

Sustainable construction with CCPs

- an update for Europe -



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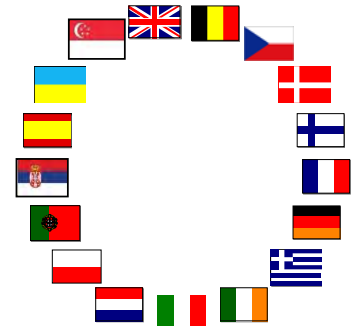
Hans-Joachim FEUERBORN
ECOBA Secretary General



ECOBA in brief

ECOBA is the “European Coal Combustion Products Association”

- Established in 1990 by European energy producer and marketing companies to deal with matters related to the use of coal combustion products (CCPs) as raw and construction materials. Today also downstreams users are members of ECOBA
- Represents more than 90 % of European (EU27+) CCP production
- ECOBA members consider coal combustion products valuable raw and construction materials which can be utilized in various environmentally compatible ways



The mission of ECOBA is

- encourage the development of the use of CCPs from coal-fired power stations, both on the industrial and the environmental level
- develop the legal/regulatory measures for the recognition, acceptance and promotion of CCPs in Europe as valuable raw materials
- participate in European and international activities and ensure the exchange of information and documentation among the various national and international bodies



Introduction – Energy in Europe

The power industry in European power plants is under continuous pressure

- to meet stricter Emission limits values (BREF/BAT)
- to accomplish with legal requirements for clean air and today especially for CO₂ reduction and climate neutrality (resulting in e.g. EC climate law)
- to meet market requirements on availability and economic production

Coal is still a major fuel for energy production with strong reduction in single member states. More than 85 million tonnes of Coal Combustion Products (CCPs) result in Europe.

CCPs are used since decades as construction material and in constructions. They are not only essential for performance of building materials but also for their sustainability.

Availability is a major problem in some member states and re-use from stock or imports are a tool to serve market needs.



Европейски парламент Parlamento Europeo Evropský parlament Europa-Parlamentet Europäisches Parlament
Euroopa Parlament Ευρωπαϊκό Κοινοβούλιο European Parliament Parlement européen Parlaimint na hEorpa
Europski parlament Parlamento europeo Eiropas Parlaments Europos Parlamentas Európai Parlament
Parlament Ewropew Europees Parlement Parlament Europejski Parlamento Europeu Parlamentul European
Európsky parlament Evropski parlament Euroopan parlamentti Europaparlamentet

Energy Policy: General Principles

Achievements	Dec 2008 Climate and Energy Package	Jan 2014 Climate and Energy Framework	Dec 2019 European Green Deal	Juli 2021 European Climate Law (2021/1119)	Feb. 2024 assessment for 2040 climate target
Reduction of greenhouse gas emission (basis 1990 level)	20	40	55 (by 2030)	55 (by 2030)	90 (by 2040)
Increase renewables energy consumption	20	32			
Improvement energy efficiency	20	32.5			
Interconnection EU electricity system		15			

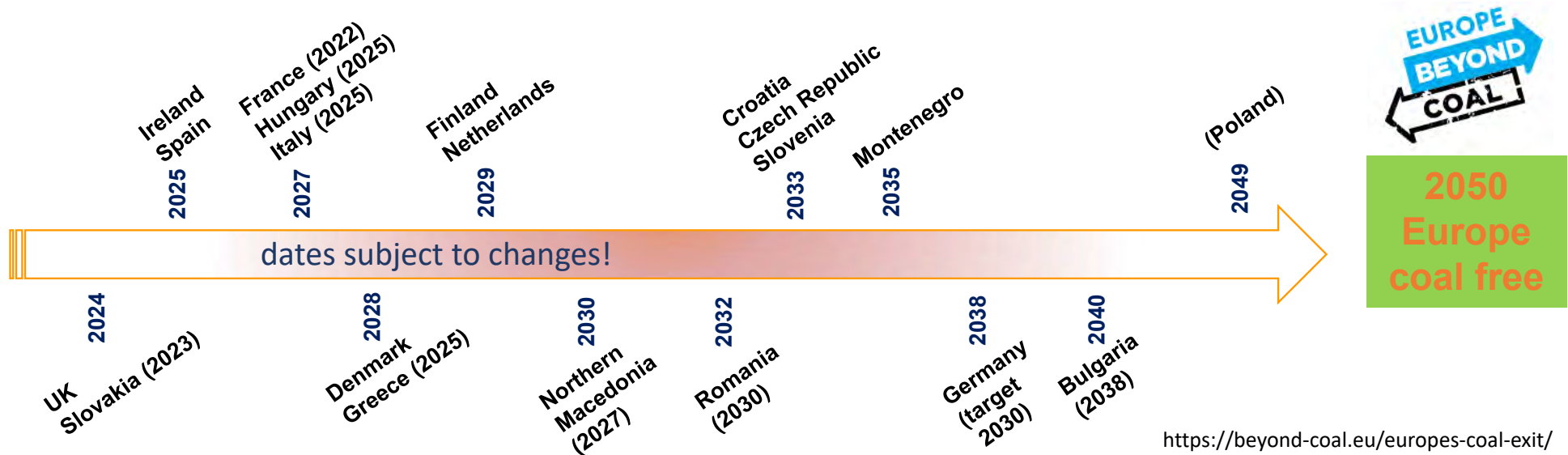
Climate Change Policies / Regulations

Coal phase-out in Europe - status / announcements

No coal in energy mix: Albania, Cyprus, Estonia (oil shale), Iceland, Latvia, Lithuania, Luxembourg, Malta, Norway, Switzerland

No phase out under discussion: Bosnia-Herzegovina, Kosovo, Serbia, (Poland), (Turkey)

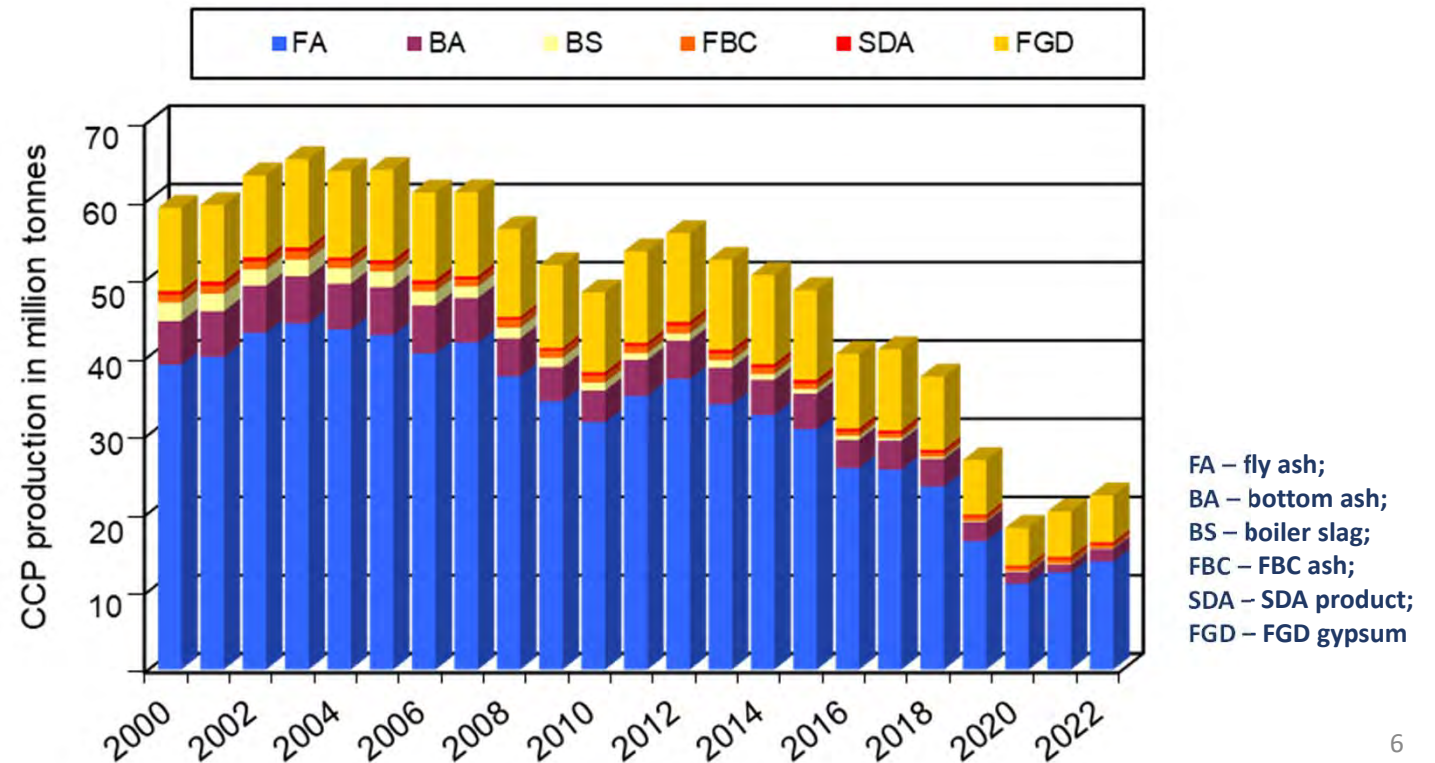
Phased out: 2016 Belgium; 2020 Austria, Sweden; 2021 Portugal



ECOBA statistics on production and use of CCPs (fresh production!)

- in EU 15 member states (Northern and Western EU member states) continuous decrease of CCPs from fresh production due to increased use of renewables and phase-out decisions of member states
- in 2021, unexpected high production (especially in some countries/regions) as consequence of sanctions against Russia
- In 2022, continued increase (temporary)

Development of CCP production in Europe (EU 15) from 2000 to 2022



ECOBA statistics on production and use of CCPs (fresh production!)

- in EU 15 production down to 22 million tonnes
- in EU 27 production > 66 million tonnes due to high production especially in East-European countries
- in EU more then 85 million tonnes are produced
- information on utilisation only available for EU 15 countries (annual statistics), but fields of applications are the same in the other parts of Europe

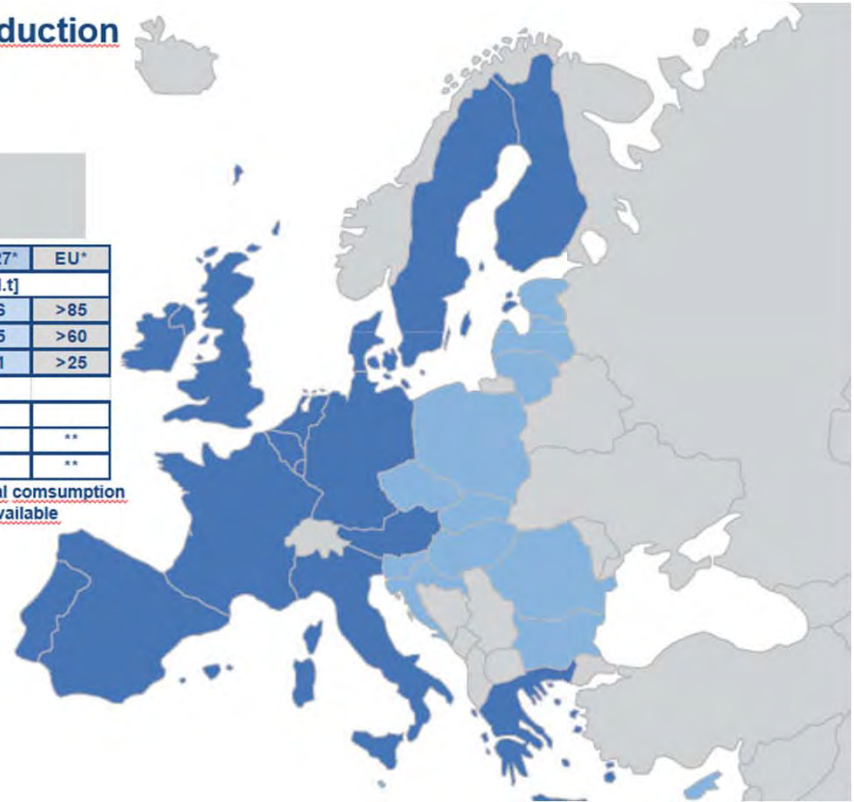
Statistics CCP production EU15 / EU27 / EU



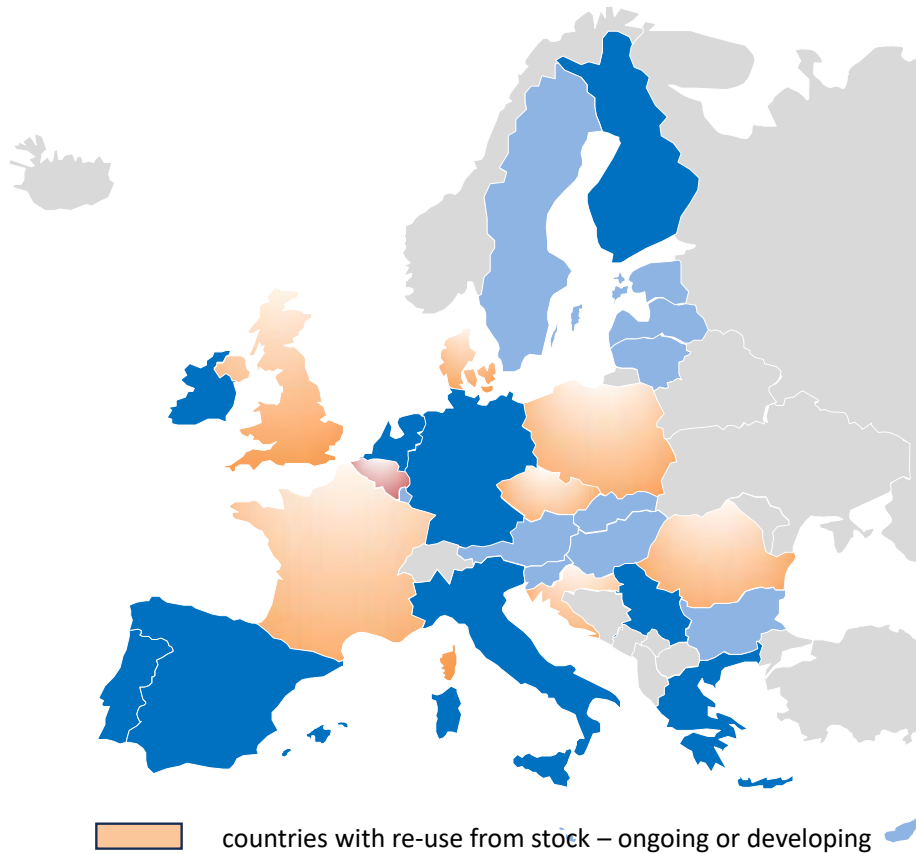
	EU15	EU 27*	EU*
Production	[mill.t]		
CCPs total	22	> 66	> 85
ashes	15	> 45	> 60
desulph. products	7	> 21	> 25

	EU15	EU 27*	EU*
utilisation rate			
construction ind.	120%	**	**
constr. + reclam.	98%	**	**

* data and calculation based on coal consumption
 ** information on uses only partly available



Re-use from stock: ongoing and/or developing



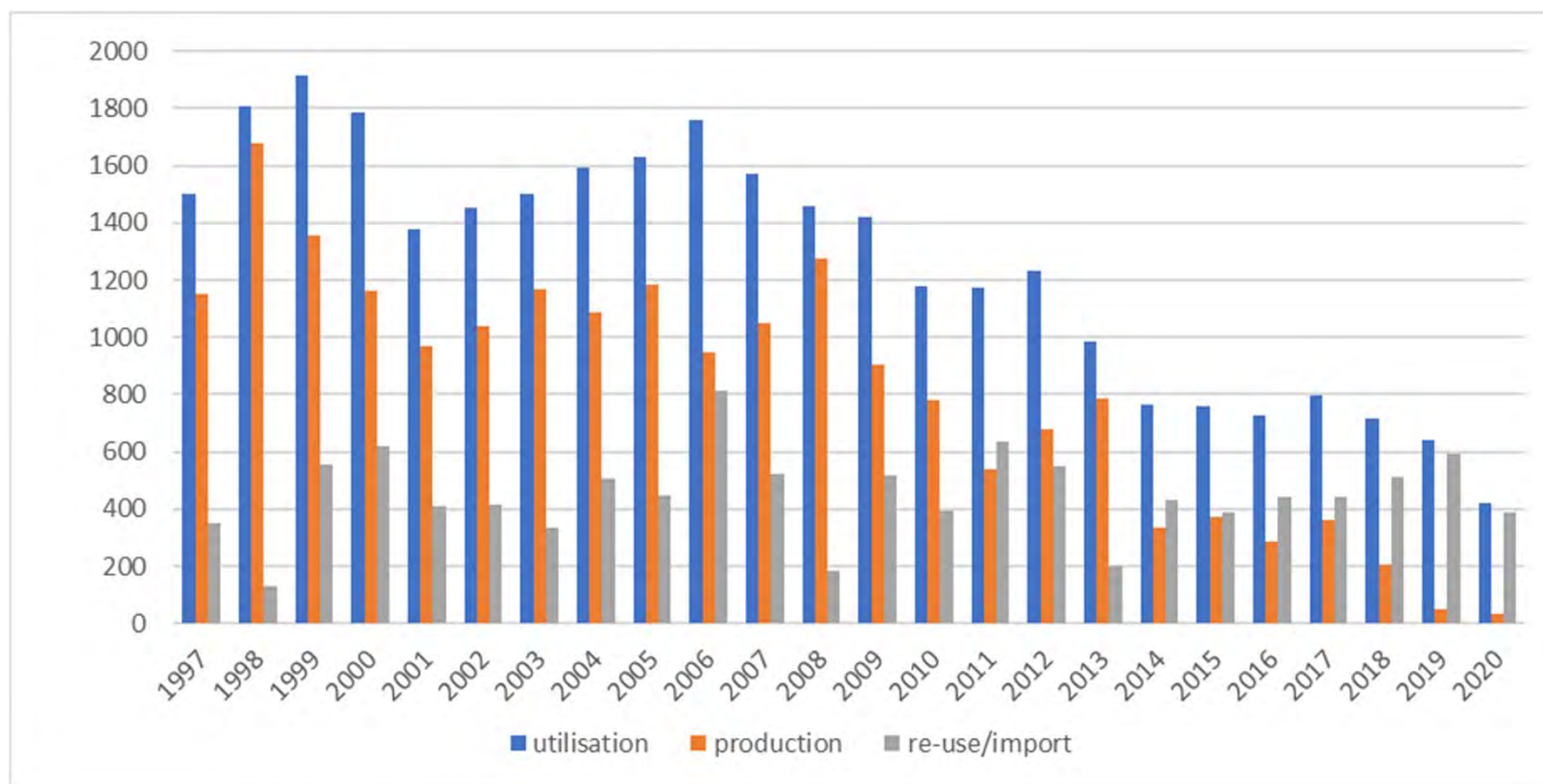
Ongoing re-use:

- Regular re-use in France
- since more than 50 years as wet ash for different applications
- since more than 30 years for cement and concrete industry after drying
- In other EU countries for cement and concrete and for road construction

Developing re-use:

- Identification of stocks
- Research work on properties of ash from stock
- Identification of markets and processing technologies
- Huge reserves on stock identified

Production vs re-use / import in France from 1997 to 2020



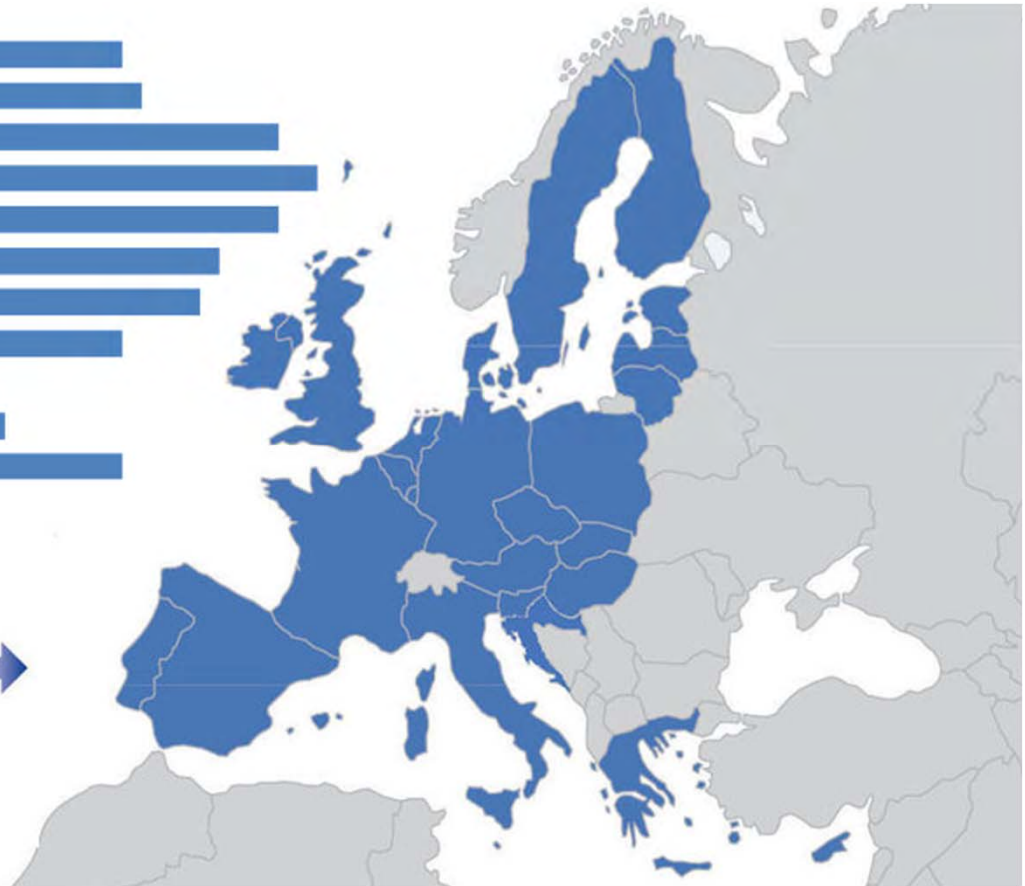
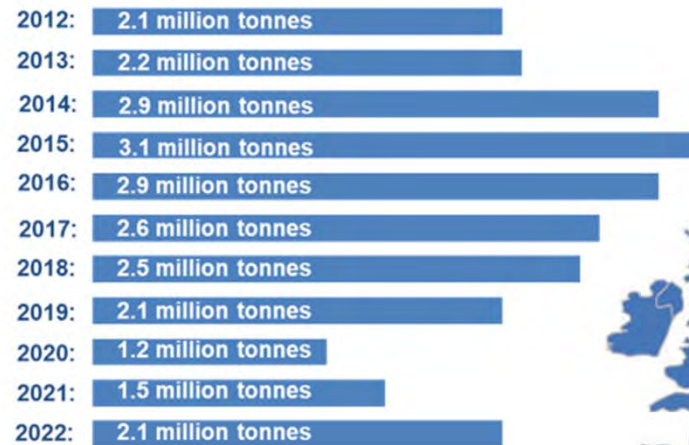
- fresh production reduced over the years and are very low until shut down of coal-fired power stations (operation extended although phase-out announced!)
- Re-use from stock between 130 to 810 kto per year resulting in more than 10 million tonnes of ash reused from stock or imported

ECOBA Statistics- Import/Cross Border Transport

The 3rd pillar on availability of CCPs is import from other countries.

ECOBA annually compiles data on cross border transport in EU.

The amount of ashes transported cross border for serving cement and concrete industry is about 2 million tonnes with decreases in 2020 and developments after Corona from 2021.





CCPs in standards (EU + national)

Product Standards (h/nh*)

Detailed Information on product and it's intended use

Scope

Normative references

Specifications

- chemical
- physical
- others
- Information on request

Packaging and Labelling

Sampling Criteria

Application Standards (h/nh*)

Detailed information on how products are used for different applications

(e.g. EN 206, with regulations how to produce concrete from cement, aggregates, additions, additives and water in different exposures; min cement content and defined w/c-ratio.

Additional national standards, technical evaluations or guidance papers

h = harmonised = has to be used in member states
nh = non harmonised = may be used in member states



CCPs in standards (EU + national)

Selected European product standards under regular revision

- EN 197-1 Cement
- EN 450-1 Fly ash for concrete
- EN 13282 Hydraulic road binder
- *EN 14227 Hydraulically bound mixtures*



Definitions for siliceous and calcareous ash

- EN 12620 Aggregates for concrete
- EN 13042 Aggregates for bituminous....
- EN 13139 Aggregates for mortars
- EN 13242 Aggregates for un-/bound mixtures
- EN 13055 Lightweight aggregates



future
EN 17555



Lists of source materials now in CEN/TS 17438

- EN 206 Concrete
- Concrete products, Road Constr. Materials



Application standards/ rules for application

- Alternative way via EU or national evaluation (former approval)
- Experiences by project approvals especially in road constr. & earthworks

- Siliceous and calcareous fly ash are defined in EN 197-1
- **Blended cements with fly ash according EN 197-1 contain up to 20 % by mass (CEM II/A-V) or up to 35 % by mass (CEM II/B-V) by mass of fly ash**
- Also **composite cements contain fly ash in the same ranges** or are part of total cement product
- in 2021, a new standard for **portland-composite cements** (CEM II/C-M) and composite cement (CEM VI) was published as a non-harmonised standard (EN 197-5)
- non harmonised standards need to be cited by national regulators for construction works.
- the non harmonised standards may be covered in the future work on revision of EN 197-1

Cement product according table 1 of EN 197-1

Haupt- zement- arten	Bezeichnung der 27 Produkte (Normalzementarten)		Zusammensetzung: (Massenanteile in Prozent) ^a										Neben- be- stand- teile		
			Hauptbestandteile												
			Portland- zement- klinker	Hütten- sand	Silica- staub	Puzzolane		Flugasche		Ge- brannter Schiefer	Kalkstein				
						natür- lich	natür- lich getemp- ert	Kiesel- säure- reich	kalk- reich		T	L		LL	
			K	S	D ^b	P	Q	V	W	T	L	LL			
CEM I	Portland- zement	CEM I	95-100	-	-	-	-	-	-	-	-	-	-	0-5	
CEM II	Portland- hütten- zement	CEM II/A-S	80-94	6-20	-	-	-	-	-	-	-	-	-	0-5	
		CEM II/B-S	65-79	21-35	-	-	-	-	-	-	-	-	-	-	0-5
	Portland- silicastaub- zement	CEM II/A-D	90-94	-	6-10	-	-	-	-	-	-	-	-	-	0-5
	Portland- puzzolan- zement	CEM II/A-P	80-94	-	-	6-20	-	-	-	-	-	-	-	-	0-5
		CEM II/B-P	65-79	-	-	21-35	-	-	-	-	-	-	-	-	0-5
		CEM II/A-Q	80-94	-	-	-	6-20	-	-	-	-	-	-	-	0-5
		CEM II/B-Q	65-79	-	-	-	21-35	-	-	-	-	-	-	-	0-5
	Portland- flugasche- zement	CEM II/A-V	80-94	-	-	-	-	6-20	-	-	-	-	-	-	0-5
		CEM II/B-V	65-79	-	-	-	-	21-35	-	-	-	-	-	-	0-5
		CEM II/A-W	80-94	-	-	-	-	-	6-20	-	-	-	-	-	0-5
		CEM II/B-W	65-79	-	-	-	-	-	21-35	-	-	-	-	-	0-5
	Portland- schiefer- zement	CEM II/A-T	80-94	-	-	-	-	-	-	6-20	-	-	-	-	0-5
		CEM II/B-T	65-79	-	-	-	-	-	-	21-35	-	-	-	-	0-5
	Portland- kalkstein- zement	CEM II/A-L	80-94	-	-	-	-	-	-	-	-	6-20	-	-	0-5
		CEM II/B-L	65-79	-	-	-	-	-	-	-	-	21-35	-	-	0-5
		CEM II/A-LL	80-94	-	-	-	-	-	-	-	-	-	6-20	-	0-5
CEM II/B-LL		65-79	-	-	-	-	-	-	-	-	-	21-35	-	0-5	
CEM II	Portland- komposit- zement ^c	CEM II/A-M	80-94	6-20								-	-	0-5	
		CEM II/B-M	65-79	21-35								-	-	0-5	
CEM III	Hochofen- zement	CEM III/A	35-64	36-65	-	-	-	-	-	-	-	-	-	-	0-5
		CEM III/B	20-34	66-80	-	-	-	-	-	-	-	-	-	-	0-5
		CEM III/C	5-19	81-95	-	-	-	-	-	-	-	-	-	-	0-5
CEM IV	Puzzolan- zement ^c	CEM IV/A	65-89	-	11-35					-	-	-	-	0-5	
		CEM IV/B	45-64	-	36-55					-	-	-	-	0-5	
CEM V	Komposit- zement ^c	CEM V/A	40-64	18-30	-	18-30			-	-	-	-	-	0-5	
		CEM V/B	20-38	31-50	-	31-50			-	-	-	-	-	0-5	

Update Construction Products Regulations (PCR)

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 9 March 2011

laying down harmonised conditions for the marketing of construction products and repealing
Council Directive 89/106/EEC

(Text with EEA relevance)

- The CPR was published in March 2011 and entered force in June 2013
- **It lays down harmonised rules for the marketing of construction products in the EU.** The Regulation provides a common technical language to assess the performance of construction products.
- Although much work has been investigated in revision of harmonised product standards, only few standards have been published by the EC. Most of the revised standards were deemed not meeting the CPR requirements.
- On 2nd February, the compromise text on the revised CPR was adopted after a trilogue procedure. The publication is expected by the end of 2024. (note: the basic requirements for construction products have not change)



4.4.2011	EN	Official Journal of the European Union	L 88/5
REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (Text with EEA relevance)			
THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,	(4)	Member States have introduced provisions, including requirements, relating not only to safety of buildings and other construction works but also to health, durability, energy economy, protection of the environment, economic aspects, and other important aspects in the public interest. Laws, regulations, administrative measures or case-law, established either at Union or Member State level, concerning construction works may have an impact on the requirements of construction products. Since their effect on the functioning of the internal market is likely to be very similar, it is appropriate to consider such laws, regulations, administrative measures or case-law as 'provisions' for the purposes of this Regulation.	
Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,			
Having regard to the proposal from the Commission,			
Having regard to the opinion of the European Economic and Social Committee ⁽¹⁾ ,			
Acting in accordance with the ordinary legislative procedure ⁽²⁾ ,	(2)	Where applicable, provisions for an intended use or uses of a construction product in a Member State, aimed at fulfilling basic requirements for construction works, determine the essential characteristics the performance of which should be declared. In order to avoid an empty declaration of performance, at least one of the essential characteristics of a construction product which are relevant for the declared use or uses should be declared.	
Whereas:			
(1) The rules of Member States require that construction works be designed and executed so as not to endanger the safety of persons, domestic animals or property nor damage the environment.	(6)	Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products ⁽³⁾ aimed to remove technical barriers to trade in the field of construction products in order to enhance their free movement in the internal market.	
(2) Those rules have a direct influence on the requirements of construction products. Those requirements are consequently reflected in national product standards, national technical approvals and other national technical specifications and provisions related to construction products. Due to their disparity, those requirements hinder trade within the Union.	(7)	In order to achieve that objective, Directive 89/106/EEC provided for the establishment of harmonised standards for construction products and provided for the granting of European technical approvals.	
(3) This Regulation should not affect the right of Member States to specify the requirements they deem necessary to ensure the protection of health, the environment and workers when using construction products.	(8)	Directive 89/106/EEC should be replaced in order to simplify and clarify the existing framework, and improve the transparency and the effectiveness of the existing measures.	
⁽¹⁾ OJ C 218, 11.9.2009, p. 15. ⁽²⁾ Position of the European Parliament of 24 April 2009 (OJ C 124 E, 7.7.2010, p. 441), position of the Council at first reading of 13 September 2010 (OJ C 282 E, 19.10.2010, p. 1), position of the European Parliament of 18 January 2011, not yet published in the Official Journal, and decision of the Council of 23 February 2011. ⁽³⁾ OJ L 40, 11.2.1989, p. 12.			



Update Construction Products Regulations (PCR)

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 9 March 2011

laying down harmonised conditions for the marketing of construction products and repealing
Council Directive 89/106/EEC

(Text with EEA relevance)

CPR focus i.a.: Basic Work Requirements (BWR) for “Construction Works for an economically reasonable working life”

**Subject to
extension
mandates
for product
standards**



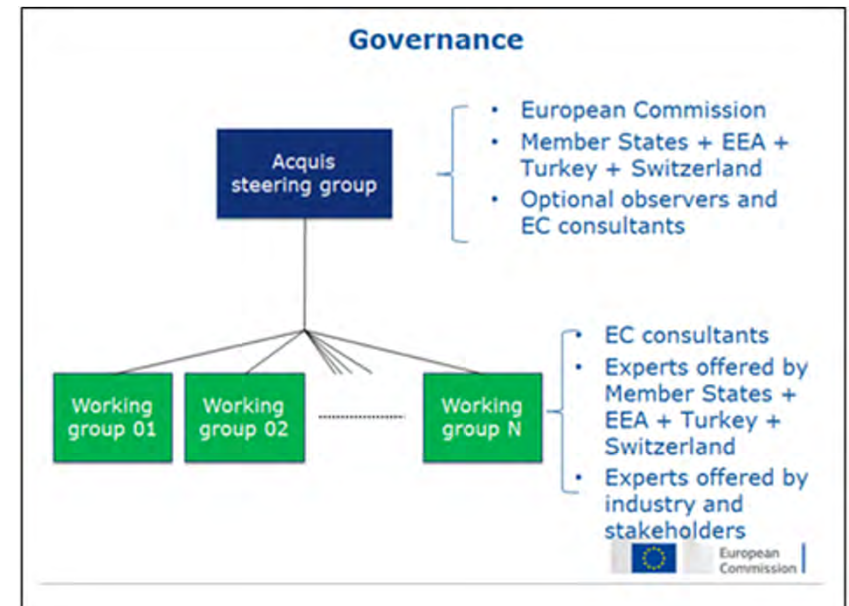
1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and the environment
4. Safety and accessibility in use
5. Protection against noise
6. Energy economy and heat retention
7. Sustainable use of natural resources

With the revision of the CPR, the EC has installed the “Aquis-process” which is a milestone or precondition for the revision of the Construction Products Regulation.

The aquis process is to ensure compliance of harmonised product standards (hEN), European Assessment documents (EADs) and legal acts.

The EC has started to install working groups in the aquis process for the definition of the essential characteristics. The existing CEN working groups, which are working on this for a long time, are meanwhile invited to support. The experts for the aquis working groups are nominated by the member states.

Based on the developments in the aquis process for the first two mandates (M100 precast concrete; M120 structural metallic products) first outcomes for standardisation requests (replacement for mandates) were presented end of 2023.



Update CPR – Aquis Process



Standardisation work and ambitions of the revised CPR

Oscar Nieto, Policy Officer, European Commission

under existing
(old) CPR

2nd meeting of
acqui WG
cement on
11.03.24

under revised
(new) CPR

Acquis groups
expected to
start late 2024

Acquis groups
expected to
start early 2025

Steering group		
Fire		
Dangerous substances		
Environmental sustainability		
2021	1	Precast concrete products
2021	2	Structural metallic products
2022	3	Reinforcing prestressing steel
2022	4	Doors, windows and shutters
2023	5	Cement
2023	6	Thermal insulating products
...	7	Structural timber products
	8	Concrete, mortar and grout
	9	Masonry
	10	Aggregates
	11	Fixed firefighting equipment
	12	Road construction products
	13	Floorings
	14	ETICs
	15	Curtain walling
	16	Wood based panels
	17	Structural bearings
	18	Kits and assemblies
	19	Wall and ceiling finishes
	20	Space heating appliances
	21	Roof coverings
	22	Circulation fixtures
	23	Waste water disposal
	24	Adhesives
	25	Gypsum
	26	Anchors and fasteners
	27	Membranes
	28	Glass
	29	Geotextiles
	30	Sanitary appliances
	31	Pipes and tanks
	32	Cables
	33	Chimneys
	34	Sealants



PCR for construction products / fly ash

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15804

January 2012

ICS 91.010.99

English Version

Sustainability of construction works - Environmental product
declarations - Core rules for the product category of construction
products

Contribution des ouvrages de construction au
développement durable - Déclarations environnementales
sur les produits - Règles régissant les catégories de
produits de construction

Nachhaltigkeit von Bauwerken -
Umweltproduktdeklarationen - Grundregeln für die
Produktkategorie Bauprodukte

EN 15804 serves as basic standard on sustainability of
construction works

It has to be considered in the preparation of product
specific PCRs and EPDs

6.4.3.2 Co-product allocation

Allocation shall be avoided as far as possible by dividing the unit process to be allocated into different sub-processes that can be allocated to the co-products and by collecting the input and output data related to these sub-processes.

- If a process can be sub-divided but respective data are not available, the inputs and outputs of the system under study should be partitioned between its different products or functions in a way which reflects the underlying physical relationships between them; i.e. they shall reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system;

In the case of joint co-production, where the processes cannot be sub-divided, allocation shall respect the main purpose of the processes studied, allocating all relevant products and functions appropriately. The purpose of a plant and therefore of the related processes is generally declared in its permit and should be taken into account. Processes generating a very low contribution to the overall revenue may be neglected. Joint co-product allocation shall be allocated as follows:

- Allocation shall be based on physical properties (e.g. mass, volume) when the difference in revenue from the co-products is low;

- In all other cases allocation shall be based on economic values;

- Material flows carrying specific inherent properties, e.g. energy content, elementary composition (e.g. biogenic carbon content), shall always be allocated reflecting the physical flows, irrespective of the allocation chosen for the process.

NOTE 1 Contributions to the overall revenue of the order of 1% or less is regarded as very low. A difference in revenue of more than 25 % is regarded as high.

NOTE 2 A common position on the definition on the most appropriate allocation rule needs to be defined together with other relevant sectors.

NOTE 3 Products and functions are the outputs and/or services provided by the process, having a positive economic value.

NOTE 4 In industrial processes there may be a wide variety of different types of materials produced in conjunction with the intended product. In business vocabulary, these may be identified as by-products, co-products, intermediate products, non-core products or sub-products. In this standard these terms are treated as being equivalent. However for the allocation of environmental aspects and impacts a distinction between co-products and products is made in this standard

PCR Guidance-Texts for Building-Related Products and Services

From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)

Part B: Requirements on the EPD for Processed fly ash

www.ibu-epd.com



Product-group-specific LCA calculation rules from PCR part A

Allocation rule for fly ash for concrete in accordance with EN 450-1 of European origin:

For hard coal fly ash of European origin: The power plant operation outlays are allocated in full to the generation of electricity and heat as the primary purpose of this process in which hard coal fly ash is incurred as waste is the generation of electrical and thermal energy. Within the power plant process, hard coal fly ash reaches its end-of-waste after the electric filter in the power plant. For this reason, power plant operation outlays must be allocated in full to electricity and heat generation. The outlays associated with storage, conformity assessment and transport within the power plant as well as all outlays associated with processing/refining after the electric filter are allocated to hard coal fly ash. The system boundary is formed by the finished product at the plant gate.

Environmental Product Declarations based on this Product Category Rule result in mean 12 kg CO₂/t for fly ash produced in power plants.

In case of economic allocation the amount only relates to transport to gate as the value of fly ash compared to electricity is low (< 1%)

Note: in single cement PCRs/EPDs the contribution of fly ash to the overall income from electricity generation is very small

Note: in single concrete EPDs also physical allocations are used



PCR for construction products / fly ash

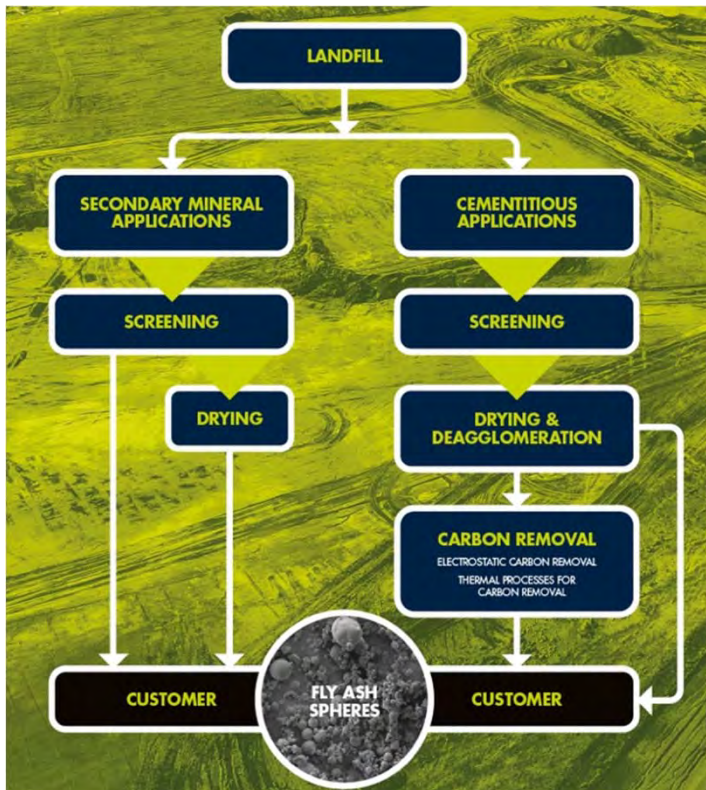
Examples for fly ash EPDs (from fresh production) based on EN 15804



Global Warming Potential (GWP) in the published (specific) EPD's up to 2 kg CO₂ eq.

PCR for construction products / fly ash

Example for fly ash EPDs (from processing plants) based on EN 15804



Fly ash from processing starts with fly ash considered as a resource (formerly discarded (landfilled, stockpiled) or not fit for use for different reasons).

All steps to make the fly ash as valuable product has to be considered for the evaluation:

- from stockpile: mining, breaking, screening, transports (up to 6.5 kg CO₂/t)¹⁾
- in case of drying energy consumption for the drying process (up to 6.5 kg CO₂/t)¹⁾
- in case of additional e.g. LOI reduction also for this process (up to 97kg CO₂/t)¹⁾

1) [Indicative values based on desk top study](http://www.ukqaa.org.uk/wp-content/uploads/CO2-allocation-for-CDFA-Final.pdf)
<http://www.ukqaa.org.uk/wp-content/uploads/CO2-allocation-for-CDFA-Final.pdf>



PCR for construction products / fly ash

Example for fly ash EPDs (from processing plants) based on EN 15804

from landfill with re-drying



SURSCHISTE

Déclaration Environnementale Produit
Environmental Product Declaration

Cendre volante séchée SILICOLINE®

En conformité avec la norme NF EN 15804+A1 et son complément national NF EN 15804/ON

Global Warming Potential (GWP) in the specific EPD is 47,5 kg CO₂ eq.

from separation with cyclons technique



Umwelt-Produktdeklaration
nach ISO 14025 und EN 15804+A2

Deklarationsinhaber:	BauMineral GmbH
Herausgeber:	Kiwa GmbH – Ecobility Experts
Programhalter:	Kiwa GmbH – Ecobility Experts
Deklarationsnummer:	EPD-BauMineral-168-DE
Ausstellungsdatum:	30.09.2021
Gültig bis:	29.09.2026



Global Warming Potential (GWP) in the specific EPD is 60,9 kg CO₂ eq.



Summary / Outlook

- Environmental Strategies, Directives, Regulations and laws with strict aims for CO₂ inter alia result in closures of power plants due to economic consideration and phase-out decisions.
- CCP production is depending on energy production by coal. It's production and use has to consider quality and availability for serving existing markets. They contribute to the sustainability of construction materials and constructions!
- Aside the direct production in power plants the processing of ash from direct production as well as from stockpile and cross border transport has to be considered for safeguarding availability.
- Ashes from stock have been produced formerly in coal-fired power plants and are available in huge amounts. Licensing issue are a precondition for re-use from stock. Quality aspects have to be considered and processing is a must.
- In addition, sustainability aspects have to be considered. Product Category rules (PCRs) and Environmental Product Declarations (EPDs) for ashes from fresh production and from stock exist/are under further development.



Fly ash – a resource still available for Sustainable Construction

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Hans-Joachim Feuerborn (Secretary General)

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SAVE THE DATE

EUROCOALASH 2025



International Conference

June 16-18, 2025

Lille / France

