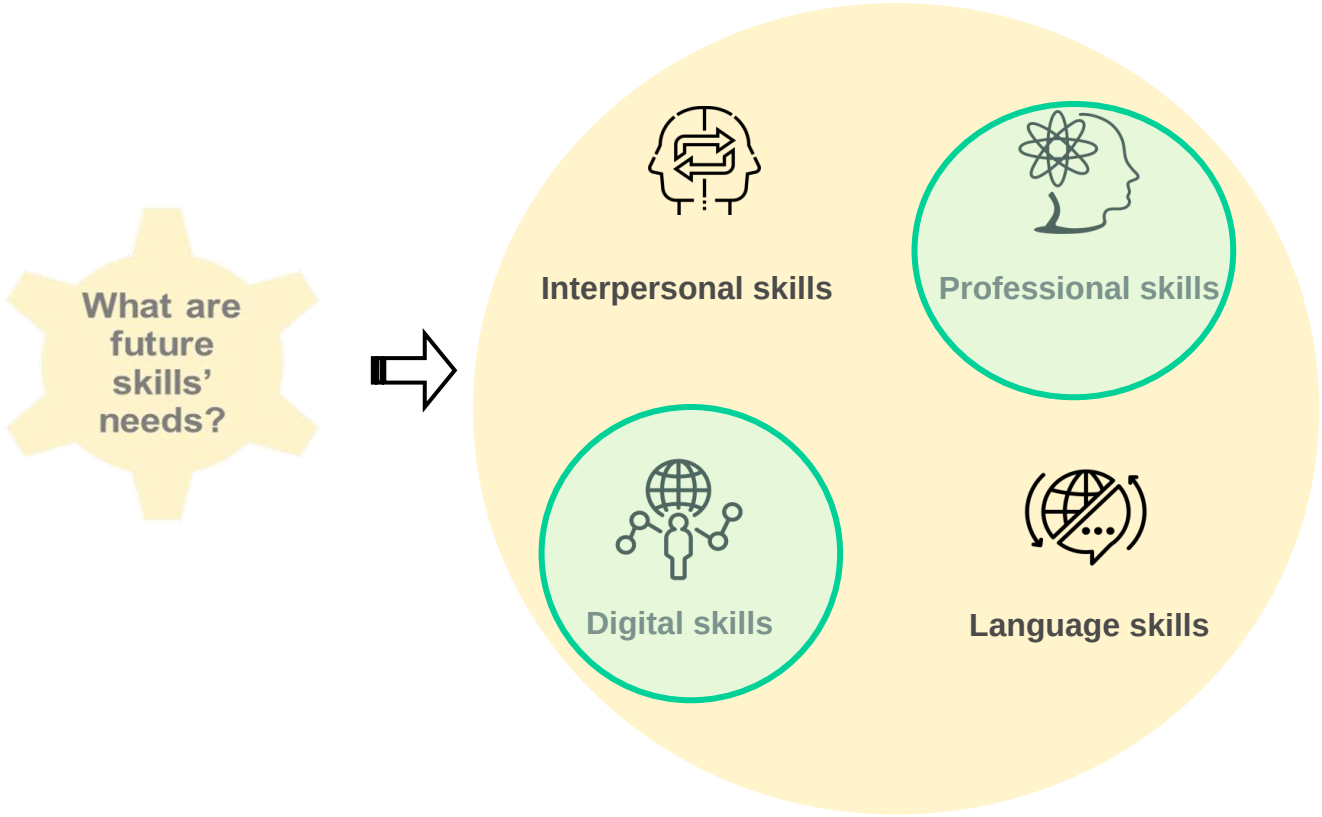
Language skills

- Key competence in the European framework of reference for lifelong learning
- Basis for successfull learning of future techologies
- language skills lead to an increase in mobility

Source: VDZ

Defining the skills‘ concept of the study

Matching the European Skills Agenda with the future skills’ needs of the cement industry



Focus on decarbonization and digital skills

- As decarbonization is the most crucial and challenging transformation process in the cement industry, the study design focuses specifically on an in-depth analysis of the professional skills requirements.
- In parallel, the development and implementation of innovative technologies in the industry will inevitably lead to an increase in new digital systems and programs. These technological advances are not only crucial for optimizing process control, but also play a key role in analyzing and managing the increasingly complex amounts of data generated in modern cement production. As a result, the development of new professional skills will be closely linked to the promotion and expansion of digital skills.
- Nevertheless, language and interpersonal skills will still become increasingly important.

Source: VDZ

Professional skills‘ requirements for the transformation

Professional Skills

New technologies & products, infrastructures and materials

- New technologies (e.g. Oxyfuel Technology, use of hydrogen)
- CO_2 separation, utilization and storage (e.g. scrubber)
- CO_2 infrastructure and transport-systems
- Chemical and physical properties of new materials (e.g. circularity)
- Cement chemistry and material science
- Geoscience and biology
- Automation and control systems for efficient production
- Process optimization for energy efficiency in cement production

Engineering & Project Management

- Thermal and mechanical engineering
- Process optimization for energy efficiency in cement production
- Development of alternative, sustainable raw materials for cement production
- Innovation Management

New regulatory EU requirements & international trade

- Environmental management, Environmental law & mitigation strategies
- Emission control, permitting
- Emissions trading, CBAM
- Monitoring, Reporting & Certification
- International trade & carbon leakage
- Circular economy & waste management
- EU Taxonomy, sustainability reporting
- Cross-sectoral negotiation skills

Digital skills‘ requirements for the transformation

Source: European Reference Framework for Digital Competences (DigComp)

Adaption to the cement industry

Digital Skills

Information and data literacy

- Evaluation and assessment of data
- Information and digital content
- Organizing and managing data

Communication and collaboration

- Interaction, communication and collaboration with the help of digital technologies

Digital content creation

- Interaction, communication and collaboration with the help of digital technologies

Safety

- Protection of personal data and privacy
- Awareness of the impact of digital technologies

Problem solving

- Identifying technical problems and finding solutions
- Using digital tools to innovate processes and products
- Artificial intelligence
- Machine Learning

Occupational Groups of the Cement Industry

Classification used in the study

International Standard Classification of Occupations 2008 (ISCO-08)

- A clear classification of occupational groups & professions in the cement industry is essential.
- The International Standard Classification of Occupations 2008 (ISCO-08) provides internationally comparable definitions and has been adopted for the study.
- The ISCO-08 is divided into 4 levels: major groups > sub-major groups > minor groups > unit groups.
- Four of the nine major groups were selected in which the work profiles of the cement industry corresponded the most (Major groups 1-3 and 8).
- The occupation classifications of individual countries may differ from ISCO-08. It will, however, ensure comparability of case studies and gives clear structure & definitions for the project.
- Of course, the use of ISCO-08 is not intended to replace any existing national classification of occupations.

Occupational Groups of the Cement Industry acc. ISCO-08

	Managers[1] Major group 1 acc. ISCO	**Professionals**[2] Major group 2 acc. ISCO	**Technicians and Associate Professionals**[3] Major group 3 acc. ISCO	**Plant and Machine operators and assemblers**[4] Major group 8 acc. ISCO
Job profiles Examples	Plant Manager	Chemists and Chemical Engineer	Electrical Technician	Industrial Foreman and Process Controller
	Production Manager	Material Engineer	Engineering Technician	Plant and Machine Operators
	Operations Manager	Process Engineer	Maintenance Technician	Labourer in mining, construction, manufacturing, and transport
	Quality Manager	Environmental Engineer	Automation Technician	Cement, Stone and other product Machine Operators
	Administrative and Commercial Manager	Electrical Engineer	Laboratory Technician	Electrical and Electronic Trades Worker
	Communication Manager	Maintenance Engineer	…	Crafts and related trades Worker
	Human Resource Manager	…	…	Truck Driver, Loader and Excavator Operator
	Sales Manager	…	…	…
	Environmental Health and Safety Manager	…	…	…

[1] Second stage of tertiary education leading to an advanced research qualification (e.g. doctoral studies)
[2] Second stage of tertiary education leading to an advanced research qualification (e.g. masters degree)
[3] First stage of tertiary education, short or medium duration (e.g. bachelors degree)
[4] Post-secondary, non-tertiary education (“Industriemeister”- Industrial Foreman), upper secondary level of education (“Produktionssteuerer”- process controller), lower secondary level of education

Source: International Standard Classification of Occupations (ISCO 08)

Concept of skills used in the study

Skills requirements, education & training today and tomorrow

- As decarbonization is the most crucial and challenging transformation process in the cement industry, the study design focuses specifically on an in-depth analysis of the professional skills requirements.
- In parallel, the development and implementation of innovative technologies in the industry will inevitably lead to an increase in new digital systems and programs, which require new skills of the work force.
- Language and interpersonal skills will also become increasingly important. However, the study will focus exclusively on the professional and digital skills.
- A clear classification of occupations in the cement industry is essential. For the purpose of the study, the International Standard Classification of Occupations 2008 (ISCO-08) was used, which provides internationally comparable definitions.

Evolving the well-established

3.2 1st Workshop – Summary of results

Brainstorming for Cement Skills by 2030-2050

Brussels, 7th – 8th March 2024

Workshop „Brainstorming for Cement Skills by 2030-2050”

Impressions, objectives and partipation

Objectives

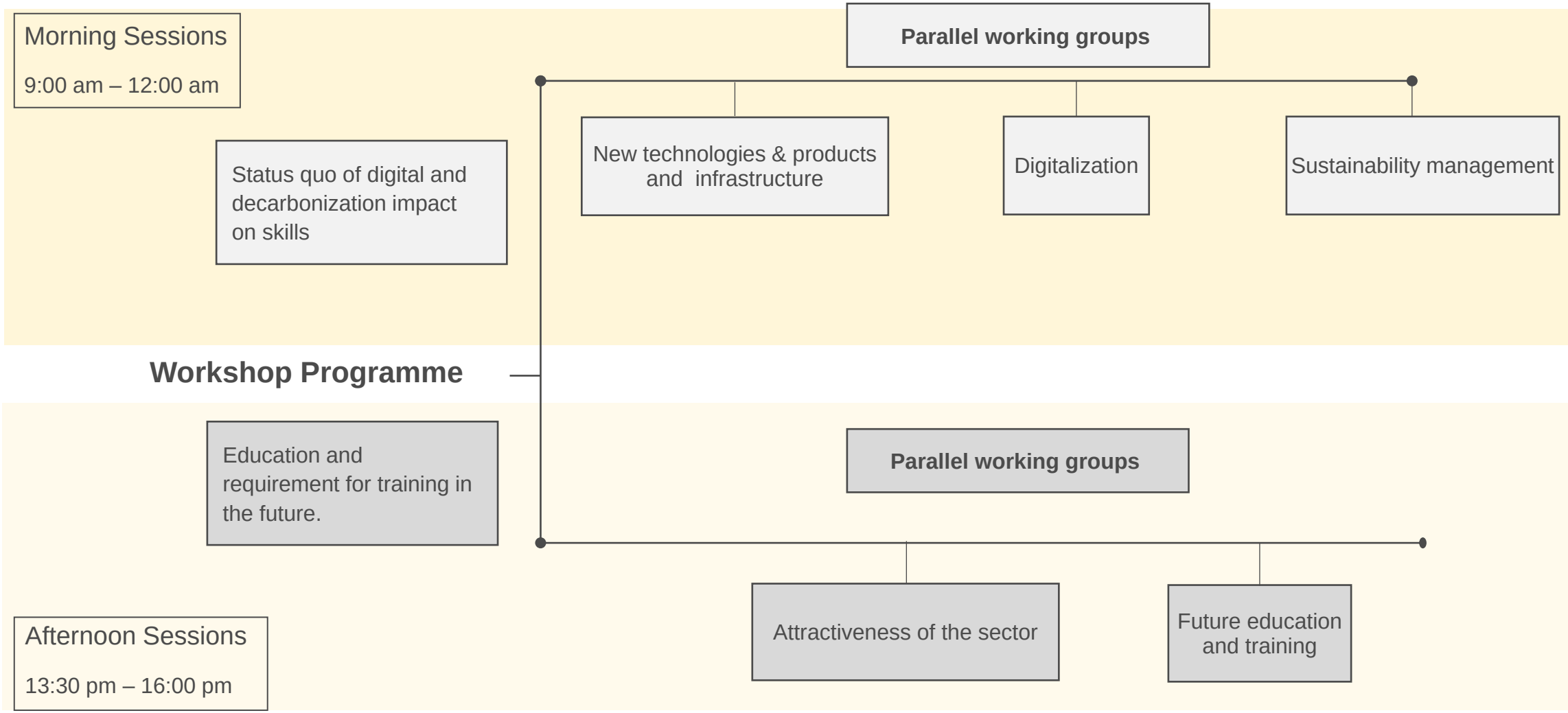
- Presentation of VDZ‘s desk research findings
- Brainstorming on the impact of transformation processes on the workforce of the cement industry
- Presentation and discussion of the draft questionnaire for the only survey

Participation

- Approximately 30 participants from over 10 countries: representatives from EFBWW and CEMBUREAU as well as from their affiliate organisations and companies.
- High level of participation in all working group sessions and valueable results
- Positive feedback regarding the organisation and the topics discussed

Workshop „Brainstorming for Cement Skills by 2030-2050”

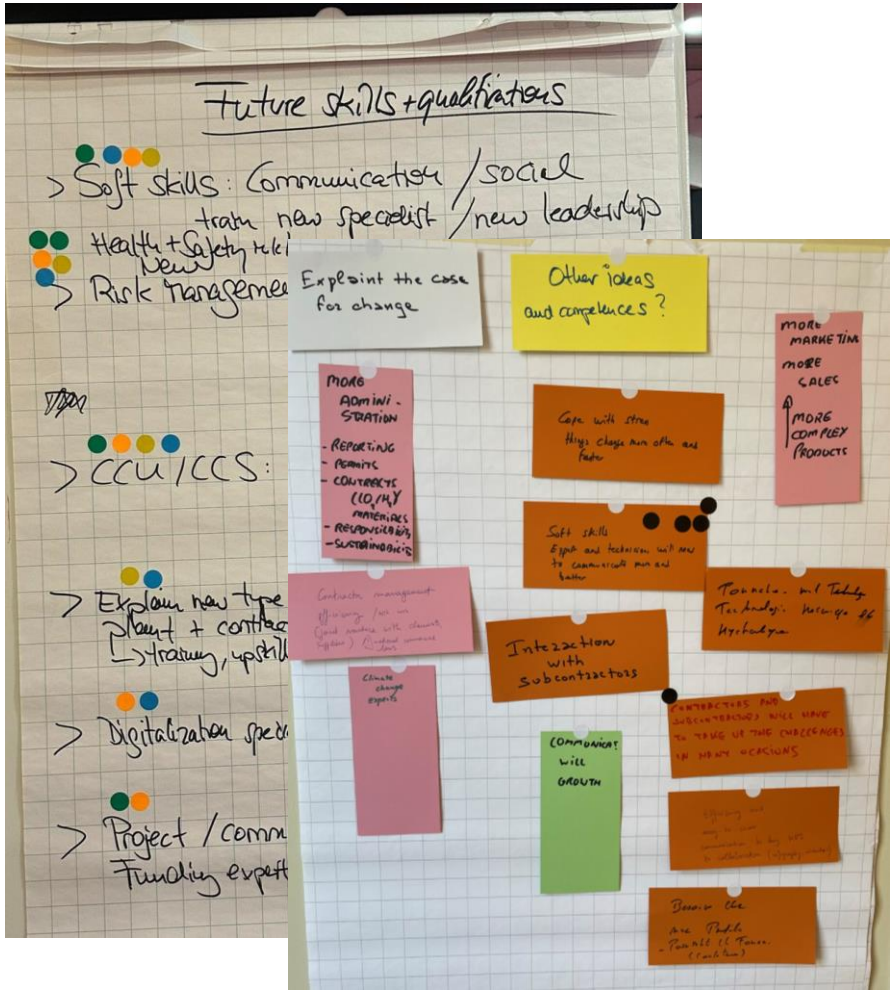
Programme



Workshop results „New technologies, products and infrastructure“

Which skills are required for the transformation of the cement sector? Who needs what?

- High demand for specialists in internal and external risk management, particularly for chemicals and new technology risks as well as automation experts and engineers
- Comprehensive training for new processes and regarding health and safety
- Project and communication managers will also become increasingly important for managing new investments and ensuring an effective communication



Workshop results „Sustainability management“

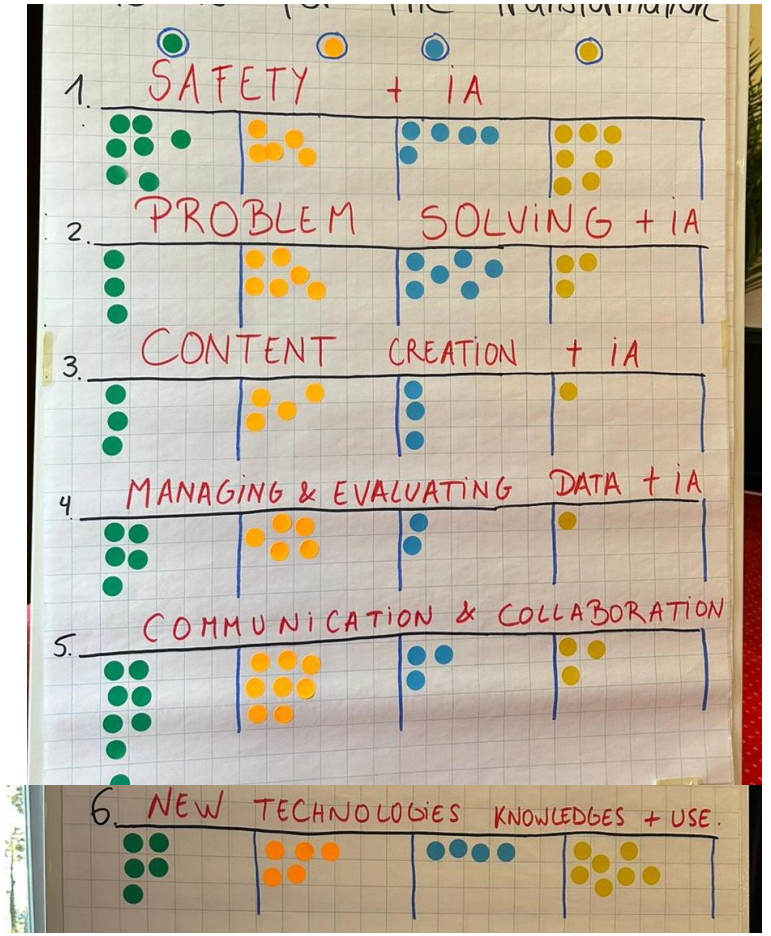
Which skills are required for the transformation of the cement sector? Who needs what?

- Professionals needed in areas such as Finance, Legal, Chemistry, Environmental Engineering, Economics, Sustainability, Health & Safety and Communication.
- Proficiency in IT tools for reporting, in-depth chemical knowledge, environmental protection techniques, automation, and technical skills, alongside effective risk management strategies.
- For successful project implementation, attributes such as empathy, curiosity, adaptability, creativity, leadership and concern for the community were emphasised.
- Strong stakeholder involvement, effective communication at all levels and continuous professional development is required

Workshop results „Digitalization“

Which skills are required for the digitalization of the cement sector? Who needs what?

- Essential digital skills for all occupational groups: Safety, communication and collaboration, new technologies knowledge and use
- Increasingly important is the integration of AI and knowledge about AI (including the identification of potential risks)
- There will also be a growing need for hands-on training in new technologies, security and AI-driven processes



Workshop results „Future education and training“

What needs to be changed, adapted and developed in order to train the right skills ?

- First step: Evaluation of existing skills to map new requirements and identify knowledge gaps
- Support life long learning and develop opportunities for all employees: Strategies to boost motivation and engagement are essential
- Tailored training programmes need to be developed for different target groups
- Training formats and methods should follow a mixed approach, with an emphasis on hands-on, practical training methods to ensure successful transfer to day-to-day work

Workshop results „Attractiveness of the sector“

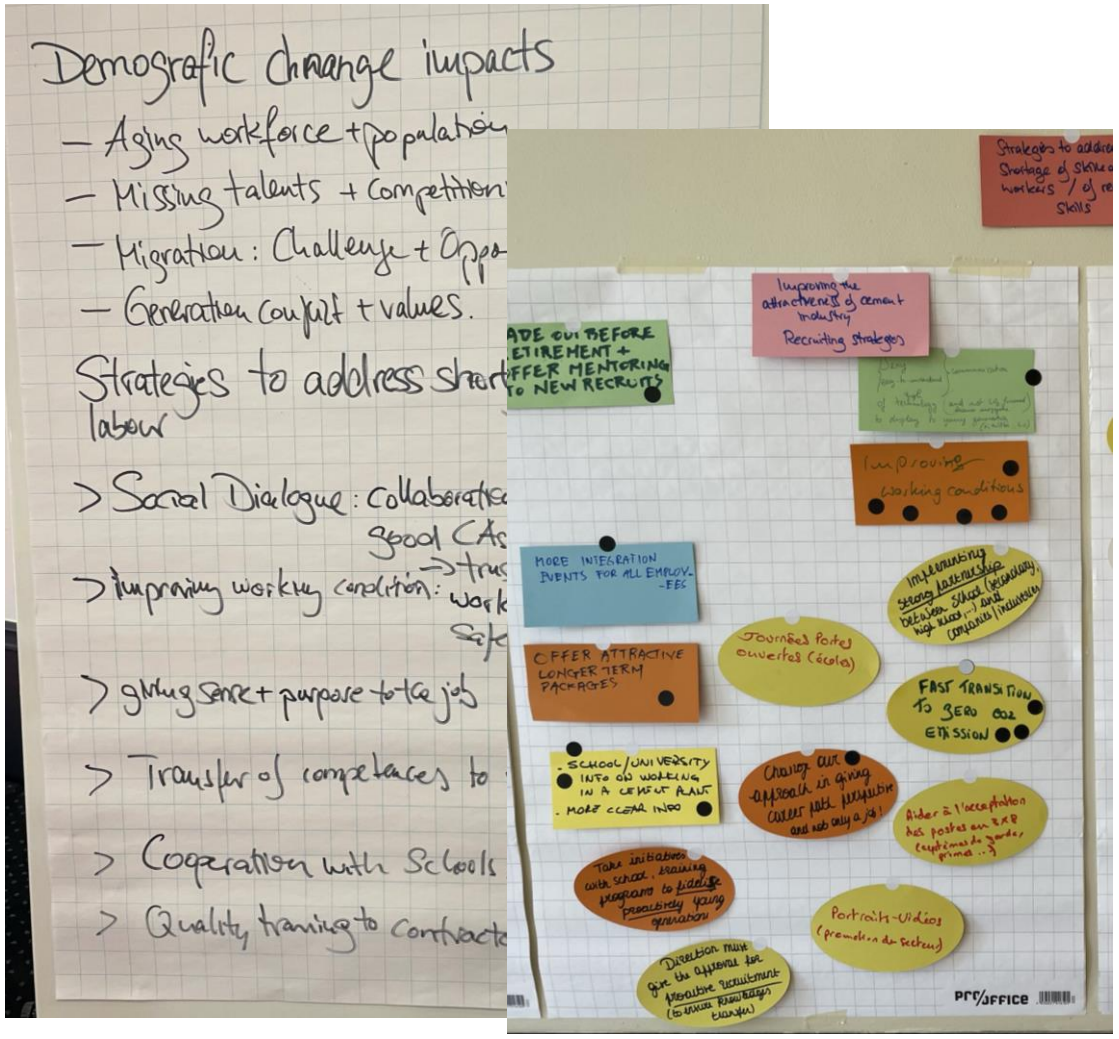
Challenges of demografic change & Strategies to adress skilled labour shortages

Challenges:

- Aging workforce & competition for talents
- Generational conflicts and cultural differences

Strategies:

- Social Dialogue to foster collaboration at all levels
- Improvement of working conditions to make jobs in the cement sector more attractive
- Transfer of skills from experienced to new employees
- Educational cooperations and new training programmes, tailored to the needs of the cement industry



Workshop results at a glance

Summary of key findings

- High demand for specialists in risk management, automation, environmental technologies and communication, particularly in areas like chemicals and new technologies.
- Important soft skills such as empathy, adaptability, creativity, and leadership are crucial for successful project implementation and stakeholder engagement.
- Growing importance of AI and new technologies: Training on safety and AI-driven processes is essential across all occupational groups.
- Lifelong learning becomes increasingly important: Develop tailored, hands-on training programs for different target groups to ensure skills transfer.
- Enhancing sector attractiveness through social dialogue, improved working conditions, and intergenerational collaboration.
- Addressing demographic challenges to tackle skilled labor shortages through educational cooperation and industry-specific training programs.

3.2 Online Survey – Analysis of survey results

Cement Skills 2030: Online Questionnaire

Methodological Considerations

- **Data Collection period**: 31 working days (from June 19th to July 31st 2024)
- **Data Collection method:** Online survey (created using the LamaPoll tool), distributed to participants by CEMBUREAU and EFBWW. The questionnaires were translated and sent out in six languages (English, French, Polish, Spanish, Greek, German).
- **Question types:** Primarily multiple-choice questions, supplemented by partially open-ended questions and ranking questions.
- **Sample:** Analysis is based on 97 fully completed questionnaires; 118 participants dropped out, mostly after the demographic questions.
- **Data analysis:** Descriptive method to highlight basic patterns and trends.
- **Representativeness:** The results of the survey are only partially generalisable due to their limited representativeness. Sample composition and the voluntary nature of participation limit the transferability of the results to the whole industry. The results should therefore be interpreted as indicators of possible trends and not as final conclusions.
- **Personal interviews:** Conducted to validate the case studies.

Structure of the survey analysis

Overview

Demographics	Status quo	Future skills‘ requirements	Future education & training	Case studies
• participation by country & organisation	• training strategies & participation • training topics & formats • internal communication • attractiveness of the industry	• professional skills • regulatory & compliance skills • digital skills	• training topics • training formats • role of social partners & european platform	• Belgium • France • Germany • Greece • Poland • Spain

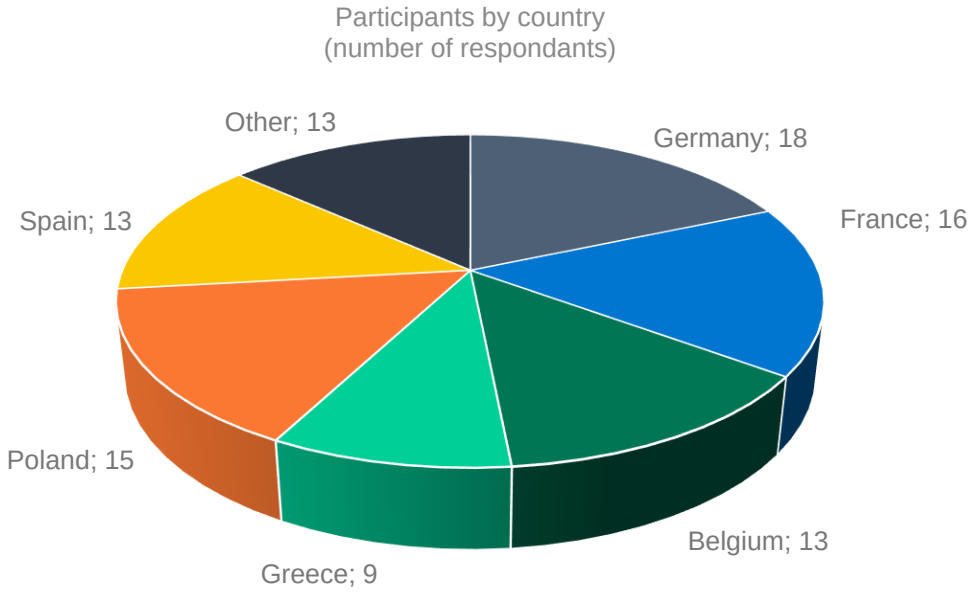
Structure of the survey analysis

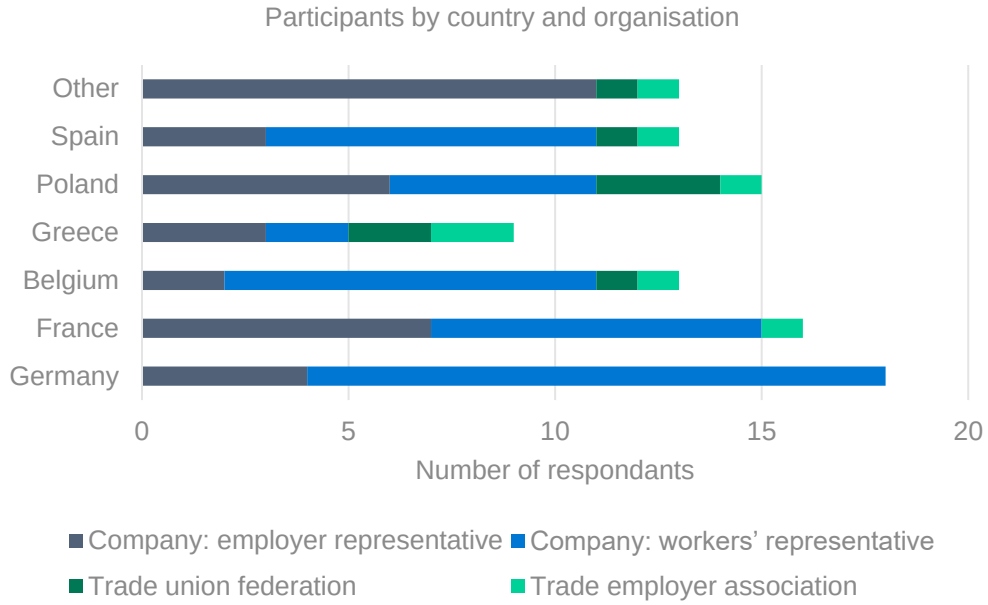
Overview

Demographics	Status quo	Future skills‘ requirements	Future education & training	Case studies
• participation by country & organisation	• training strategies & participation • training topics & formats • internal communication • attractiveness of the industry	• professional skills • regulatory & compliance skills • digital skills	• training topics • training formats • role of social partners & european platform	• Belgium • France • Germany • Greece • Poland • Spain

Participation by country and type of organisation

Good coverage of the case study countries and beyond





- All six case study countries with good level of participation from target groups (*Germany: only company level responses)
- Slightly more responses from workers‘ representatives and trade unions (54 out of 97 completed questionnaires)
- 85% of responses from company representatives (workers + employers side)
- Managers, professionals, technicians and associate professionals with 65% share of total responses
- Comparably low participation of plant & machine operators

Note: other countries with respondants = Bulgaria, Croatia, Czech Republic, Austria, Estonia, Latvia, Luxembourg, Portugal and Italy

Structure of the survey analysis

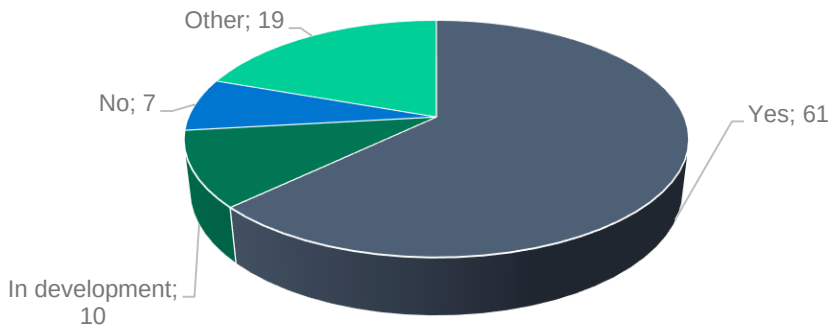
Overview

Demographics	Status quo	Future skills‘ requirements	Future education & training	Case studies
• participation by country & organisation	• training strategies & participation • training topics & formats • internal communication • attractiveness of the industry	• professional skills • regulatory & compliance skills • digital skills	• training topics • training formats • role of social partners & european platform	• Belgium • France • Germany • Greece • Poland • Spain

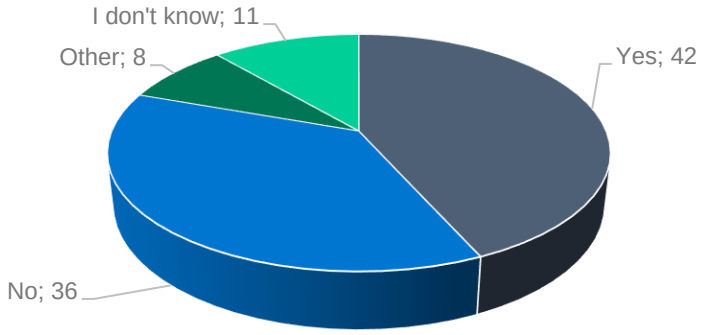
Training strategies and collective agreements

Majority of companies with training strategies in place

Does your company or organisation have a training strategy plan? (number of respondants)



Collective agreement in your company on employee training? (number of respondants)



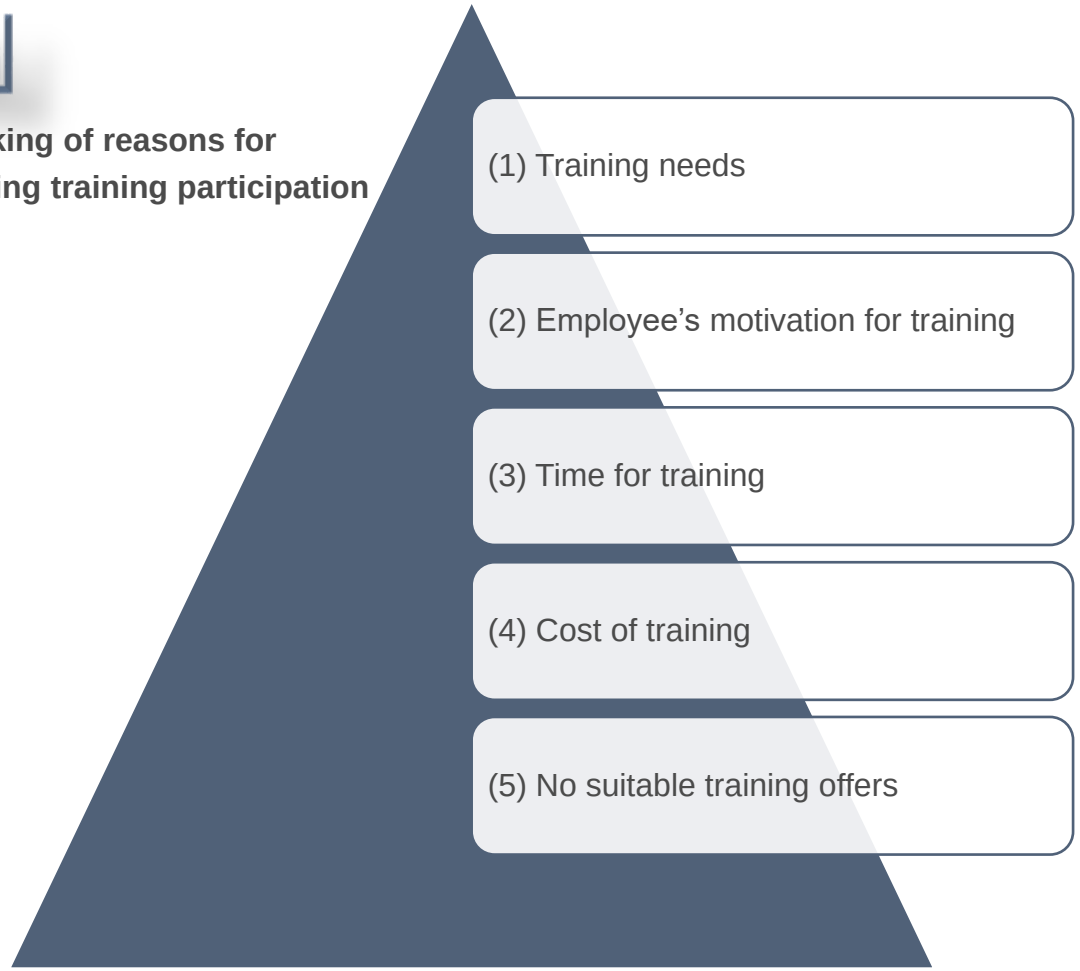
- Two-thirds of participants report of training strategies in place on company level with a small proportion currently developing such a strategy. Only 20% of the responses mention no specific training plan.
- Very similar distribution of answers across case study countries.
- Collective agreements on employee training appear to have a very different status in the various countries. France, Belgium and Greece in particular rely more heavily on this instrument.
- Other dedicated agreements on training between companies and other institutions seem to exist in all countries to some extent, showing a particular importance in Spain.
- Public financial support for training seems to be the exception rather than the rule.
- Individual training programmes are mainly determined by HR departments with no or limited participation of works councils or employee. This general view is shared in all countries covered.

Note: other collective agreements incl. among other a national collective agreement for the cement industry in France and a “general law regarding trainings specification“ in Portugal

Training responsibilities and participation

Participation in training programmes partly differ by occupational or age groups

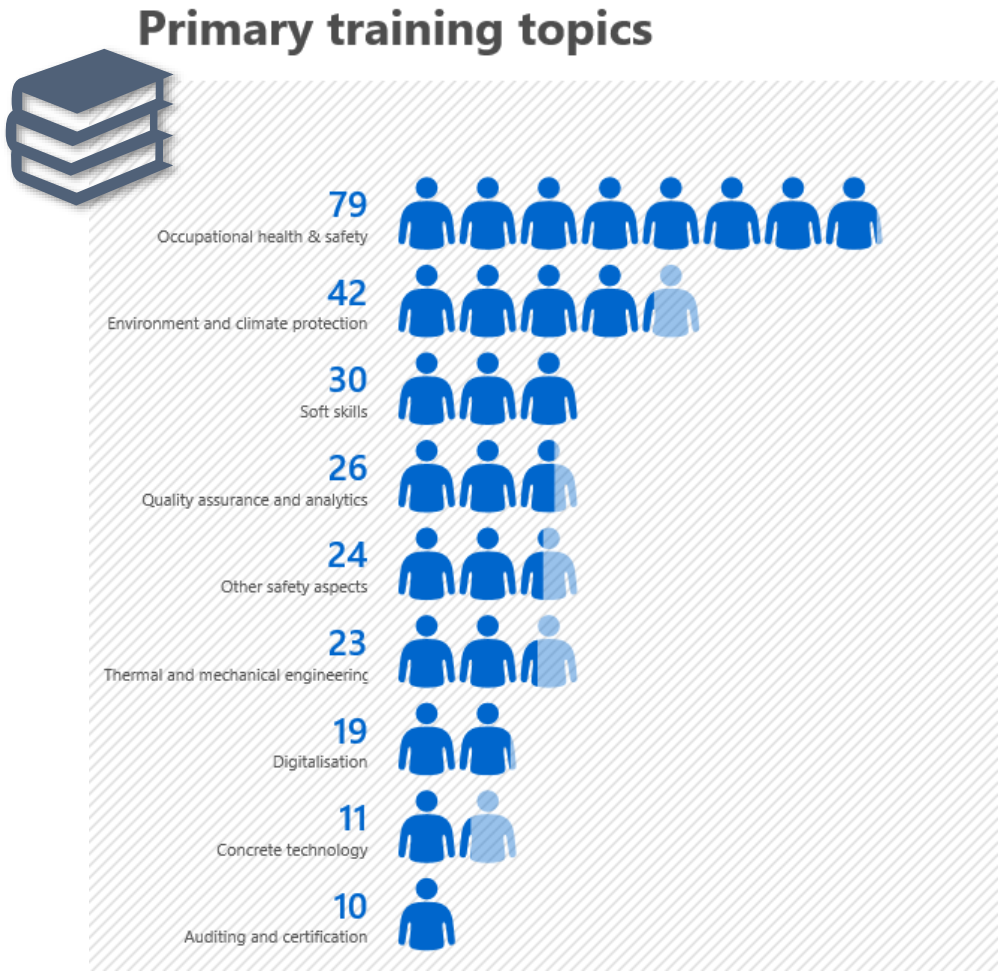
Ranking of reasons for varying training participation



- Almost 50% reported that there are differences in training participation between occupational or age groups; around 8% did not know.
- Some variations across countries. While for Poland more than half of the particpants reported differences in training participation by occupational or age groups, in countries such as Belgium or Greece these variations seem not to occur that often.
- Slight differences in the rankings of reasons between participating countries. While in Germany „Cost of training“ ranks first, the „Time for training“ is most important in France. „Employees motivation for training“ overall ranked second, but less relevant in Belgium and France.

Training topics – status quo

Health & Safety on top in all countries, higher variation among other topics

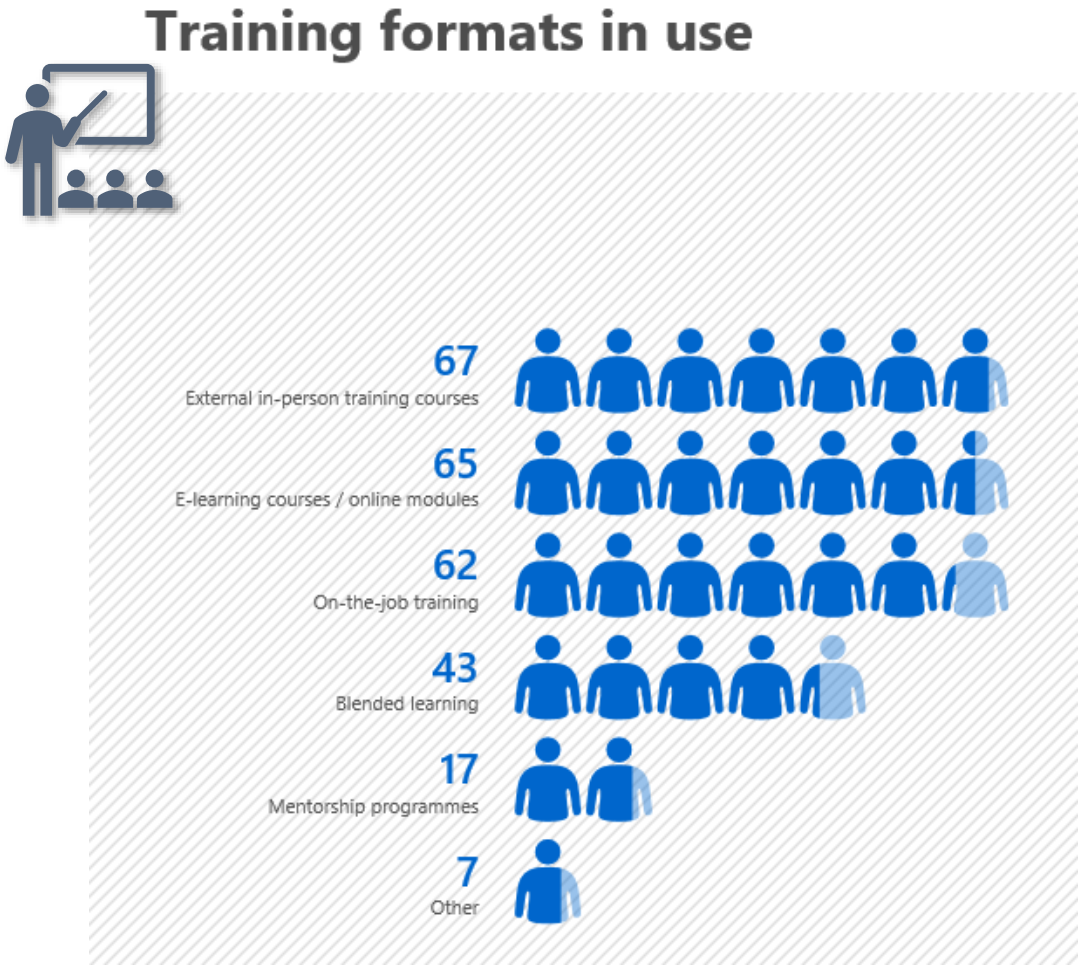


- Occupational health & safety is ranked as the top priority across all countries*, requiring continuous updates to address evolving technologies and materials in the cement industry.
- Many companies are already incorporating environmental and climate protection into their training programs, demonstrating that these issues are high on the agenda.
- Soft skills rank as the second-highest priority in Belgium and Greece. Their importance is growing, particularly for adapting to change, with an emphasis on leadership, conflict resolution, and change management to improve employee retention, motivation, and overall productivity.
- Process engineering topics play a subordinate role, suggesting that knowledge in these areas is already well-established and the industry's focus is increasingly shifting towards transformational processes such as digitalization and decarbonization.

Note: People graph = question with multiple selection, figures represent amount of responses for each category; * often mandatory training courses

Training formats – status quo

Similar preferences in all countries, in-person training courses & e-learning dominate



- External in-person training courses and e-learning courses are the most commonly used training formats, offering a flexible blend of traditional methods and digital learning that allows learning to take place anywhere and at any time. This combination is preferred in the cement industry to accommodate different learning preferences and to meet the specific skill needs of employees.
- Hands-on, on-the-job training is also essential, as it enables immediate integration of new knowledge into daily work routines and processes

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Training materials and programmes

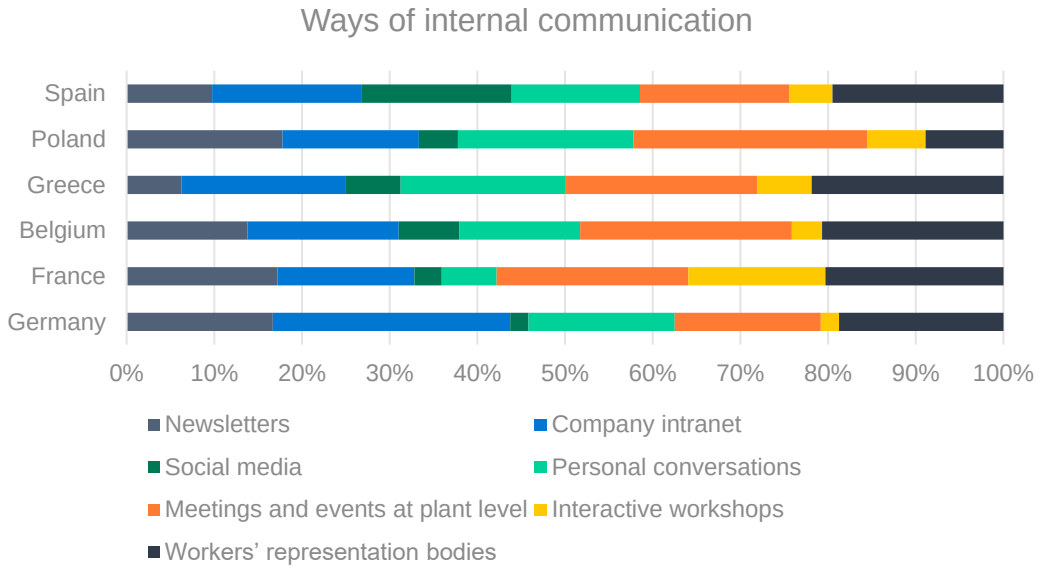
Most participants were satisfied with the offered material and provided recommendations

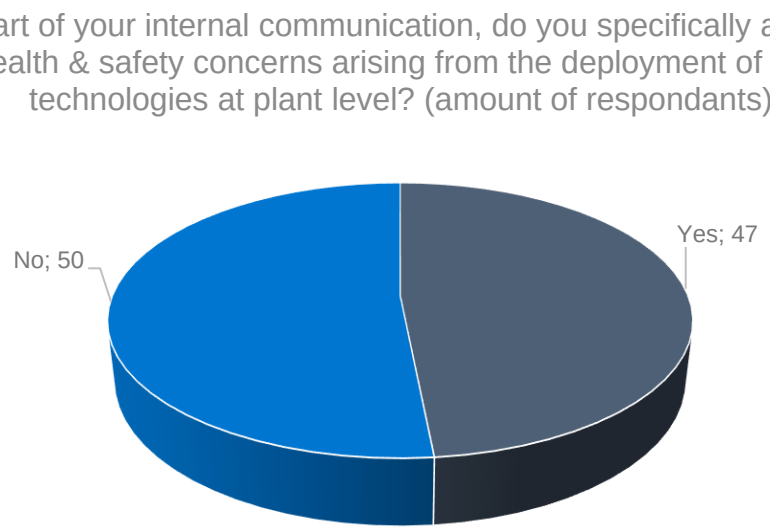
- Two-thirds of the participants reported that they are satisfied with the offered training material and programmes, of which around 40% still see room for improvement.
- Roughly 30% of respondents were not satisfied.
- Most frequently mentioned suggestions for improving material or training programmes
  - Tailored training
  - New training topics
  - Moderinzation of training methods
  - Practical on-the-job-training
  - Support from managemnt / trainers
  - Language / translation

Note: questions with open answers that were clustered by VDZ; the bigger the box the more important the cluster

Ways of internal communication

Personal interaction most relevant to communicate about changes and new technologies

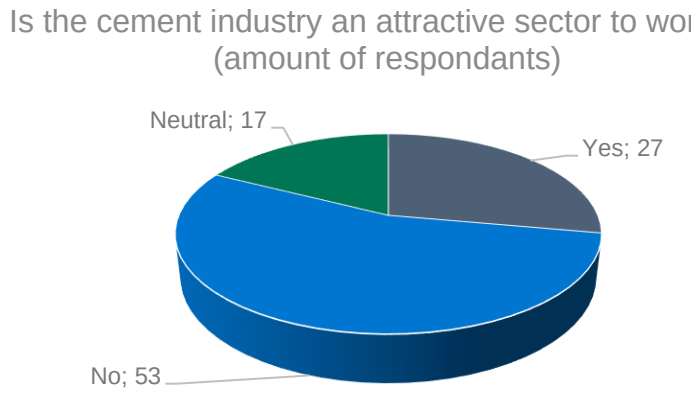




- Meetings and events at plant level with highest overall score, followed by company intranet.
- In France, Greece and Spain workers' representation bodies are the most important way to inform workers. While in Spain social media play a certain role, it is of rather low importance in the other countries.
- Less than half of the respondents (47 out of 97) reported that internal communication addresses health and safety issues arising from the use of new technologies at the plant level. Examples include training programs, workshops, (online) briefings or newsletters. However, in the majority of cases health and safety issues are not yet specifically addressed.

Attractiveness of the industry and skilled professional shortages

Cement industry confronted with a lack of technicians – worsening situation expected



- The cement industry has a rather negative image as a place to work in. Nevertheless such perception is dynamic, i.e. participants reported that the image is undergoing either a positive or a negative change (20% each).
- Positive image change is mostly linked to decarbonisation. Arguments for the negative image is among other high CO_2 emissions, pollution or a general unattractiveness of heavy industries. Overall, the image of the cement sector seems to be quite different from country to country.
- Facing this negative perception it is challenging to attract skilled professionals.
- High demand for technicians and associate professionals as well as plant and machine operators and assemblers. The lack of professionals (such as natural scientists or electrical and civil engineers) ranks on third position.
- Over the next ten years this shortage is expected to worsen, specifically with regard to technicians and plant / machine operators.

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Online Survey results at a glance

Status quo analysis: Summary of key findings

- Majority of companies with training strategy in place or in development, 20% mention no specific plan.
- Collective agreements between the social partners on employee training with different status across countries. Individual training programmes at company level are mainly determined by HR departments.
- Participation in training programmes varies for the following reasons: 1) training needs; 2) employee motivation; 3) time for training; 4) cost of training; 5) no suitable offers. The level of participation in training also appears to vary partly by occupation or age group.
- Training topics today dominated by health & safety in all countries, higher variation among other topics, i.e. environment & climate protection, soft skills, quality assurance & analytics.
- External in-person training courses and e-learning are the most commonly used training formats. Most participants were satisfied with the training materials provided, but still room for improvement.
- Personal interaction is the most important form of internal communication about changes, new technologies and associated health & safety topics.
- The cement industry has a rather negative image as a place to work. However, this perception is dynamic, i.e. the image is changing either positively (decarbonization) or negatively.
- Shortage of skilled labour already today, especially technicians, associate professionals & machine operators - negative trend expected in coming years.

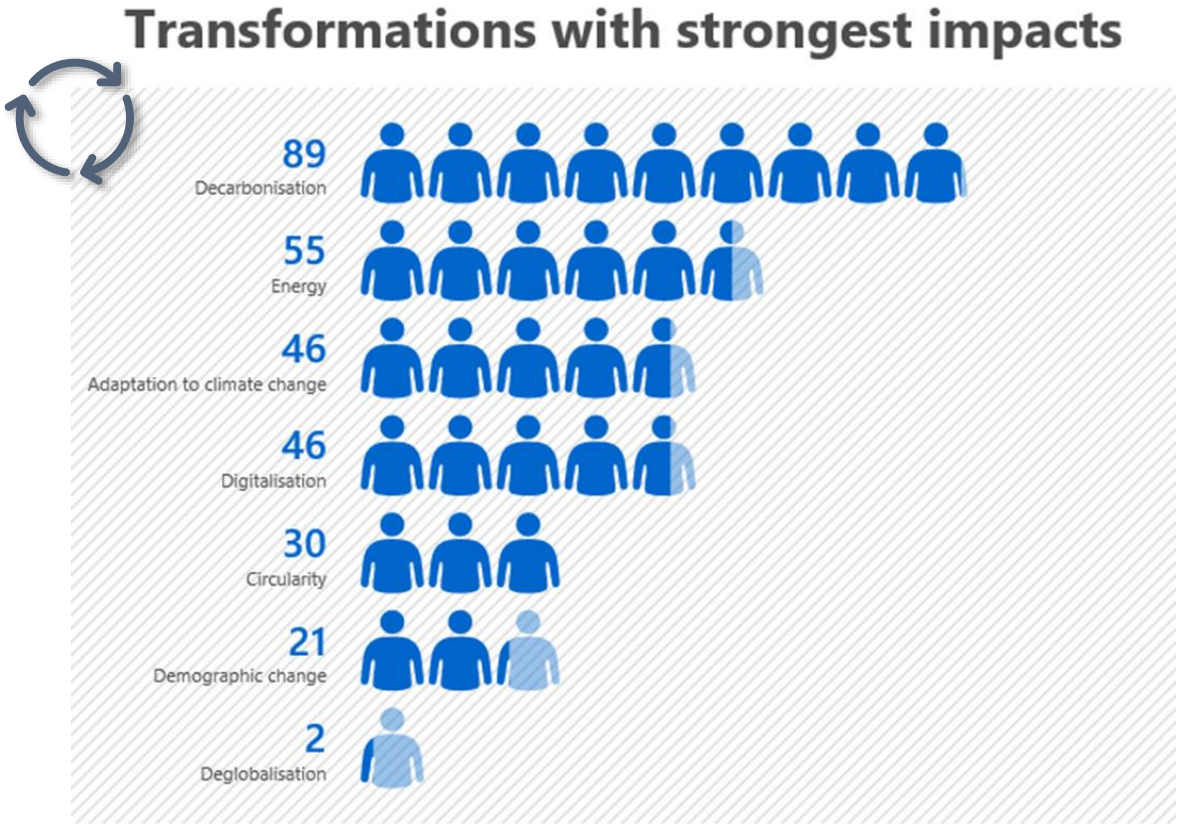
Structure of the survey analysis

Overview

Demographics	Status quo	Future skills‘ requirements	Future education & training	Case studies
• participation by country & organisation	• training strategies & participation • training topics & formats • internal communication • attractiveness of the industry	• professional skills • regulatory & compliance skills • digital skills	• training topics • training formats • role of social partners & european platform	• Belgium • France • Germany • Greece • Poland • Spain

Transformation in the cement industry

Decarbonisation as the most pressing issue, but the industry also faces other transformations



- Decarbonization with highest score in all countries.
- Germany, Greece and Spain rank digitalization as the second highest priority.
- Both, decarbonization and digitalization, are advancing together as a "double transformation," creating synergies that significantly enhance energy efficiency, for example, through the use of digital systems.
- France, Belgium, and Poland consider "Energy" the second most significant transformation, as the adoption of renewable energy and energy-efficient technologies is essential for reducing CO_2 emissions while also achieving cost savings.
- Big differences in the assessment of demographic change: High scores in Germany and Poland, low scores in especially in Spain and Greece.

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Future professional skills requirements for the transformations

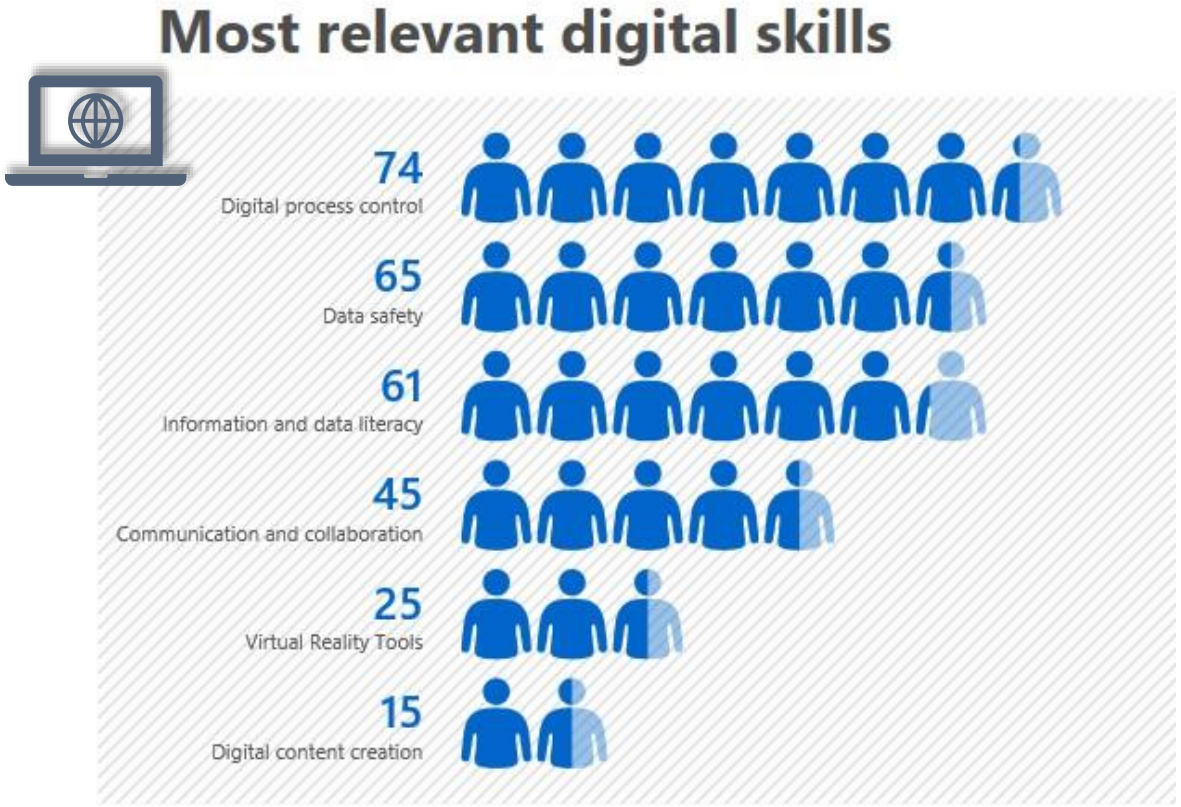
Carbon capture, transport, handling and digitalisation will become most relevant skills

- Decarbonization is identified as the top priority and the most challenging transformation topic, aligning with the evaluation of professional skills requirements
- Strengthening technical knowledge is essential to meet decarbonization objectives: "Carbon capture & process technology" is ranked as the highest overall priority
- In all countries, the second-highest priority is either "CO_2 transport & handling“ (France, Belgium, Poland and Spain) or "Digitalization and Automation“ (Germany and Greece)

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Future digital skills requirements for the transformations

Digital process control, data safety and literacy as most pressing qualifications



- Digitalization and decarbonization are advancing simultaneously, forming a “double transformation.” This creates synergy effects, so that, for example, energy efficiency can be significantly improved through the use of digital systems and models.
- In Germany, France, Greece, and Spain, the topics of “Digital Process Control” and “Data Safety” are the top two priorities
- Belgium places a strong emphasis on skills in “Communication and Collaboration” as a top priority, while France prioritizes skills in “Information and Data Literacy.”

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Future compliance skills requirements for the transformations

Emissions trading, circular economy and sustainability monitoring require most attention.

- Emission trading and emission control, circular economy & waste management as well as sustainability monitoring rank highest overall.
- Emission trading & control with highest priority in Germany and Poland, whereas circular economy & waste management skills considered most important in France, Greece and Spain.
- Occupational safety skills continues to have high relevance across all countries, plant safety and safety of communities with rather low scores, except for France.
- Soft skills related to the transformations such as stakeholder management seen as relevant but overall ranking low, except for Greece.
- Competitiveness and trading as well as environmental law skills with medium relevance.

Note: People graph = question with multiple selection, figures represent amount of responses for each category

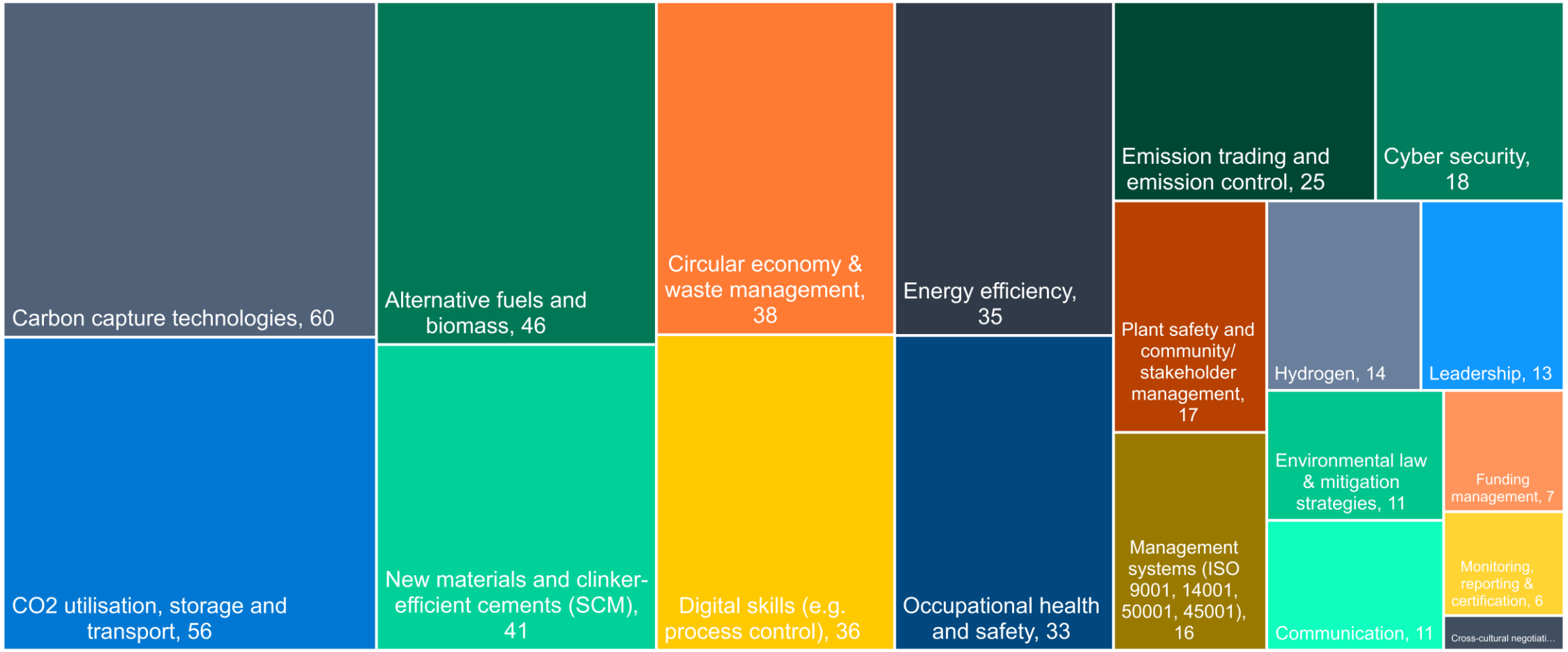
Structure of the survey analysis

Overview

Demographics	Status quo	Future skills' requirements	Future education & training	Case studies
• participation by country & organisation	• training strategies & participation • training topics & formats • internal communication • attractiveness of the industry	• professional skills • regulatory & compliance skills • digital skills	• training topics • training formats • role of social partners & european platform	• Belgium • France • Germany • Greece • Poland • Spain

Prioritised topics in the future to adapt training programmes

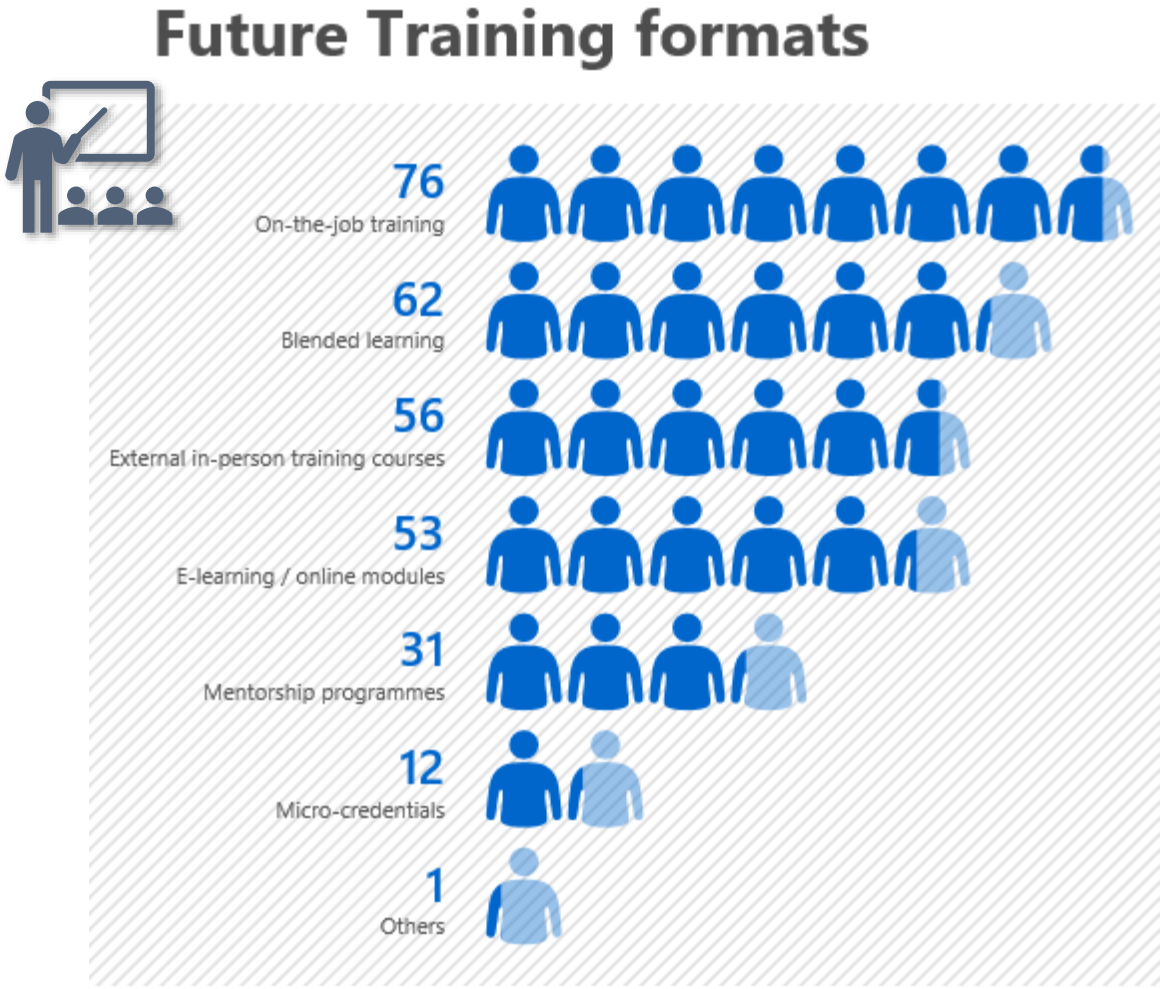
Decarbonisation, digitalisation and circular economy on top of „wishlist“



Note: questions with multiple selection; figures in boxes show how many participants selected this option, the bigger the box the more important the topic

Training formats – priorities for the future

On-the-job and blended learning considered most promising concepts



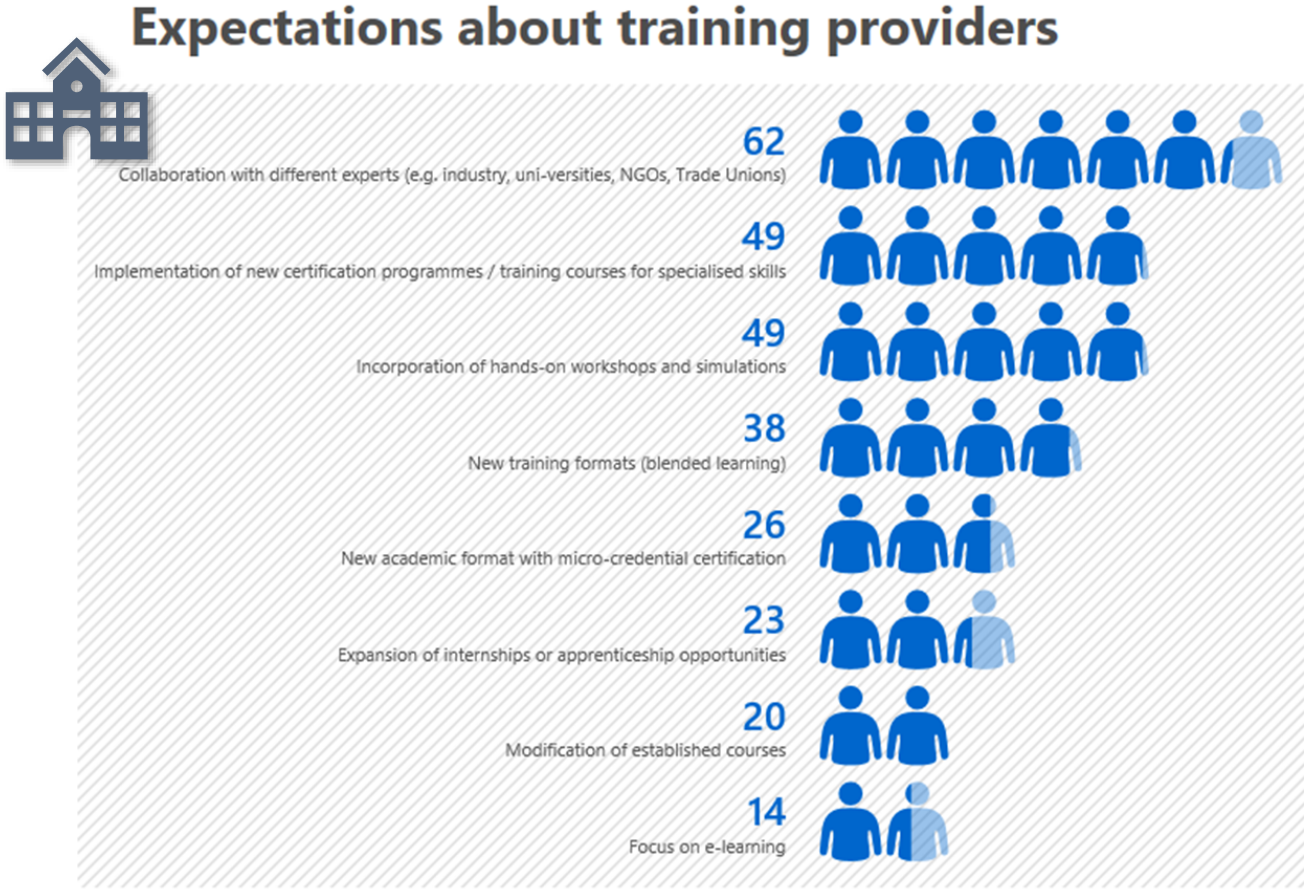
Recommendations for action based on the participants‘ responses:

- On-the-job training is a key tool for imparting practical knowledge about technologies & products and for passing on experience to younger employees.
- Expand blended learning programs by integrating e-learning with in-person training, using digital tools for basic theoretical knowledge and in-person sessions for practical, hands-on tasks and complex skills.
- Invest in internal trainers and mentors by establishing a structured mentoring program that trains experienced employees to share their knowledge, provide effective feedback, and guide new employees in their skill development.
- Highlight the benefits of training by clearly linking it to career growth and development opportunities.
- Implement skills management programs to track progress, and providing regular feedback to ensure employees feel recognized, valued, and motivated in their learning journey.

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Perspectives on future education and training programmes

Training providers are expected to offer collaboration, hands-on workshops, and flexible learning formats.

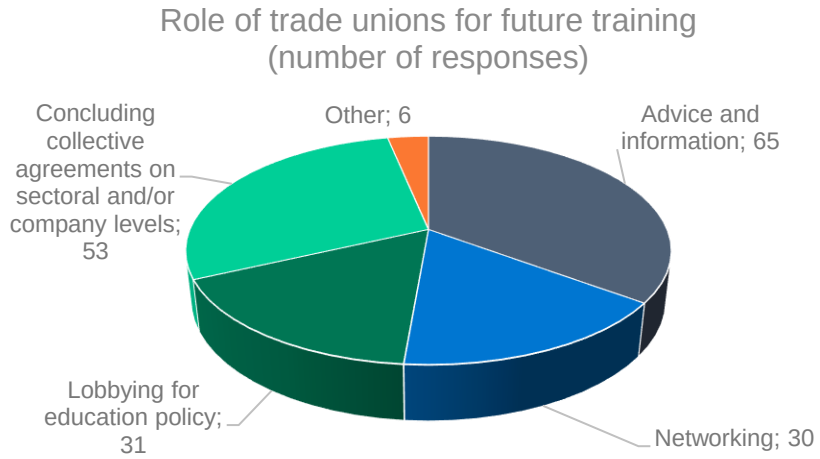


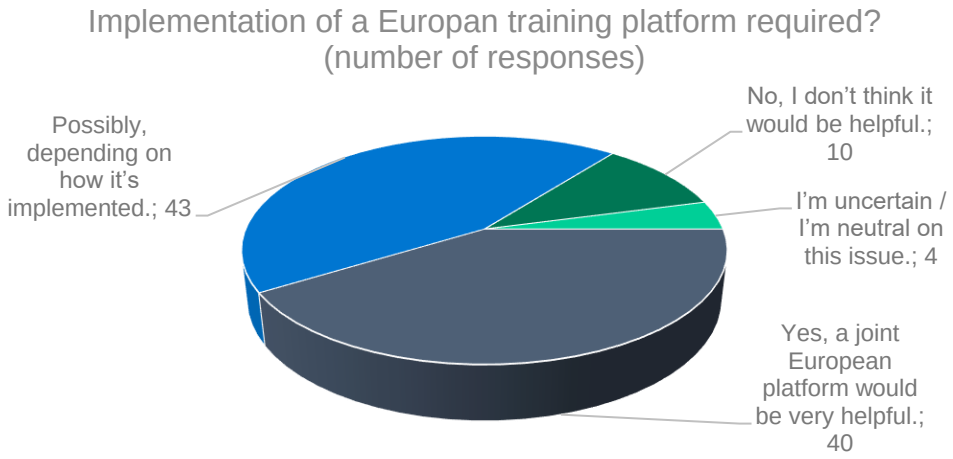
- Expand collaborations with external experts and institutions, including industry, universities, NGOs, and trade unions, to ensure continuous knowledge exchange. This approach brings diverse perspectives on sustainability, digitalization, and labor challenges.
- Implement new certification programs for specialized skills, focusing on areas like CO_2 reduction, circular economy, and new technologies.
- Use qualified trainers to ensure practical knowledge transfer, enabling employees to apply new skills effectively in their daily work.

Note: People graph = question with multiple selection, figures represent amount of responses for each category

Role of trade unions and joint platforms in future training

Union‘s expected to provide advice & information, collective agreements & partnerships





- The most widely recognized role for trade unions is providing advice and information with regards to training demands and skills development – specifically in Poland and Spain.
- Another relevant role is developing collective agreements at the sectoral or company level as well as partnerships with educational institutions to facilitate lifelong learning as well as lobbying for education policy changes – especially in France and Spain.
- To a certain extent, involvement in companies' education strategies is also viewed as relevant, particularly in countries like Belgium and Greece.
- Most participants believe that a European training platform would be beneficial in providing the necessary tools and courses for a successful transition for the sector (e.g. by sharing of good practices, providing information in different languages)

Online Survey results at a glance

Future skills‘ and training requirements: Summary of key findings

- Carbon capture, transport, handling and digitalisation will become most relevant professional skills.
- Digital process control, data safety and literacy as most pressing digital skills.
- Emissions trading, circular economy and sustainability monitoring as key compliance skills.
- Priority topics for future training programmes are decarbonisation technologies, new SCMs, alternative fuels & biomass, and circularity & digitalisation. Emerging issues such as cyber security, plant safety and stakeholder management with lower ratings but increasing relevance.
- On-the-job and blended learning are seen as the most promising training approaches for the future, with specific recommendations: expand blended learning programs by integrating e-learning with in-person training
  - invest in internal trainers and mentors by establishing a structured mentoring program
  - Highlight the benefits of training by clearly linking it to career growth and development opportunities.
  - Implement skills management programs to track progress and provide feedback.
- Training providers are expected to offer collaboration, hands-on workshops, and flexible learning formats.
- Trade unions expected to provide advice & information, collective agreements & partnerships in training.

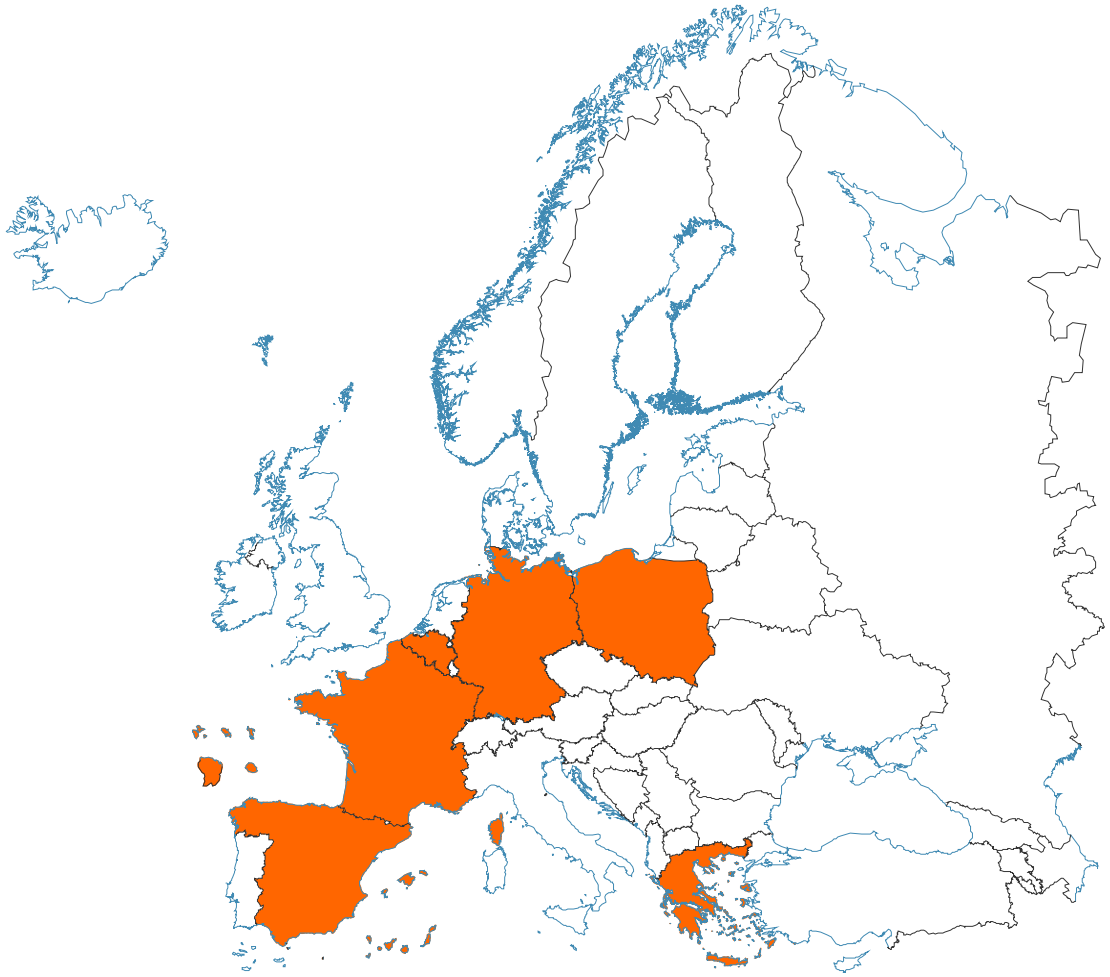
3.3 Case Studies

- Belgium
- France
- Germany
- Greece
- Poland
- Spain

Case studies Europe

An overview of six countries / key figures 2022

Country	Plants	Production (Mt)	Capacity (Mt)	Employees (2021)
Belgium	8	8.5	8.7	2,600
France	43	16.5	29.6	7,300
Germany	53	32.9	47.0	8,000*
Greece	7	6.8	12.7	1,468
Poland	11	18.5	23.5	8,500
Spain	32	18.4	42.5	5,400



Sources: Eurostat, VDZ, Federal Statistical Office Germany, Global Cement Report (15th ed.), Oficemen, Hellenic Cement Industry Association
Note: * ~ 13,000 acc. to the new EU definition of a company

Case study Belgium

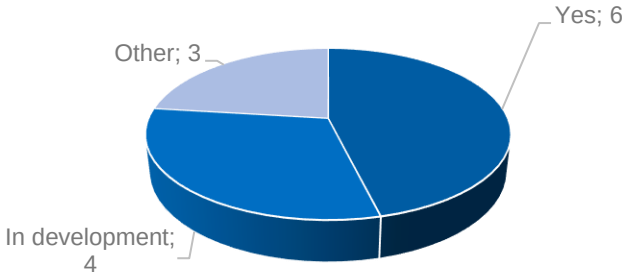
Based on social data input from companies and national associations (not part of online questionnaire)

- Four responses from three companies and one association
- Belgium cement industry with predominantly large companies
- Age structure of employees vary from company to company
- The concept of apprenticeship varies from region to region
  - public/private concepts in Brussels and Wallonia
  - public concepts for Wallonia, Flanders, Brussels and German speaking region
- Share of apprentices among total employees below 5%
- Types of employer-sponsored apprenticeships: Industrial mechanic, process mechanic, electronics technician, chemical laboratory technician, industrial clerk
- Training hours per employee differ from company to company – from 10 - 20 hours to more than 40 hours per year

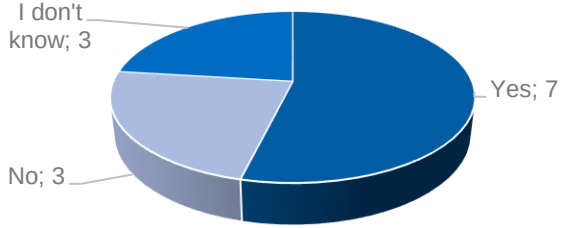
	Concepts of apprenticeships	
Region	**Public/private**	**Public**
Brussels	efp https://www.efp.be/	Actiris.brussels https://www.actiris.brussels/fr/citoyens/ & Bruxelles Formation https://www.bruxellesformation.brussels/
Wallonia	IFAPME https://www.ifapme.be/	FOREM = Public Service for Employment and Vocational Training in Wallonia https://www.leforem.be/
Flanders		VDAB https://www.vdab.be/
German speaking region		Arbeitsamt der deutschsprachigen Gemeinschaft Belgiens https://adg.be/

Cement Skills in Belgium / status quo analysis

Company with training strategy plan?



Company with collective agreement on employee training?

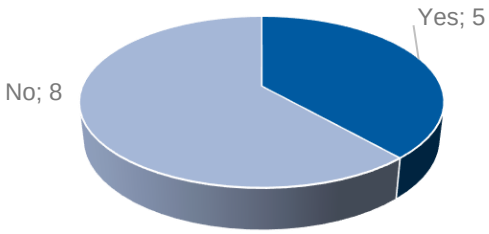


Ranking of reasons for varying training participation

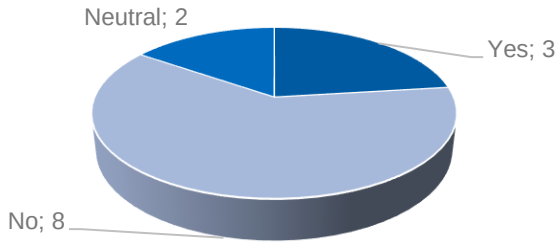
TOP 5 Training topics

- Occupational health & safety (11)
- Soft Skills (5)
- Environment and climate protection (4)
- Other safety aspects (4)
- Digitalisation (3)

Communication of health & safety concerns of new technologies?



Is the cement industry an attractive sector to work in?



Note: 13 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / Belgium

TOP 5

Professional skills

- Carbon capture & process technologies (9)
- CO_2 transport & handling (6)
- Digitalisation & automation (5)
- Helth & safety monitoring & mapping (4)
- Knowledge of electrical infrastructure (4)

Digital skills

- Communication & collaboration (11)
- Digital process control (9)
- Information and data literacy (7)
- Data safety (6)
- Digital content creation (3)

Compliance skills

- Sustainability monitoring, reporting & certification (7)
- Occupational health & safety (7)
- Circular Economy & Waste Management (5)
- Plant safety & safety of communities (5)
- Emission trading & emission control (4)

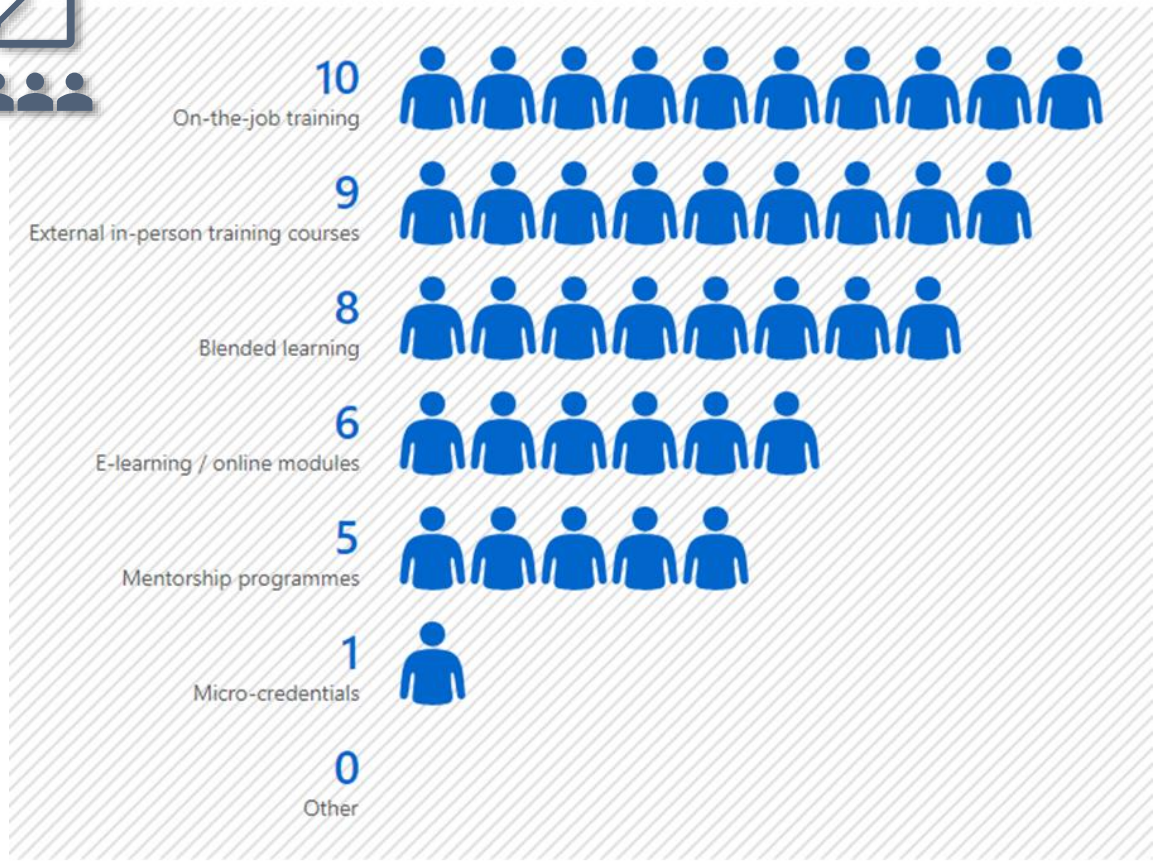
Note: 13 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / Belgium

TOP 8 Training topics

- CO_2 utilisation, storage and transport (10)
- Carbon capture technologies (6)
- Energy efficiency (6)
- Plant safety and community/stakeholder management (6)
- New materials and clinker-efficient cements (SCM) (5)
- Circular economy & waste management (5)
- Digital skills (e.g. process control) (5)
- Occupational health & safety (5)

Future training formats

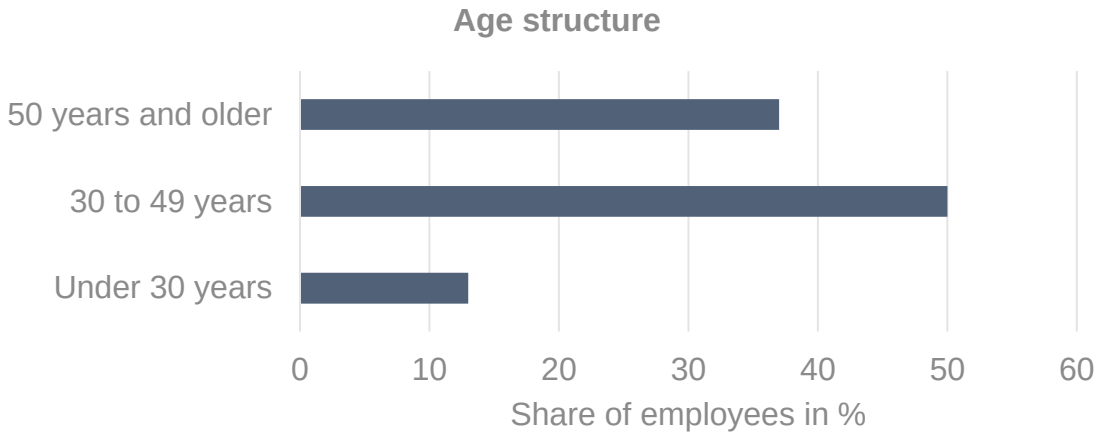


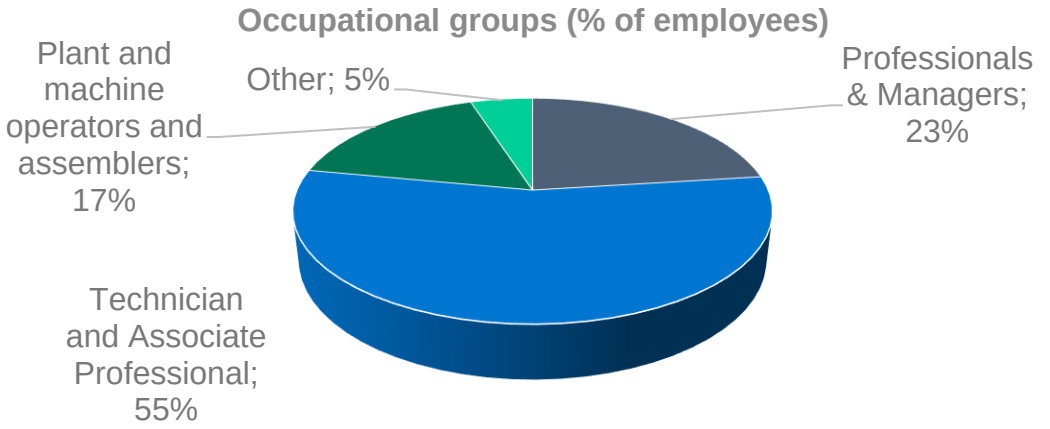
Note: 13 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case study France

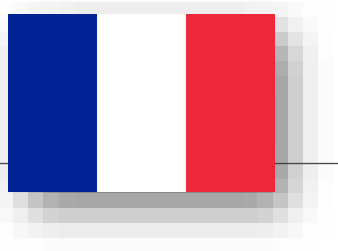
Based on social data input from companies and national associations (not part of online questionnaire)

- One response from one association
- France cement industry with predominantly large companies
- Age structure: 50% of employees between 30 to 49 years old; further 37% are older
- More than half of employees are technicians and associate professionals
- Public/private concept of apprenticeship in France with electrical and mechanical maintenance technicians, health and safety facilitators as well as operation technicians as most relevant types for the cement industry
- Share of apprentices among total employees below 5%
- 27 annual training hours per employee on average

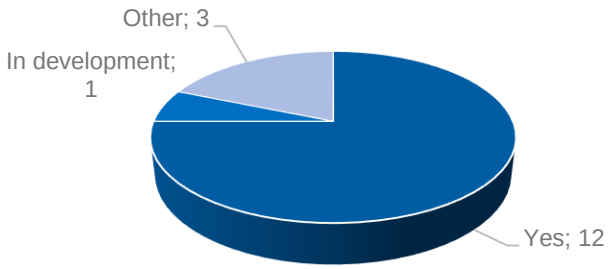




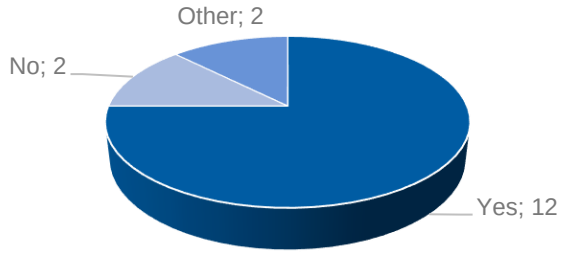
Cement Skills in France / status quo analysis



Company with training strategy plan?



Company with collective agreement on employee training?

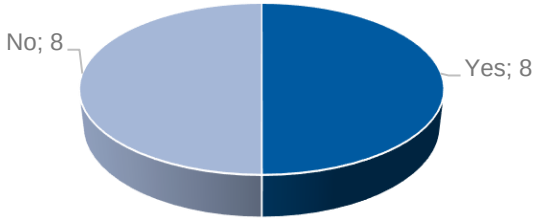


Ranking of reasons for varying training participation

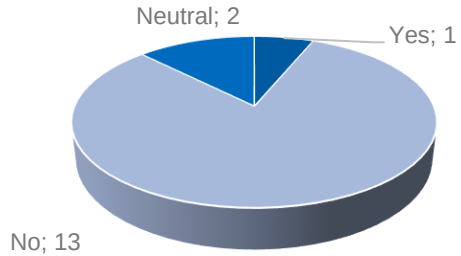
TOP 5 Training topics

- Occupational health & safety (13)
- Thermal and mechanical engineering (7)
- Environment and climate protection (7)
- Soft skills (6)
- Other safety aspects (3)

Communication of health & safety concerns of new technologies?

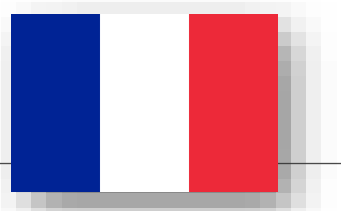


Is the cement industry an attractive sector to work in?



Note: 16 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / France



TOP 5

Professional skills

- Carbon capture & process technologies (16)
- CO_2 transport & handling (10)
- Digitalisation & automation (7)
- Helth & safety monitoring & mapping (5)
- Risk managements & new safety protocols (5)

Digital skills

- Data safety (13)
- Digital process control (11)
- Information and data literacy (10)
- Virtual reality tools (7)
- Communication and collaboration (4)

Compliance skills

- Circular economy & waste management (11)
- Environmental Law & mitigation strategies (9)
- Emission trading and emission control (8)
- Plant safety & safety of communities (8)
- Occupational health and safety (7)

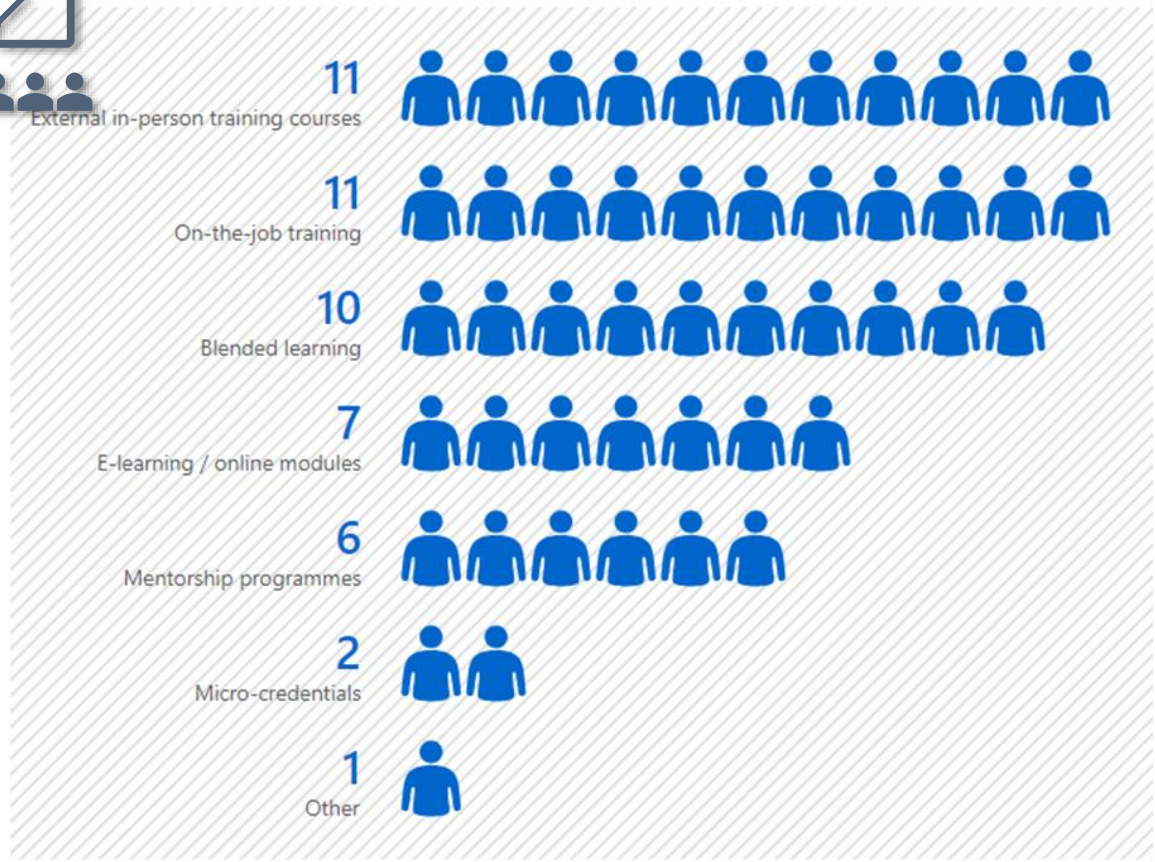
Note: 16 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / France

TOP 8 Training topics

- Alternative fuels and biomass (13)
- Carbon capture technologies (13)
- CO_2 utilisation, storage and transport (9)
- New materials and clinker-efficient cements (SCM) (8)
- Energy efficiency (6)
- Circular economy & waste management (6)
- Occupational health & safety (6)
- Emission trading and emission control (4)

Future training formats

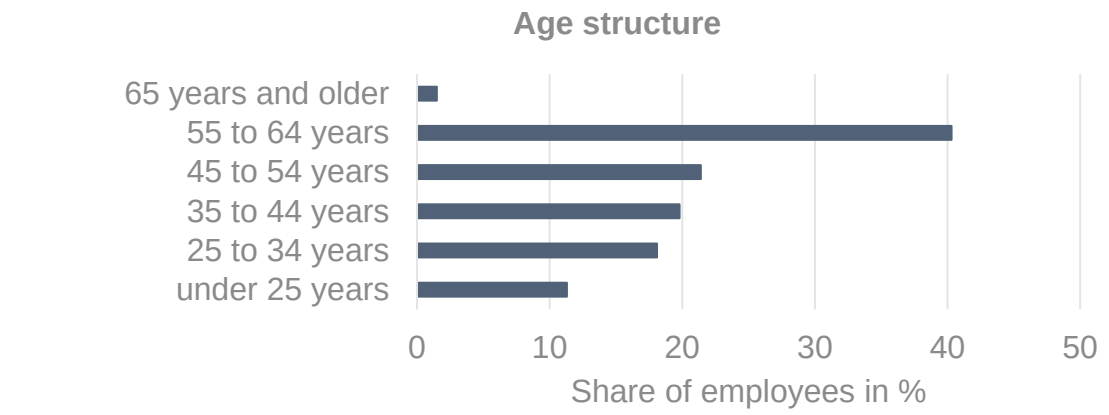


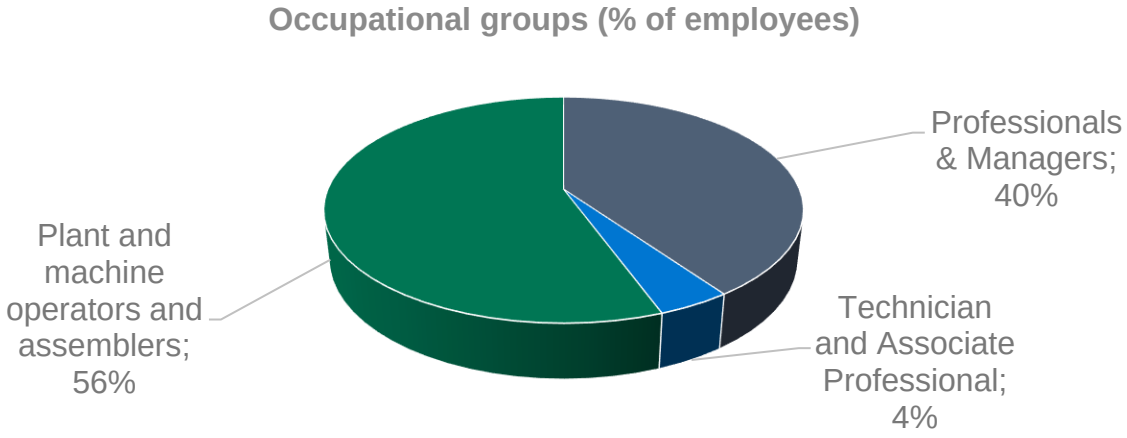
Note: 16 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case study Germany

Based on social data input from companies and national associations (not part of online questionnaire)

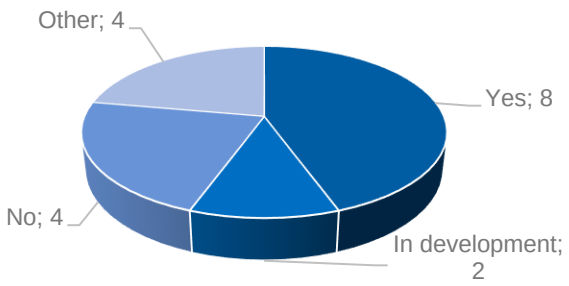
- Two responses from one association and one company
- German cement industry with a mix of large and medium-sizes companies
- Age structure: 40% of employees between 55 to 64 years old; share of young employees below 34 years is significantly lower and a major demograhpic challenge across different industries in Germany
- More than half of employees are plant and machine operators and assemblers
- Proven system consisting of dual training and dual study programmes that offers a combination of theoretical apprenticeship training at a vocational school and practical training at a company
- Share of apprentices among total employees below 5%
- 21 to 40 annual training hours per employee on average



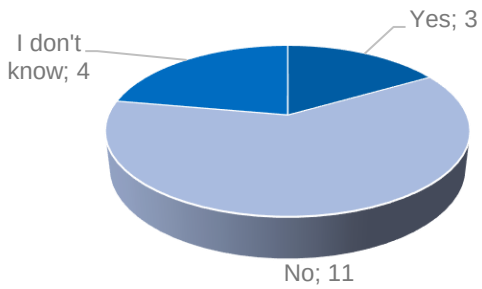


Cement Skills in Germany / status quo analysis

Company with training strategy plan?



Company with collective agreement on employee training?

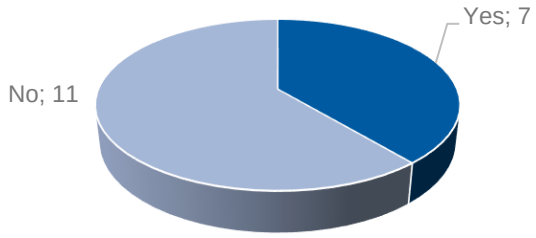


Ranking of reasons for varying training participation

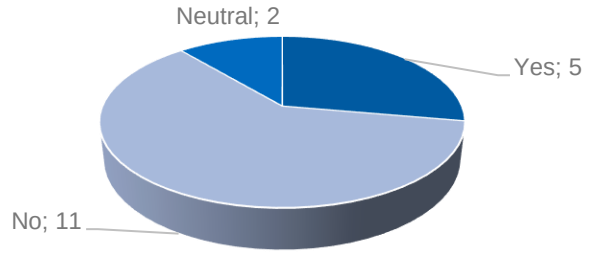
TOP 5 Training topics

- Occupational health & safety (13)
- Quality assurance and analytics (12)
- Environment and climate protection (9)
- Digitalisation (4)
- Thermal and mechanical engineering (3)

Communication of health & safety concerns of new technologies?



Is the cement industry an attractive sector to work in?



Note: 18 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / Germany

TOP 5

Professional skills

- Carbon capture & process technologies (12)
- CO_2 transport & handling (10)
- Digitalisation & automation (9)
- Chemical knowledge of new material & gases (6)
- Knowledge of electrical infrastructure & processes (5)

Digital skills

- Digital process control (15)
- Data safety (13)
- Information and data literacy (13)
- Communication and collaboration (11)
- Digital content creation (1)

Compliance skills

- Emission trading and emission control (11)
- Occupational health and safety (11)
- Circular economy & waste management (8)
- Sustainability monitoring, reporting & certification (6)
- International trade & carbon leakage (CBAM) (5)

Note: 18 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / Germany

TOP 8 Training topics

- CO_2 utilisation, storage and transport (13)
- Carbon capture technologies (11)
- Energy efficiency (9)
- Alternative fuels and biomass (8)
- Circular Economy & waste management (7)
- Hydrogen (6)
- Emission trading and emission control (6)
- Cyber security (5)

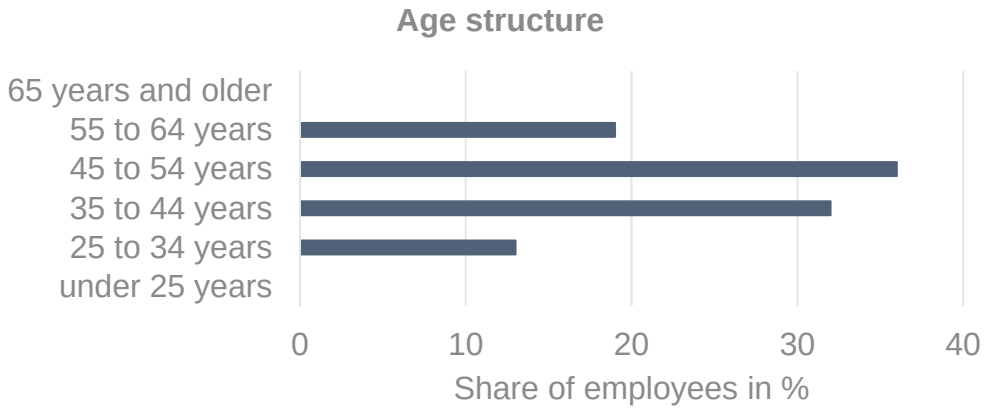
Future training formats

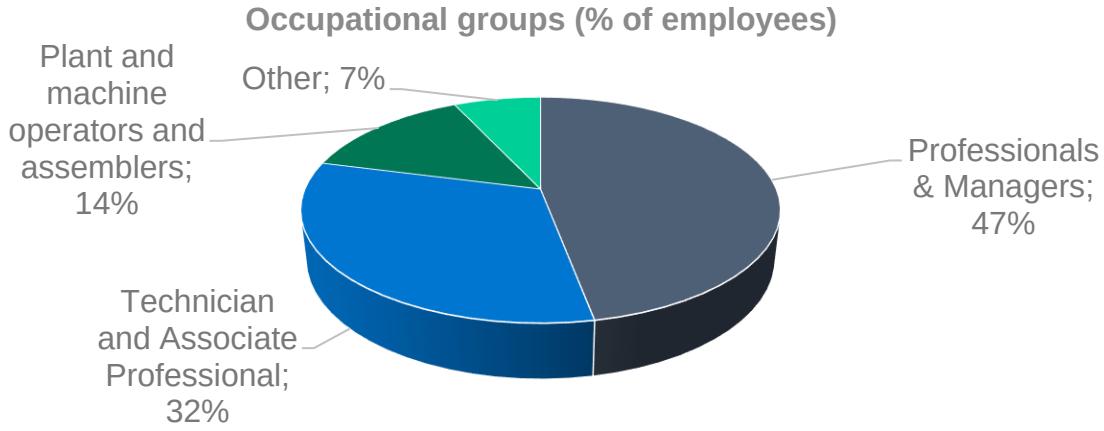
Note: 18 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case study Greece

Based on social data input from companies and national associations (not part of online questionnaire)

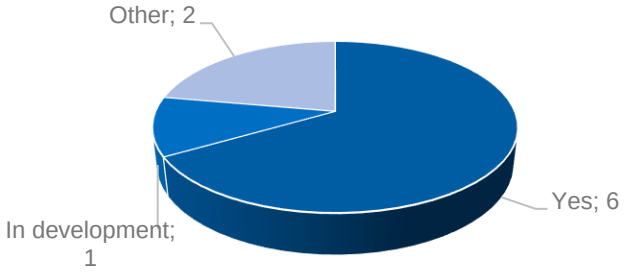
- One response from one association
- Greek cement industry with predominantly large companies
- Age structure: two thirds of employees between 35 and 54 years old
- Almost half of employees are professionals & managers
- Mix of public and private apprenticeship concepts with technical highschools, universities and colleges
- Further apprenticeship institutions are EPAL (Vocational Lyceums - secondary level technical schools) & IEK (Vocational training institutes) & Post-graduate training programs offered by public & private universities, colleges & business schools
- Share of apprentices among total employees below 5%
- 21 to 40 annual training hours per employee on average



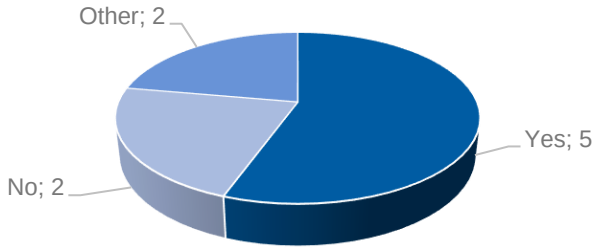


Cement Skills in Greece / status quo analysis

Company with training strategy plan?



Company with collective agreement on employee training?

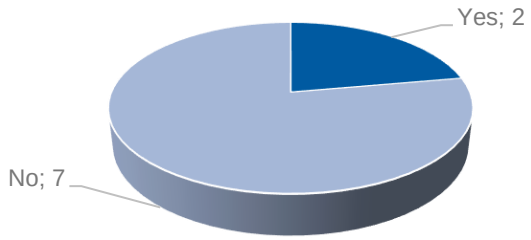


Ranking of reasons for varying training participation

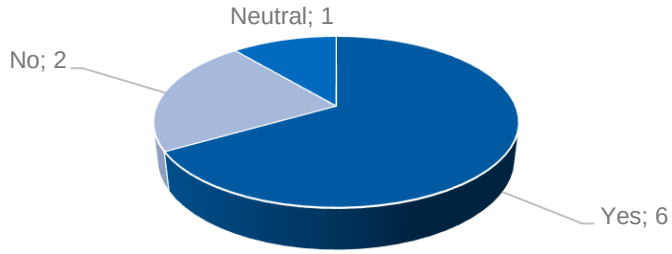
TOP 5 Training topics

- Occupational health & safety (7)
- Thermal and mechanical engineering (3)
- Environment and climate protection (3)
- Soft skills (3)
- Auditing and certification (2)

Communication of health & safety concerns of new technologies?



Is the cement industry an attractive sector to work in?



Note: 9 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / Greece

TOP 5

Professional skills

- Carbon capture & process technologies (6)
- CO_2 transport & handling (5)
- Digitalisation & automation (5)
- Risk management and new safety protocols (4)
- Health & safety monitoring & mapping (3)

Digital skills

- Digital process control (8)
- Information and data literacy (8)
- Data safety (5)
- Communication and collaboration (2)
- Digital content creation (2)

Compliance skills

- Circular economy & waste management (6)
- Sustainability monitoring, reporting & certification (5)
- International trade & carbon leakage (CBAM) (5)
- Environmental law & mitigation strategies (4)
- Plant safety and safety of communities (4)

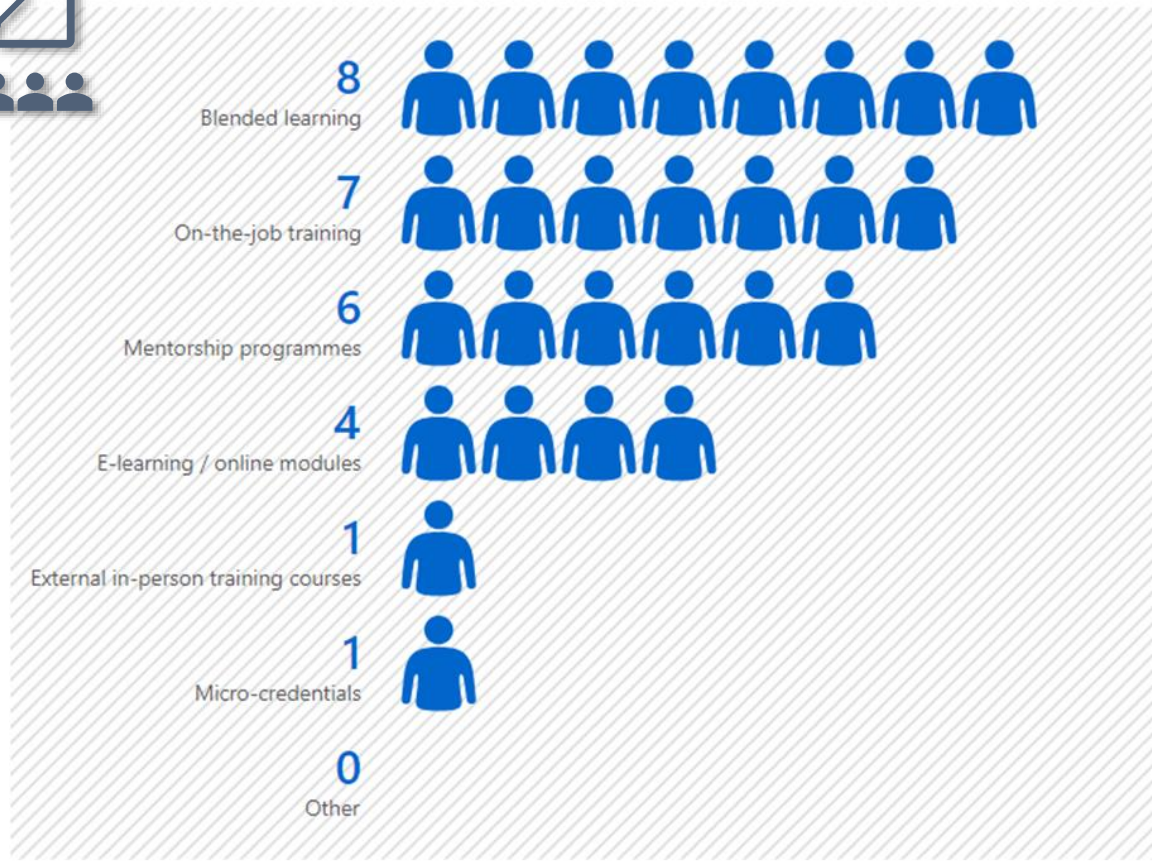
Note: 9 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / Greece

TOP 8 Training topics

- Carbon capture technologies (6)
- Alternative fuels and biomass (5)
- Digital skills (5)
- New materials and clinker-efficient cements (SCM) (4)
- CO_2 utilisation, storage and transport (4)
- Energy efficiency (4)
- Emission trading and emission control (4)
- Circular economy & waste management (3)

Future training formats

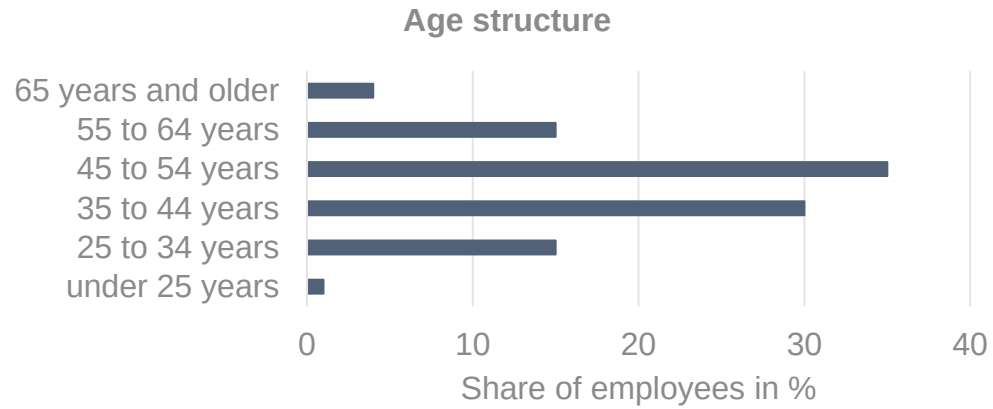


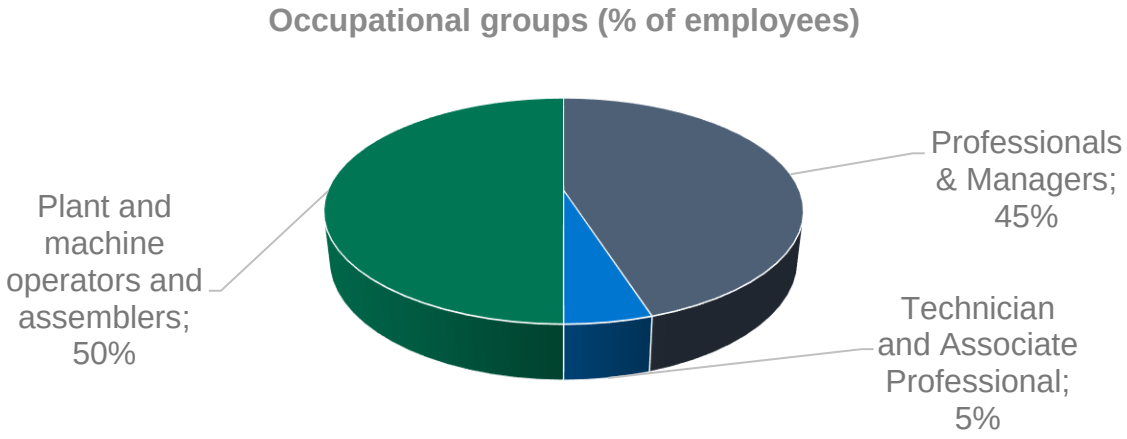
Note: 9 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case study Poland

Based on social data input from companies and national associations (not part of online questionnaire)

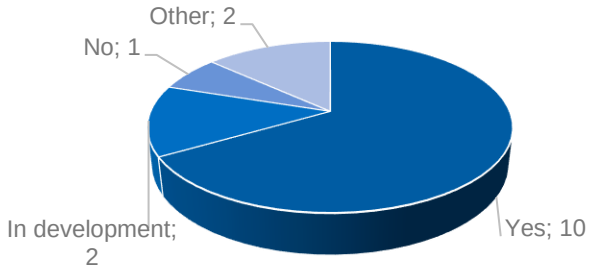
- One response from one association
- Polish cement industry with small and medium sized companies as well as large companies, with balanced coverage
- Age structure: two thirds of employees between 35 and 54 years old
- Half of employees are plant & machine operators and assemblers
- Private concept of apprenticeship
- Machine operators and electricians with public exams
- Vocational schools in which students undergo professional internships in private companies as one of the elements of passing the exam
- Share of apprentices among total employees below 5%
- 10 to 20 annual training hours per employee on average



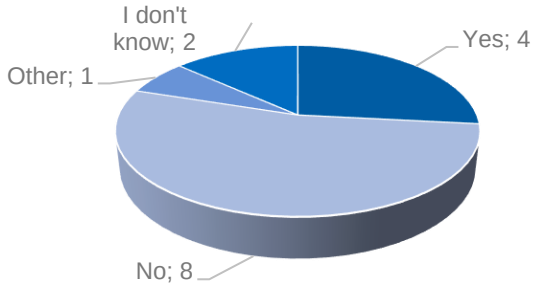


Cement Skills in Poland / status quo analysis

Company with training strategy plan?



Company with collective agreement on employee training?

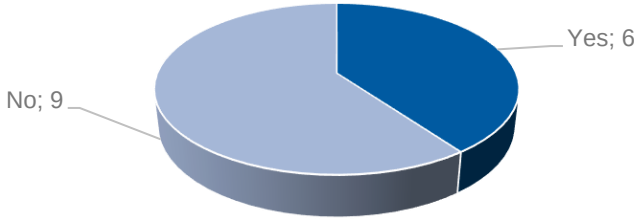


Ranking of reasons for varying training participation

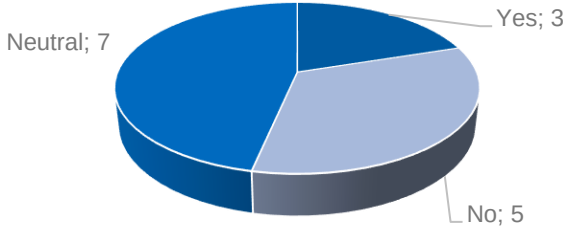
TOP 5 Training topics

- Occupational health & safety (13)
- Environment and climate protection (6)
- Other safety aspects (5)
- Digitalisation (4)
- Soft skills (4)

Communication of health & safety concerns of new technologies?



Is the cement industry an attractive sector to work in?



Note: 15 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / Poland

TOP 5

Professional skills

- Carbon capture & process technologies (12)
- CO_2 transport & handling (9)
- Digitalisation & automation (7)
- Health & safety monitoring & mapping (7)
- Chemical knowledge of new materials & gases (3)

Digital skills

- Digital process control (13)
- Information and data literacy (10)
- Data safety (8)
- Communication and collaboration (8)
- Virtual reality tools (4)

Compliance skills

- Emission trading and emission control (13)
- Sustainability monitoring, reporting & certification (9)
- International trade & carbon leakage (CBAM) (8)
- Occupational health and safety (8)
- Circular economy & waste management (5)

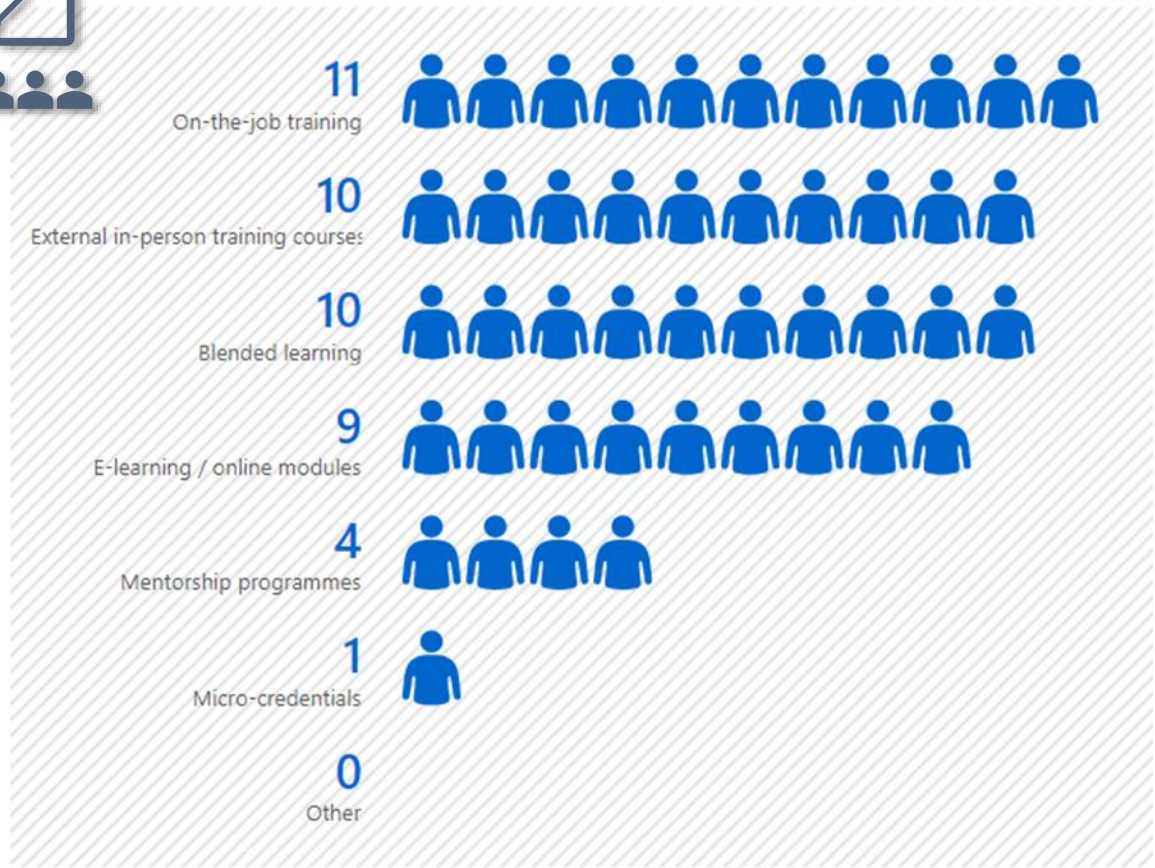
Note: 15 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / Poland

TOP 8 Training topics

- New materials and clinker-efficient cements (SCM) (8)
- CO_2 utilisation, storage and transport (8)
- Digital skills (8)
- Alternative fuels and biomass (7)
- Carbon capture technologies (7)
- Occupational health & safety (7)
- Cyber security (5)
- Management systems (4)

Future training formats

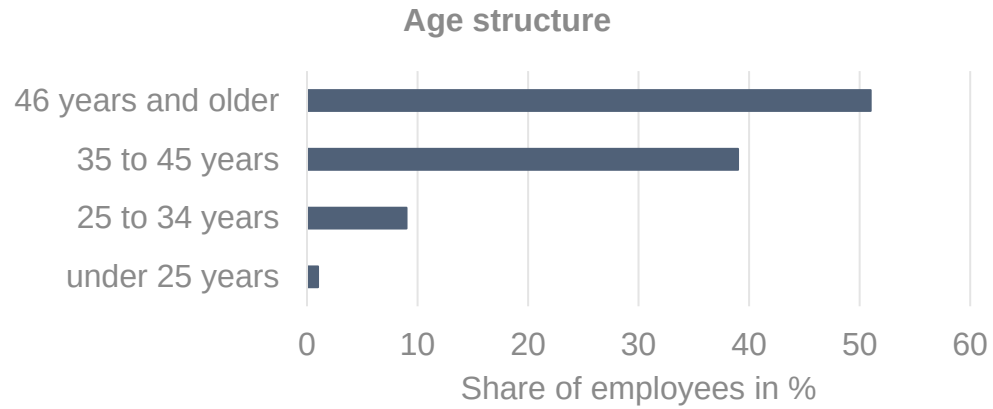


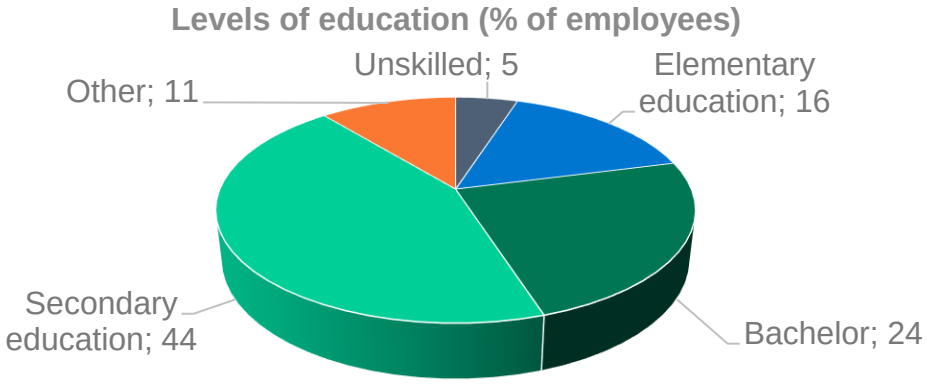
Note: 15 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case study Spain

Based on social data input from companies and national associations (not part of online questionnaire)

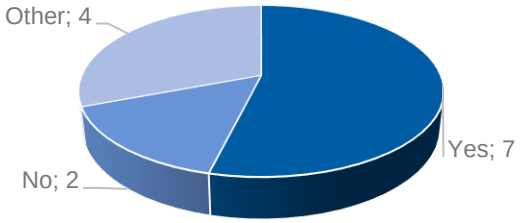
- Two responses from one company and one association
- Cement industry with predominantly large companies
- Age structure: more than half of employees older than 45 years
- Around 12% of employees are women
- Almost half of the employees with secondary education, further 24% with Bachelor‘s degree
- Public/Private concept of apprenticeship with industrial mechanics, electronics technicians, chemical laboratory technicians, plant mechatronics technicians and office clerks as most relevant types for the cement industry
- Dual Vocational Training is a new modality within vocational training; combining teaching and learning processes in the company and in the training center
- 10 to 20 annual training hours per employee on average



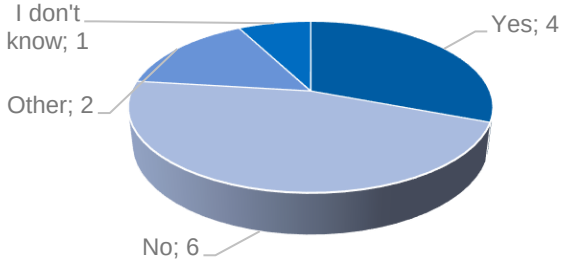


Cement Skills in Spain / status quo analysis

Company with training strategy plan?



Company with collective agreement on employee training?

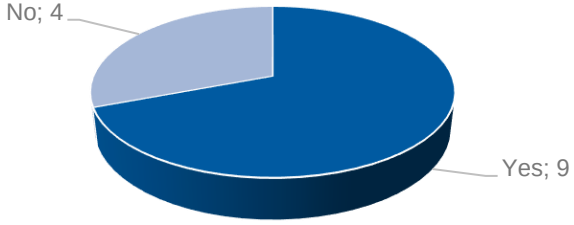


Ranking of reasons for varying training participation

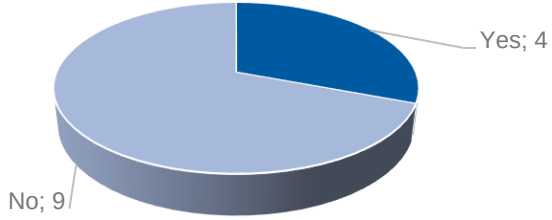
TOP 5 Training topics

- Occupational health & safety (11)
- Environment and climate protection (8)
- Other safety aspects (4)
- Digitalisation (4)
- Soft skills (3)

Communication of health & safety concerns of new technologies?



Is the cement industry an attractive sector to work in?



Note: 13 participants; TOP 5 Training topics = question with multiple selection; figures in brackets show how many participants selected this option

Most relevant cement skills of the future / Spain

TOP 5

Professional skills

- Carbon capture & process technologies (10)
- Digitalisation & automation (9)
- CO_2 transport & handling (8)
- Risk management and new safety protocols (4)
- Chemical knowledge of new materials & gases (4)

Digital skills

- Data safety (11)
- Digital process control (9)
- Information and data literacy (7)
- Communication and collaboration (4)
- Virtual reality tools (4)

Compliance skills

- Circular economy & waste management (9)
- Emission trading and emission control (6)
- Occupational health and safety (6)
- Environmental law & mitigation strategies (5)
- Sustainability monitoring, reporting & certification (5)

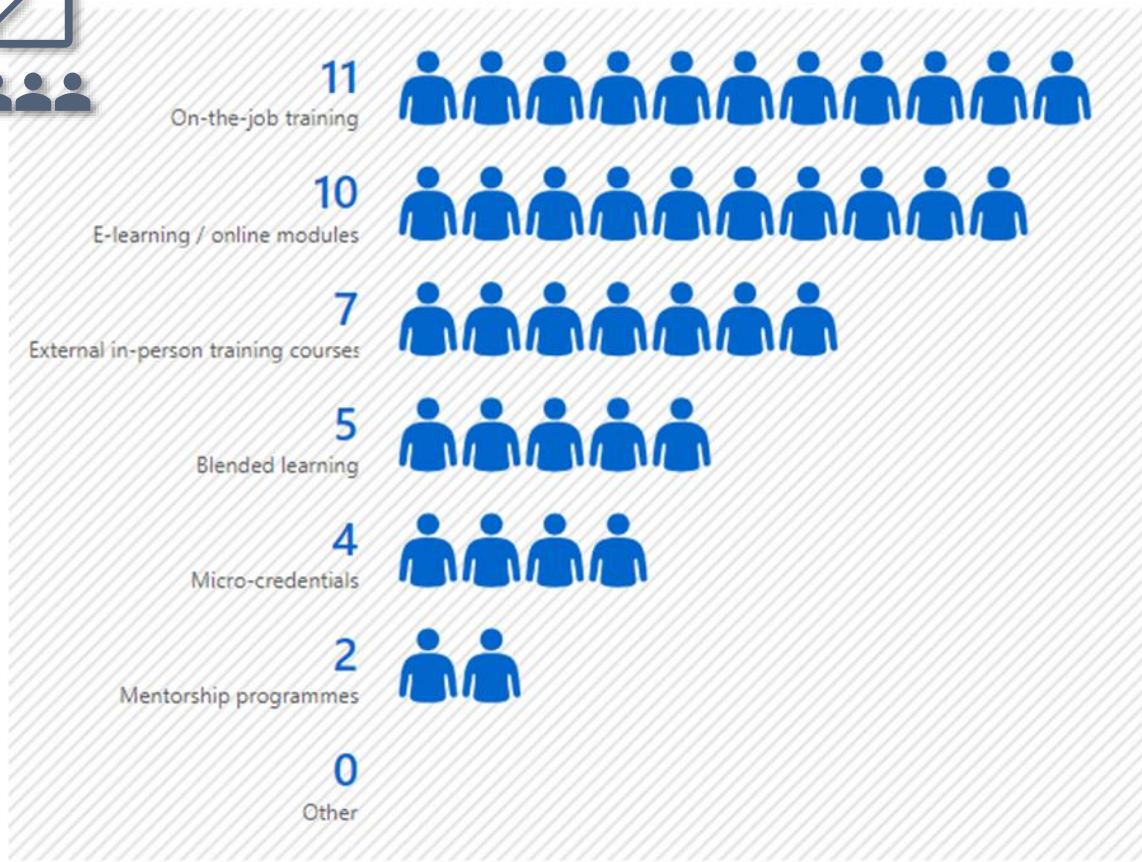
Note: 13 participants; questions with multiple selection; figures in brackets show how many participants selected this option

Training topics and formats of the future / Spain

TOP 8 Training topics

- Carbon capture technologies (8)
- Circular economy & waste management (8)
- Occupational health & safety (8)
- CO_2 utilisation, storage and transport (7)
- Alternative fuels and biomass (6)
- Digital skills (5)
- Management systems (4)
- Leadership (3)

Future training formats



Note: 13 participants; questions with multiple selection; figures in brackets show how many participants selected this option; People graph also refers to a question with multiple selection, figures represent amount of responses for each category

Case studies at a glance

Spotlight on some of the key findings

- Collective agreements on employee training appear to have a very different status in the various countries. France, Belgium and Greece in particular rely more heavily on this instrument. Other dedicated agreements on training between companies and other institutions seem to exist in all countries to some extent, showing a particular importance in Spain.
- The communication of health and safety issues arising from the use of new technologies at plant level is reported by the majority of respondents in Spain, while in other case study countries it plays a less important role, yet.
- Overall, there are similar priorities for future skills, training topics and formats in all countries, most of which are related to the decarbonisation of industry, i.e. carbon capture technologies and CO_2 management. There are only minor differences in the lower-ranked skills and training topics, such as knowledge of electrical infrastructure, cyber security, hydrogen and leadership. In terms of training formats, mentorship programmes are considered to be more important in Greece.
- Attractiveness of the sector is reported to be positive or rather neutral in Greece and Poland. In all other countries the cement industry is, by the majority of respondents, not perceived to be an attractive sector to work in.

Bibliography

EU Green Deal

- European Commission, Ed. *The European Green Deal: COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS; 11.12.2019; COM(2019) 640 final*. Brussels, 2019. Available at: https://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:52019DC0640&qid=1734696764359&rid=3
- UBA, Ed. *Der Europäische Emissionshandel: Vergleich von Emissionen und Emissionsobergrenzen (Cap) im stationären EU-ETS 1* [Access on: 20.12.2024]. Available at: https://www.umweltbundesamt.de/daten/klima/der-europaeische-emissionshandel#vergleich-von-emissionen-und-emissionsobergrenzen-cap-im-stationaren-eu-ets-1
- European Parliament, Ed. *DIRECTIVE (EU) 2023/959 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (Text with EEA relevance)*. Official Journal of the European Communities. 2023, (L 130), S.134-202 [Access on: 20.12.2024]. Available at: https://eur-lex.europa.eu/eli/dir/2023/959/oj
- European Parliament, Ed. *REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 May 2023 establishing a carbon border adjustment mechanism (Text with EEA relevance)*. Official Journal of the European Communities. 2024, (L 1735), S.1-63 [Access on: 20.12.2024]. Available at: http://data.europa.eu/eli/reg/2024/1735/oj
- European Commission, Ed. *What is the Innovation Fund?* [Access on: 20.12.2024]. Available at: https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/what-innovation-fund_en
- *Innovation Fund Project Portfolio: Driving clean innovative technologies towards the market* [Access on: 20.12.2024]. Available at: https://dashboard.tech.ec.europa.eu/qs_digit_dashboard_mt/public/sense/app/6e4815c8-1f4c-4664-b9ca-8454f77d758d/sheet/bac47ac8-b5c7-4cd1-87ad-9f8d6d238eae/state/analysis

EU Green Deal

- European Commission, Ed. *Towards an ambitious Industrial Carbon Management for the EU: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; 6.2.2024; COM/2024/62 final*. Strasbourg, 2024 [Access on: 14.02.2024] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A62%3AFIN
- European Commission, Ed. *Fit for 55 - how the EU will become more energy-efficient* [Access on: 20.12.2024]. Available at: https://europa.eu/!nFCxF7
- European Commission, Ed. *The Net-Zero Industry Act - Accelerating the transition to climate neutrality* [Access on: 20.12.2024]. Available at: https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en
- European Commission, Ed. *Carbon capture, utilisation and storage Forum (Aalborg 27.-28.11.2023).* [Access on: 20.12.2024]. Available at: https://energy.ec.europa.eu/events/carbon-capture-utilisation-and-storage-forum-2023-11-27_en
- European Commission, Ed. *Renewable Energy Directive* [Access on: 20.12.2024]. Available at: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en
- European Parliament, Ed. *DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)*. Official Journal of the European Communities. 2018, (L 328), S.82 [Access on: 20.12.2024]. Available at: http://data.europa.eu/eli/dir/2018/2001/2024-07-16
- European Commission, Ed. *Zero Pollution Action Plan: Towards zero pollution for air, water and soil* [Access on: 08.01.2025]. Available at: https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en

EU Green Deal

- European Commission, Ed. Pathway to a Healthy Planet for All - EU Action Plan "Towards Zero Pollution for Air, Water and Soil" : Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; 12.05.2021; COM(2021) 400 final. Strasbourg, 2021 [Access on: 08.01.2025] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0400
- European Commission, Ed. A new Circular Economy Action Plan - For a cleaner and more competitive Europe : Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ; 11.03.2020 COM(2020) 98 final. Strasbourg, 2020 [Access on: 08.01.2025] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:98:FIN
- European Commission, Ed. *Circular economy action plan: The EU's new circular action plan paves the way for a cleaner and more competitive Europe* [Access on: 08.01.2025]. Available at: https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
- European Commission, Ed. *Energy Performance of Buildings Directive: Aiming to achieve a fully decarbonised building stock by 2050, the Energy Performance of Buildings Directive contributes directly to the EU's energy and climate goals* [Access on: 08.01.2025]. Available at: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildingsdirective_en
- European Parliament, Ed. *DIRECTIVE (EU) 2024/1275 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 April 2024 on the energy performance of buildings (recast); 08.05.2025*. Amtsblatt der Europäischen Union. 2024, (L)[Access on: 08.01.2025]. Available at: https://eur-lex.europa.eu/eli/dir/2024/1275
- EFRAG, Ed. *Sustainability reporting* [Access on: 08.01.2025]. Available at: https://www.efrag.org/en/sustainability-reporting

Just Transition Mechanism

- European Commission, Ed. The Just Transition Mechanism - making sure no one is left behind [Access on: 08.01.2025]. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en
- Happaerts, Sander. Just Transition Fund - Context and opportunities for CCS. In: CCS4CEE project consortium, Ed. Funding and financing carbon capture and storage (CCS) in Central and Eastern Europe - CCS4CEE Workshop (Online 31.03.2023) [Access on: 08.01.2025]. Available at: https://ccs4cee.eu/wp-content/uploads/2023/04/Sander-Happaerts-20230331-CCS4CEE.pdf
- European Parliament, Ed. REGULATION (EU) 2021/1056 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 establishing the Just Transition Fund. Official Journal of the European Communities; Amtsblatt der Europäischen Union. 2021, (L 231), S.1-20 [Access on: 08.01.2025]. Available at: https://eur-lex.europa.eu/eli/reg/2021/1056/oj
- *Fonds pour une transition juste - subsides en vue pour le projet Anthemis de la cimenterie Heidelberg Materials d'Antoing: 21.12.2023* [Access on: 08.01.2025]. Available at: https://www.heidelbergmaterials-benelux.com/fr/fonds-pour-une-transition-juste-subsides-en-vue-pour-le-projet-anthemis-de-la-cimenterie-heidelberg-materials-dantoing
- European Commission, Ed. *Cohesion Open Data Platform - Just Transition Fund (JTF)* [Access on: 08.01.2025]. Available at: https://cohesiondata.ec.europa.eu/funds/jtf/21-27

European Skills Agenda

- European Commission, Ed. *European Skills Agenda* [Access on: 08.01.2025]. Available at: https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda_en
- Demary, Vera; Matthes, Jürgen; Plünnecke, Axel; Schaefer, Thilo. *Gleichzeitig - Wie vier Disruptionen die deutsche Wirtschaft verändern: Herausforderungen und Lösungen*. Köln, 2021 (IW-Studien - Schriften zur Wirtschaftspolitik aus dem Institut der deutschen Wirtschaft) [Access on: 08.01.2025] Available at: http://nbn-resolving.org/urn:nbn:de:101:1-20210917102206732329 77
- Barteková, E.; Börkey, P.. *Digitalisation for the transition to a resource efficient and circular economy*. Paris, 2022 (OECD Environment Working Papers 192) [Access on: 08.01.2025] Available at: https://doi.org/10.1787/6f6d18e7-en
- Commission presents European Skills Agenda for sustainable competitiveness, social fairness and resilience: *The Commission is presenting a new Skills Agenda today setting ambitious objectives for upskilling and reskilling for the next five years*; 01.07.2020 [Access on: 08.01.2025]. Available at: https://ec.europa.eu/social/main.jsp?langId=en&catId=89&furtherNews=yes&newsId=9723
- European Commission, Ed. *European skills Agenda: 12 flagship actions*. 2020 [Access on: 08.01.2025] Available at: https://ec.europa.eu/social/BlobServlet?docId=26818&langId=en
- European Commission, Ed. *Labour and skills shortages in the EU - an action plan: COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS; 20.3.2024; COM(2024) 131 final*. Strasbourg, 2024 [Access on: 08.01.2025] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52024DC0131

Transition Pathways

- Cembureau, Ed. *From Ambition to Deployment - our 2050 roadmap: The road travelled, pathways and levers to scale up our net zero ambition*. Brussels, 2024 [Access on: 08.01.2025] Available at: https://www.cembureau.eu/library/reports/cembureau-s-net-zero-roadmap
- Global Cement and Concrete Association, Ed. *Concrete Future: The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero*. London, 2021 Available at: https://gccassociation.org/concretefuture/wp-content/uploads/2021/10/GCCA-Concrete-Future-Roadmap-Document-AW.pdf
- European Cement Research Academy, ECRA, Ed. *The ECRA Technology Papers 2022 - State of the Art Cement Manufacturing - Current technologies and their future development*. Dusseldorf, 2022 Available at: https://ecra-online.org/research/technology-papers
- Vereinigung der Österreichischen Zementindustrie, VÖZ, Ed. *Wie Was Wenn - Roadmap zur CO2-Neutralität der österreichischen Zementindustrie bis 2050*. Vienna, 2022 [Access on: 10.06.2022] Available at: https://www.zement.at/downloads/downloads_2022/Roadmap_VOEZ_bis_2050.pdf
- Laskowski, Kamil; Giers, Maciej. *Poland's heavy industry decarbonisation : Policy and Financing Roadmap*. Warszawa [Access on: 08.01.2025] Available at: https://wise-europa.eu/wp-content/uploads/2024/06/Poland_Roadmap-ENG-1.pdf

Skills concept / Case studies

- European Commission, Ed. *EU digital competence framework for citizens - DigComp*. Brussels, 2016 [Access on: 08.01.2025] Available at: https://data.europa.eu/doi/10.2767/00458
- International Labour Organization, ILO, Ed. *The International Standard Classification of Occupations - ISCO-08* [Access on: 08.01.2025]. Available at: https://isco.ilo.org/en/isco-08/
- Armstrong, Thomas, Ed. *The Global Cement Report. 15. Ed*. . Dorking, Surrey, 2023 [Access on: 08.01.2025] Available at: https://www.cemnet.com/publications/global-cement-report

Contact details

Manuel Mohr
T +49 (0)30 28002 - 210
manuel.mohr@vdz-online.de
www.vdz-online.de

Dr. Stefan Schäfer
T +49 (0)211 45 78 - 251
stefan.schaefer@vdz-online.de
www.vdz-online.de