



SuStaCEM

Project Description

This project is a proposal for Topic 26 -SMP-STAND-2023-ESOS-02-IBA Standards for low-carbon cement.

Project name: **New sustainable cements and building limes**

Project acronym: **SuStaCEM**

Project duration: **36 months**

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Project Summary

Background

Cement is an essential and strategic component of the construction sector that needs to reduce its carbon footprint. To achieve this goal, many levers must be operated in the coming years and different relevant roadmaps have been announced and are being implemented, at European and National levels, on industry decarbonisation, stressing the need for the Construction sector and the cement sector in particular, to reach carbon neutrality by 2050. In these roadmaps, the additional clinker (main cement component with the highest carbon footprint) replacement in cements is a significant lever for the short term, accounting generally for 10 to 20% of the products' carbon footprint reduction. The outcomes of this project SuStaCEM will contribute to accelerate the achievement of this goal.

It is necessary to identify new pathways for the decarbonisation of cements and to increase circular economy solutions that can be introduced in standardisation. Experts from CEN/TC51 *Cement and Building Lime* have recently prepared two new non harmonized standards (EN 197-5 2021 and EN 197-6 2023) to support these objectives. In order to go beyond and identify new promising products that could be standardised without delay, an essential milestone consists of collecting all useful technical data and expertise.

The topic has been identified as a priority in the EU Strategy on Standardisation and has to be dealt with as quickly as possible.

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

Low Carbon Cement has to be understood as new, more sustainable, cements (as additional solutions at European level) even though current standards already offer in reality some products with a reduced carbon footprint.

Concept and methodology

It is essential to elaborate a platform to collaborate and exchange the useful Know-How and information on key topics between stakeholders (from industry and academic partners) to facilitate standardisation of truly proven sustainable cements.

Scientists are not always aware of how standardisation works, while standardisation experts do not always have the necessary technical background to draft standards.

There are among the academic and industrial (sometimes of different businesses) sectors many activities or initiatives to find solutions to reduce the carbon footprint of construction materials in general and cementitious materials in particular. These activities are conducted separately, without coordination and most of the time without an official request for standardisation, often due to lack of awareness, despite the urgent need for additional sustainable solutions.

This project intends to reduce this gap for the sake of supporting standardisation priorities and European legislation. By supporting pre-normative and co-normative works, this project will contribute to identify and complete all scientific and technical elements that will conduct to accelerate the development of standards / guidelines for sustainable products.

Thus, the project will identify and cover the promising materials (preferably by-products, recycled materials,...), sufficiently available for the most suitable intended uses (cements to be used in structural concrete, masonry cements, hydraulic road binders, building limes,...). The Know-How of the standardisation experts will be used to prepare the adapted standards without delay, taking into account requirements of the future Standardisation Request, facilitating the development of additional sustainable hydraulic binders in order to support the transition to a low carbon construction sector on a large scale. It will continuously feed standardisation works.

Project Description and objectives

Before CEN/TC51 develops new standards, it must be able to rely on a robust technical dossier, in which the interest in new promising materials/products has actually been scientifically demonstrated. More specifically, information to be provided in the dossier to CEN TC51 should comply with the CEN TR 16912 Guidelines for a procedure to support the European standardisation of cements.

In this project, a significant part of the approach will consist of elaborating a platform to collaborate and exchange the useful Know-How and informations on key topics between stakeholders (from industry and academic partners). The cooperation with scientific international organisations to facilitate identification of promising materials will be strengthened.

The aim of the project in the end is to :

- Create a platform to collaborate : establishing networks to consolidate data, in particular the main outcomes of previous or ongoing projects to avoid any duplication of work and research ;
- Identify new solutions to prepare technical dossiers that will contribute to harmonised standards development for low carbon cements according to the future Standardisation Request that will be prepared in the meantime under the CPR Acquis process ;
- Standardise the most promising solutions : possibility to deliver new sustainable products on the single market in the interest of European citizens.

The project is a holistic approach structured around three Work Packages (WP) in addition to WP1 dealing with Project Management and coordination :

- WP2. Cooperation to identify promising new constituents for cements, hydraulic binders and building limes.
- WP3. Cooperation to further investigate materials coming from Construction and Demolition Wastes to be used as new constituents.

- WP4. Development of an approach to facilitate harmonisation and the introduction of new or revised products' standards (like EN 197-5, EN197-6,...) in application standards (like concrete standard) across Europe

These are new areas of activity that may facilitate the use of low carbon cement in applications. Peculiar attention will be paid to the evaluation of these new solutions according to the intended uses since requirements are different.

All these routes are important because there is no single solution at European level.

It will contribute to the future Standardisation Request under the Construction Product Regulation Acquis process.

The shift towards more sustainable cements has already started with the recent evolution of cement standards (EN 197-5 and EN 197-6) and it could be boosted with the outcomes of the work packages of this project that intends not only to conduct pre-normative works to identify new promising products to be standardised but also to gather the necessary elements (relevant essential characteristics, identification of assessment methods, determination of the performance of products...) to already shape the corresponding future standards now, so that they are in line with the objectives of the CPR Acquis.

Work packages of the project.

WP1 - Project Management and Coordination

Objectives

This project is based on complementary Work Packages that require a strong coordination. For this purpose, it is necessary to nominate a coordinator for the duration of the project. The multi-national collaboration requires a strong and somewhat intensified coordination and leadership. The work will partially be carried out by a specialist, assisted by an administrative person.

Main activities will be to :

- organise monitoring committee meetings for the project follow up and prepare the minutes
- coordinate between partners with the support of lead beneficiaries of WP : organisation of workshops and webinars
- communicate
- report to European Commission

WP2 – Cooperation to identify promising new constituents for cements, hydraulic road binders and building limes

Objectives

- There is a need to anticipate some shortages of traditional constituents (GGBS, Fly Ashes) due to announced shutdowns of blast furnaces and thermal power stations. The industry has already started to explore the potential of calcined clays by producing new types of cement and this will provide new sustainable solutions but further investigation on other materials remains necessary
- Many stakeholders are working on the evaluation of new constituents (by-products or wastes) without a real coordination or without sharing data: Steel slags (BOF, EAF) and other types of slags (cupola slag,...), other types of ashes; Recycled ground glass, Bauxite Residue, Dredging sludges, Mine tailings, New clinkers, ...

- Some possibilities have already been introduced in HRB standards (EN 13282) like Crystallised Basic Oxygen Furnace (BOF) Slag – Sb –, Siliceous fly ash of circulating fluidised bed – Va –, Unslaked calcareous fly ash – Wa – and Paper sludge ash – WP –
- It could be necessary to consider new constituents and maybe new cement types for specific applications (structural concrete, masonry, soil stabilisation,...) but also new building limes.
- Many issues are still to be tackled in terms of technical, environmental and H&S areas. Processing technologies could be necessary to achieve required performance. CEN/TC 51 is already preparing some guidelines on a procedure to assess environmental aspects, such as release of dangerous substances, and sanitary impacts of new constituents.

Activities

Review materials (natural, by products, wastes) that could be incorporated in hydraulic binders.
Review literature, all KH of selected materials.

WP3 – Cooperation to further investigate materials from Construction and Demolition Wastes to be used as new constituents.

Objectives

After the introduction of Recycled Concrete Fines into standard, the objective will be to already prepare extension of prEN 197-6 about Cement with Recycled Building Materials.

This cooperation (pre-normative work) will consist of:

- Identifying available materials such as mixed rubbles, recycled brick wastes: review the state of the art, publications, provide recommendations
- Verifying performance, in particular durability, of the most promising recycled building materials, based on recommendations provided by the first task of this WP. Performance on Masonry cements with Recycled Building Materials will be also evaluated.
- Extending the specifications to carbonated Recycled Concrete Fines (RCF) and other Construction and Demolition Wastes (CDW) materials
- Providing recommendations on additional necessary studies

The outcome of the work will consist of extending prEN 197-6 Cement with Recycled Building Materials that only considers Recycled Concrete Fines today, with other available materials such as mixed rubbles. Performance of cements containing promising other recycled building materials will be evaluated. It will also cover specifications of carbonated RCF and other CDW materials. Due to the potential of capturing CO₂ of cement plant flue gas, these materials are promising. Properties of accelerated carbonated CDW will be investigated.

This part of the project will be led by AFNOR/BNLH (France) with support of laboratories acting as subcontractors.

They will be selected via a procurement process with criteria taking into account their know how in the scope of the WP (performance of preliminary or ancillary work in connection with European standardisation, including studies, cooperation activities, including international cooperation, seminars, evaluations, comparative analyses, research work, laboratory work, inter-laboratory tests, useful references, equipment, publications, etc).

WP4 – Development of an approach to facilitate the introduction of new or revised product standards (like EN 197-5, EN 197-6,...) in application standards (like concrete standard) across Europe

Objectives

When new types of cement prove to be suitable for producing concrete, every member state goes through a procedure to integrate these new cements into the national annex of the concrete standard EN 206. This procedure differs from member state to member state, but serves the same purpose: to demonstrate the general and specific suitability for use of the new cement. This also means that all member states carry out similar testing to prove the same type of cement suitable to be used for a given application. And this happens today without interaction, without exchange of knowledge and hence not in the most efficient way. Moreover, this parallel way of working slows down the adoption of the new sustainable cements.

This part of the project aims to reduce the overall European effort to evaluate and approve the new cements for all possible applications. The key to do so is collaboration and exchange of testing results between the European member states.

The first step in this section is to collect and analyse the test procedures existing in the different countries for adopting a new binder for each exposure class. This analysis will provide a complete overview of complementary and supplementary tests that enables member states to collaborate and hence rationalise the efforts, to combine and exchange results for faster and cheaper approval of the new sustainable cements.

The second step in this section will be to give recommendations on the framework of a database of evaluation results.

The idea is that every time a new cement is evaluated for a certain exposure class or application, those results would be added to the database.

And finally, there is the standardisation section. The objective is to set up guidelines / procedure on the implementation of product standards in application standards without unnecessary delay. Moreover, this work will constitute a significant contribution to the reinforcement of a further European harmonization of standards.

The domain of the national annexes that specify the use of new cements in concrete belongs to CEN/TC104. It is therefore obvious that close contact will be made with TC 104 representatives.

Activities

Collect and analyse procedures.

Provide recommendations on the framework of a database.

Guidelines on how to use the database in order to prevent redoing similar testing.

Impact and ambition

The benefits expected from this project will be to speed up this process of developing new standards and thus the market penetration of low carbon cements. It will provide deliverables such as state of the art reports, studies, preEN, preTR, CWA, technical dossier that will support the development of new sustainable product standards according to a regular timeframe.

Such a project will shorten the time to develop and revise European standards or European standardisation deliverables without compromising the quality of the work nor the basic rules of standardisation.

The innovative aspect of the approach relies on the fact that CEN/TC 51 is proactive to identify all routes of improvements without awaiting an official request for standardisation from one stakeholder

or another because it is fundamental to answer societal needs linked to the challenges of climate change.

As the methodologies and standards (EN 15804+A2 and EN 16908+A1) to evaluate environmental impact of products and in particular the Global Warming Potential indicator (kg CO₂ eq./t) are already available, the objective will be also to verify in a robust way that the new materials are relevant and will have a real positive impact on this indicator.

The project intends to support European standards applicable anywhere in Europe ; it will scale up solutions at European level, thus creating new opportunities locally. Such new developments will also contribute to revitalise the influence of EN standards beyond Europe.

By providing additional pathways to standardise new solutions in line with the objectives of the Green Deal, this project will ultimately deliver benefits to consumers and European citizens. With new standards, competition will be increased, and industrials will be able to put on the market those products fulfilling EU plans for a green and circular transition in the Construction sector.