



CEN/TC 51
Cement and building limes

CEN/TC 51 Business Plan
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BUSINESS PLAN

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EXECUTIVE SUMMARY:

European standardisation work started in 1969 on a voluntary base among experts from the six signatories of the Treaty of Rome. The work was then transferred to CEN and CEN/TC 51 was created in 1973. Because of existing notified national regulations containing provisions applicable to cements and building limes, a provisional Mandate was first issued by the European Commission and then, in 1997, Mandate M/114 to CEN and CENELEC was issued concerning the execution of standardisation work for harmonised standards on cement, building limes and other hydraulic binders.

Cement and lime are concerned by European regulations, the Construction Products Regulation (CPR), REACH and further EU Directives or Regulations.

Cement and lime are constituents of products and materials, mainly concrete and mortars, which are themselves incorporated in buildings and civil engineering constructions.

Cement and lime industries are capital-intensive and energy-intensive industries, both burning a notable proportion of alternative fuels, including biomass.

Global production is 4.2 billion tons for cement (2020).

Both industries are firmly rooted in their local environment and communities. In the EU, the cement industry represents 36,000 direct jobs (2020) and 545,000 when considering the whole supply chain. The European lime industry is producing 17.5 million tons and provides around 10.000 jobs (2020).

Benefits expected from the work of CEN/TC 51 are mainly to address major issues within the framework of the European Green Deal and more especially concerns about hydraulic binders' carbon footprint and circular economy. For that purpose, EN 197-5 has already been published in 2021.

It also concerns the elimination of barriers-to-trade and reduction of standardisation costs by application of harmonised European standards supported by European standard test methods. CEN/TC 51 carries out the work for ISO/TC 74 (of equivalent scope) within the framework of the Vienna Agreement.

Priority is given to the development of standards that will support the European Strategy to put standards back at the core of a resilient, green, and digital EU single market and to strengthen the global role of the European standardisation system.

This will be facilitated once processes of reviewing the Construction Product Regulation (CPR) Acquis and revising CPR will be completed.

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1 BUSINESS ENVIRONMENT OF THE CEN/TC 51

1.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal, societal and/or international dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of CEN/TC 51, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards.

Cement and lime are concerned by several European Directives and Regulations, the most relevant ones from a product perspective being the Construction Products Regulation (CPR), Regulation (EU) No 305/2011 which repealed the Construction Products Directive (CPD) 89/106/EEC, the REACH Regulation (Registration, Evaluation, Restriction, and Authorisation of Chemicals - Regulation (EC) No 1907/2006) and the CLP Regulation (Classification, Labelling and Packaging of substances and mixtures (Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008).

Cement being a constituent of concrete, cooperation in the frame of standardisation is essential. It is also of primary importance for CEN/TC 51 to be involved in matters related to environmental performance of products such as products in contact with drinking water, regulated dangerous substances and environmental product declarations.

1.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment to provide adequate information to support actions of CEN/TC 51:

1.2.1 Cement

1.2.1.1 General information about the cement industry

Cement is a finely ground, non-metallic, inorganic powder. When mixed with water, cement forms a paste that sets and hardens. This hydraulic hardening is primarily due to the formation of calcium silicate hydrates as a result of the reaction between mixing water and the constituents of the cement. In the case of calcium aluminate cement, hydraulic hardening involves the formation of calcium aluminate hydrates.

Cement is a basic material for building and civil engineering construction. In Europe the use of cement and concrete (a mixture of cement, aggregates, sand, and water) in large civil works can be traced back to antiquity. Portland cement, the most widely used cement in concrete construction, was patented in 1824. Output from the cement industry is directly related to the state of the construction business in general and therefore tracks the overall economic situation closely.

1.2.1.2 Energy

The cement industry is an energy intensive industry with energy typically accounting for about 30% of operational costs. Each ton of cement produced requires 60 kg to 130 kg of fuel oil or its equivalent, depending on the cement variety and the process used, and about 110 KWh of electricity.

The cement industry has a proven track record in the simultaneous recovery and recycling of waste materials in what is called a “co-processing” operation. The process is unique in that both material recycling and energy recovery take place at the same time. The mineral content of waste serves as a raw material for the production of clinker (recycling) while the energy content provides part of the energy needed for clinker production (energy recovery). 50% of energy in cement kilns comes from alternative fuels (e.g., waste tyres), including from biomass (e.g., animal meal, sewage dust, sawdust, waste wood); the remaining fuels are petcoke and coal.

In its Low Carbon Roadmap, the cement industry aims to increase the use of alternative fuels up to 90% of fuel needs by 2050. The cement sector is on a continuous innovation path through an increased use of by-products from the power sector (fly ash) and the steel sector (blast furnace slag). In terms of product innovation, efforts in R&D focus on raising the quality of concrete in construction, improving its properties and constantly developing new applications.

1.2.1.3 Environment

a) GHG emissions

Over the past 20 years, the cement industry has reduced its CO₂ emissions per ton of cement from 719 kg in 1990 to 625 kg in 2019.

In 2020, the cement industry presented its contribution to the low carbon economy (the CEMBUREAU “Roadmap to carbon neutrality”) with the objective to reach carbon neutrality in concrete in 2050.

b) Emissions

Regarding the cement industry, in 2012, the Commission launched the process for transforming relevant parts of the Cement, Lime and Magnesium Oxide (CLM) BREF into BAT Conclusions. The revised version of the BAT conclusions and the adaptation of the CLM BREF to the provisions of the IED were submitted for adoption by the European Commission. In 2013, the Commission Implementing Decision 2013/163/EU establishing the BAT conclusions on industrial emissions for the production of cement, lime and magnesium oxide was published in the Official Journal of the European Union.

The emissions limit values for the European cement industry are given in Table 1.

		IED – Annex VI Co-incineration	BATAELs BAT Conclusions
Total Dust	mg/Nm ³	30	10-20
HCl	mg/Nm ³	10	10
HF	mg/Nm ³	1	1
NOx preheater	mg/Nm ³	500	200-450
Cd+Tl	mg/Nm ³	0,05	0,05
Hg	mg/Nm ³	0,05	0,05
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm ³	0,05	0,05
Dioxins and furans	ng/Nm ³	0,1	0,1
SO ₂	mg/Nm ³	50 ^a	50-400
TOC	mg/Nm ³	50 ^a	-
^a Derogations for ELVs in case TOC and SO ₂ do not result from co-incineration			

Table 1: Emissions limit values for the European cement industry

BATAELs are neither emission nor consumption limit values and should not be understood as such. Those levels represent the environmental performance that could be anticipated as a result of the application, in this sector, of the techniques described, bearing in mind the balance of costs and advantages inherent within the definition of BAT. In some cases, it may be technically possible to achieve better emission or consumption levels but due to the costs involved or cross-media considerations, they are not considered to be appropriate as BAT for the whole sector.

c) Capital intensity

The cement industry is a capital-intensive industry. Typical investment cycles are about 30 years. The cost of a new cement plant is equivalent to around 3 years' turnover, which ranks the cement industry among the most capital-intensive industries.

d) Worldwide production and trade

Global 2020 cement production is estimated at 4.2 billion tons (Bt). The European cement sector represents 6.1 % of the global cement production but is a global leader on innovation and research and development.

World cement production in 2020

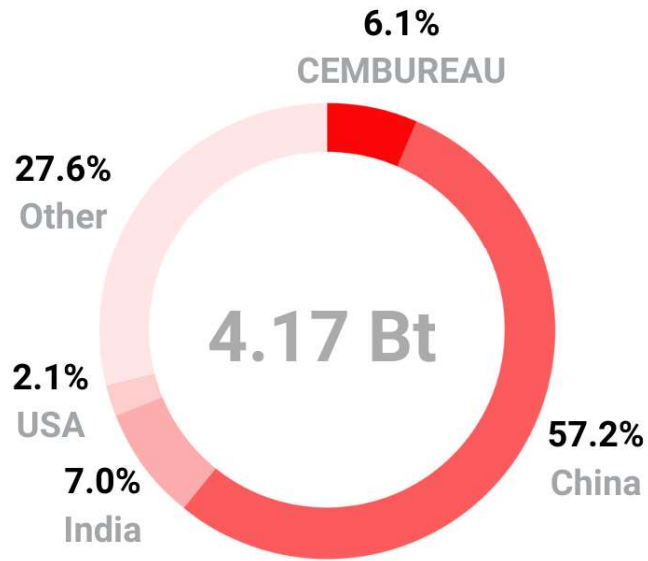


Figure 1: World cement production 2020, by region and main countries

For the exports from and imports to Europe, Figure 2 gives some clarity:

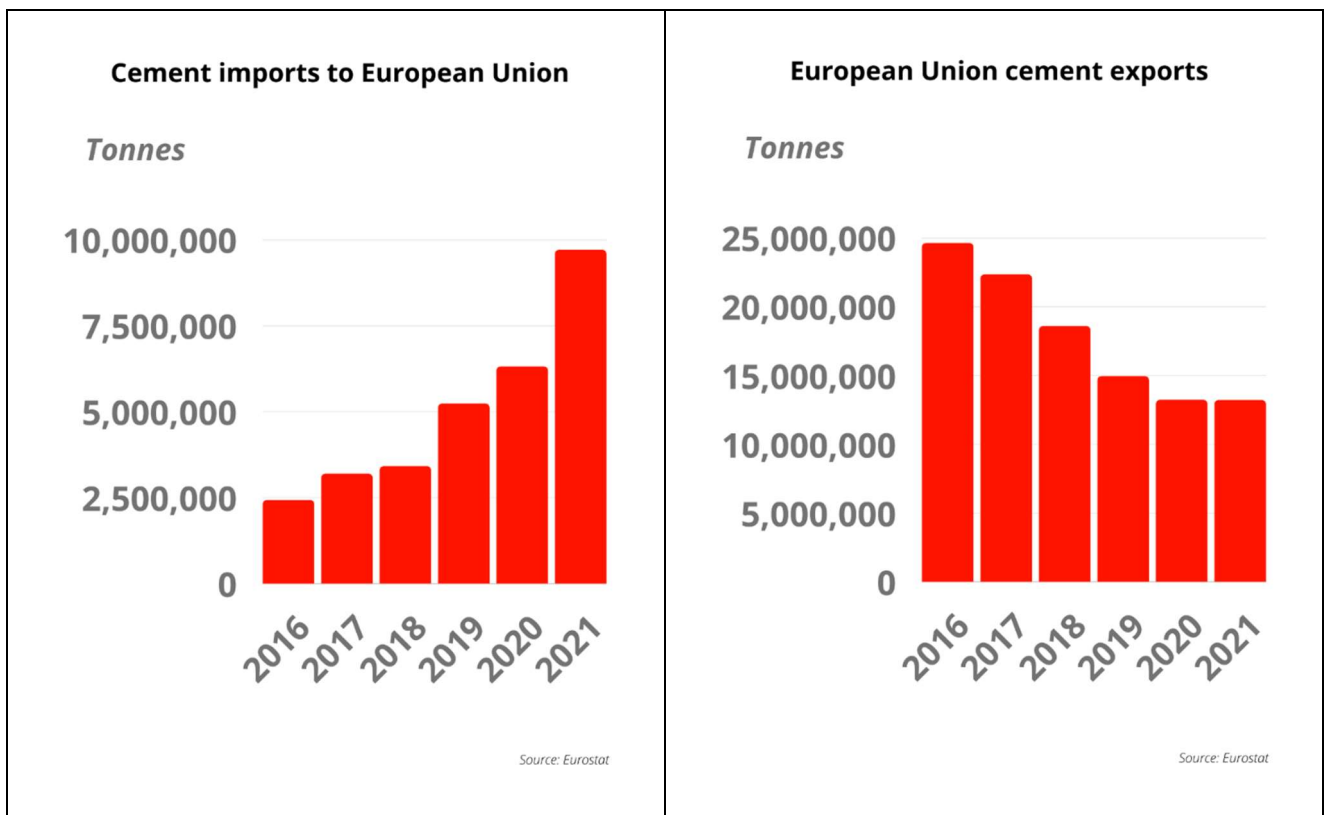


Figure 2. Cement imports and exports in European Union

Land transportation costs are significant, and it used to be said that cement could not be economically hauled beyond 200 km or at most 300 km. The price of long road transportation may even be higher than the cost price. Bulk shipping has changed that, however, and it is now cheaper to cross the Atlantic Ocean with 35,000 t of cargo than to truck it 300 km. However, in large countries transportation costs normally cluster the markets into regional areas, except for a few long-distance transfers (where, for example, sea terminal facilities exist).

e) Labour

With the development of modern automated machinery and continuous material handling devices, the cement industry has become a process industry using a limited amount of skilled labour. A modern plant is usually manned by less than 150 people. In the EU the cement industry represents 36,000 direct jobs (2020). The cement and concrete sector form the backbone of a strong supply chain in Europe which is firmly rooted in the local communities.

1.2.2 Lime

1.2.2.1 General information about the Lime industry

Lime is a mineral product derived from limestone by an industrial process. Naturally occurring limestone is composed almost exclusively of calcium carbonate. When heated, limestone transforms into quicklime, which forms the basis of all lime products available on the market. It is a calcium source for a multitude of industrial processes.

Due to its chemical characteristics, lime is a fundamental raw material used in a large number of industries, such as steel and paper industry and different critical economic activities such as water purification and air quality, lime is therefore essential to many aspects of people's lives.

It is a key enabling material used in the manufacturing process of several industries (in e.g., steel, aluminium, paper, glass). Indeed, no high-grade steel is possible without lime.

Also used in environmental applications (in e.g., flue gas cleaning, wastewater treatment) lime is the most economic material able to absorb many pollutants.

It is a soil improvement material for agriculture (calcium for soil and crop improvement) as well as for animal food.

Used in the construction as a multifunctional binder for plasters and mortars, for building blocks such as AAC (Aerated Autoclaved Concrete) and Silicabricks and public works (asphalt pavement and soil stabilisation), lime is an efficient component for road constructions and building materials.

It is an essential mineral product, but often unseen (in e.g., toothpaste, sugar, ceramics). The average EU citizen indirectly uses around 150 g/day of lime products.

Lime production is carbon-intensive; however, it is different from many other carbon-intensive industries.

Only a third of emissions comes from burning fuels to heat the kilns, as the bulk (2/3) of the emissions comes from a chemical reaction that happens during the production process.

Limestone or dolomite are heated in large kilns with temperatures above 1000°C, causing respectively the following chemical reactions:

- CaCO_3 (solid) + energy \rightarrow CaO , (solid) + CO_2 (gaseous) (lime)
- $\text{CaMg}(\text{CO}_3)_2$ (solid) + energy \rightarrow CaMgO_2 , (solid) + CO_2 (gaseous) (dolime)

Since close to two thirds of the emissions are linked to these chemical reactions, options to mitigate these emissions are limited without capturing the carbon.

Lime (calcium oxide – CaO) is an alkali as the result of the chemical transformation of limestone. Given its rapid reaction with water, calcium oxide, also called burnt lime, is often referred to as quick lime.

Dolime or dolomitic lime (calcium & magnesium oxide – CaO.MgO) is the result of the chemical transformation of double carbonate of calcium and magnesium. Like lime, dolime reacts with water. Affinity of CaO for water is higher than that of MgO.

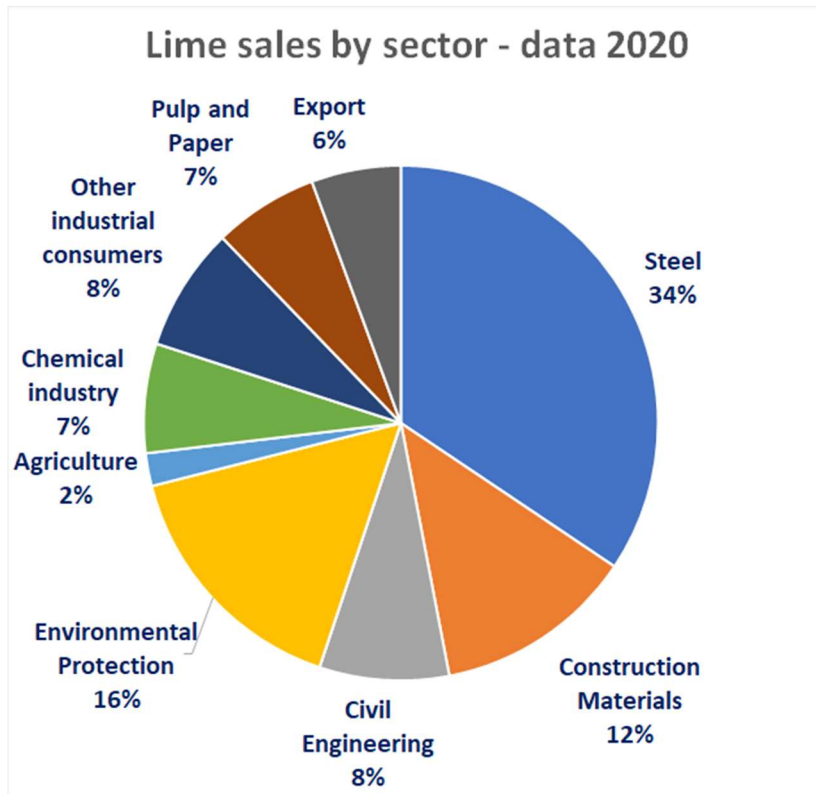


Figure 3: Lime sales by sector in Europe (EuLA 2020)

Quicklime, or burnt lime, is calcium oxide (CaO) produced by decarbonation of limestone (CaCO₃). Slaked lime is produced by reacting, or "slaking", quicklime with water and consists mainly of calcium hydroxide (Ca(OH)₂). Slaked lime includes hydrated lime (dry calcium hydroxide powder), milk of lime and lime putty (dispersions of calcium hydroxide particles in water). The term lime includes quicklime and slaked lime and is synonymous with the term lime products. Lime is, however, sometimes used incorrectly to describe limestone products, which is a frequent cause of confusion.

1.2.2.2 Production

World production of lime grew steadily from just under 60 million tons in 1960 to a peak of almost 140 million tons in 1989. Output of lime dipped in the mid-1970s and early 1980s due the general economic recessions at the time, and the world recession led to a drop in production to 120 million tons in 1995. The numbers shown do not give the complete picture, however, as a significant portion of total lime production takes place at the point of use (i.e., captive lime production within, among others, iron and steel, kraft pulp and sugar industries) and so does not enter the market.

In most EU countries the lime industry is characterized by small and medium-sized companies. There has, however, been a growing trend towards consolidations in recent years, with a small number of large European based, international companies having gained a considerable market share. 19 mother companies are operating in the European Union (2020).

Germany, Italy and France are the largest producers of lime in the EU, together accounting for more than half the EU production.

Data of the captive lime production are not available. The estimated production of lime and dolime in EU in 2020 is estimated according to EuLA (European Lime Association) at 17.5 million tons representing 95 % of the total European non-captive production.

Different types of lime are used for wide variety of applications.

Each specific type of lime has certain reactivity and the type of lime used is therefore governed by the requirements of the application and the specific process. A distinction is drawn between hard burnt, medium burnt and soft burnt limes. Soft burnt limes are those with the highest reactivity. The properties of limes are for instance depending on the limestone feed material, the type of kiln and the fuel used. For example, coke-fired shaft kilns generally produce quicklime with a medium to low reactivity, whereas gas fired parallel-flow regenerative kilns usually produce a high reactivity lime.

Because of its intrinsic properties, the production of lime is a carbon intensive process. The lime production process is based on a chemical reaction induced by heating calcium carbonate (CaCO_3) to produce quicklime (CaO). Inevitably, this reaction also produces CO_2 . These emissions of CO_2 , which are inherent to the lime production process, are called process emissions. These process emissions alone constitute, on average, 67 % of the total CO_2 emissions from the lime production process.

Today, the major challenge of the lime industry is to mitigate these process emissions which cannot be avoided. Lime industry is committed to reducing combustion and indirect CO_2 emissions, however, the only possibility lies with the deployment of reliable and competitive carbon capture technologies, knowing that modern lime kilns are already highly energy efficient (close to the efficiency limit).

1.2.2.3 Energy

The lime industry is also highly energy-intensive with energy accounting for up to 40% of total production costs. The European Lime industry uses a wide variety of fuels, including fossil fuels (natural gas, solid fossil fuels and oil), waste or biomass.

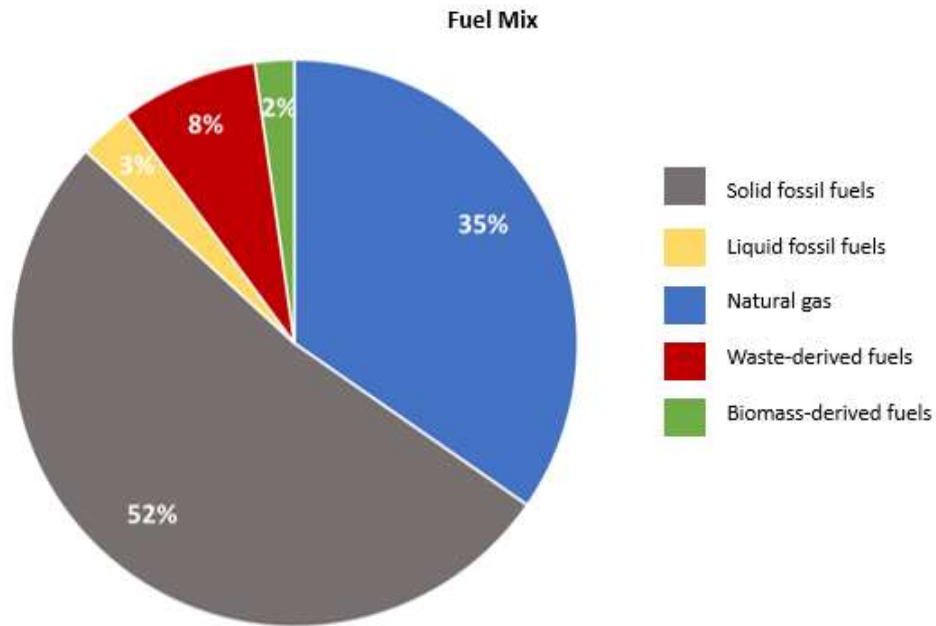


Figure 4: Fuel mix used for lime production (EuLA 2019)

The electricity consumption in lime manufacturing is relatively low. Electricity is mainly used for operating some of the kiln equipment and mechanically crushing the limestone. Electricity consumption varies, but it is estimated at about 60 kWh/t (less than 2% of the carbon emissions).

2 BENEFITS EXPECTED FROM THE WORK OF CEN/TC 51

The expected benefits are:

- the removal of technical barriers to trade and the opening of markets throughout Europe.
- to address relevant sustainability concerns including environmental, social, and economic ones, as well as health and safety for workers of the industry, workers of the construction sites and occupants of the constructions.
- to address major issues about the reduction of products' carbon footprint, circular economy and digitalisation.
- the publication of harmonised standards.
- the publication of EN standards (e.g., EN 197-5) awaiting the adaptation of the Construction Product Regulation Acquis by the European Commission.
- the support of other European Standards dealing with concrete (CEN/TC 104) and mortars (CEN/TC 125).
- the support of European legislation, in particular: the Construction Product Regulation (CPR) (EU N° 305/2011), REACH (EC N° 1907/2006), CLP (EC N°1272/2008) and all other relevant regulation or directive in the framework of the Green Deal.
- the support of European Strategy to put standards back at the core of a resilient, green, and digital EU single market and to strengthen the global role of the European standardisation system.

3 PARTICIPATION IN CEN/TC 51

All the CEN national members are entitled to nominate delegations to CEN Technical Committees and experts to Working Groups, ensuring a balance of all interested parties. Participation as observers of recognized European or international organizations is also possible under certain conditions. To participate in the activities of CEN/TC 51, please contact the national standards organization of your country.

4 OBJECTIVES OF THE CEN/TC 51 AND STRATEGIES FOR THEIR ACHIEVEMENT

4.1 Defined objectives of the CEN/TC 51

The main objective of CEN/TC 51 is the standardisation of cement, building limes and other hydraulic binders which are constituents for other (semi-) finished products as concrete, masonry, rendering products, etc.

The use of the binders and the choice of those products must be facilitated by standardising the products to gain a certification giving confidence to the products.

To provide solutions to the climate change issues, a key objective of CEN/TC 51 is to integrate in the standardisation process new recycled materials and suitable materials with a reduced carbon footprint once their interests have been demonstrated by science.

To reduce the environmental footprint of constructions anywhere in Europe, it is necessary to continue to extend product standards to provide new solutions based on local materials availability.

CEN/TC 51 will ensure that a high level of technical performance and safety is maintained. As tools, the technical committee is developing European standards related to the terminology, the test methods, the specifications, and evaluation of conformity of the products.

CEN also gives the possibility to the industry to exchange information with all the concerned parties.

Terminology is given in different “descriptive” standards as EN 197-1, EN 413-1, EN 459-1 etc. The standards include also general important rules for the industry, users and public authorities, in particular EN 197-2 and EN 459-3 dealing with evaluation of conformity.

4.2 Identified strategies to achieve the CEN/TC 51’s defined objectives

On the short term, CEN/TC 51 intends to be proactive in the process of reviewing the Construction Product Regulation (CPR) Acquis. It will also consider all necessary actions linked to the proposal of CPR revision.

CEN/TC 51 carries out the standardisation work for ISO/TC 74 implementing the Vienna agreement to avoid any duplication of work.

CEN/TC 51 is using the best appropriate technical document to start any standardisation work; it can be national standards, but also technical documents developed in the frame of research projects by international organizations such as RILEM. Normally, the initiator of the project gets already such a document as basis of the European standardisation. CEN/TC 51 intends to reinforce its cooperation with scientific international organizations to facilitate identification of promising materials.

Liaisons with other CEN Technical Committees will continue: mainly TC 104, TC 229, TC 351, TC 350, TC 442, TC 125, and TC 396.

A new standard for cements incorporating a certain type of Construction and Demolition Waste is under preparation (CEN Enquiry and Formal Vote foreseen in 2022 – early 2023).

CEN/TC 51 is also preparing some guidelines on a procedure to assess environmental, such as release of dangerous substances, and sanitary impacts of new constituents.

4.3 Environmental aspects

Environmental Product Declarations (EPD) of cement and building limes are based on Product Category Rules EN 16908 complementary to EN 15804+A2. CEN /TC 51 is in charge of the standard EN 16908.

CEN/TC 51 will ensure that the sustainable use of natural resources is considered in standards.

5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE CEN/TC 51 WORK PROGRAMME

The main factors are:

- the uncertainties regarding the adaptation of the Construction Product Regulation Acquis.
- the uncertainties regarding the revision of the Construction Product Regulation.
- the uncertainties regarding possible European or notified national regulations, which may necessitate modifications of the content and target dates for projects in the work program.
- the lack of public funding to validate test methods (until now, all CEN/TC 51 work has been financed by the industry).
- investigation on new constituents is dependent upon funding being available to undertake the necessary pre/co-normative research.