



CERAMIC ROADMAP TO 2050

CONTINUING OUR **PATH**
TOWARDS **CLIMATE**
NEUTRALITY

EXECUTIVE SUMMARY

EUROPEAN CERAMIC INDUSTRY IN NUMBERS

**30**Member countries
Pan-European perspective**80%**SMEs
Local jobs**€26bn**Production value
Motor for growth**€5.1bn**Positive trade balance
Export champion**up to 30%**Production costs related to energy
Sensitive to energy prices**200,000**Direct jobs
Source of employment**150 years**Average lifespan of a brick house
Durable productsUnder ETS
ceramics
represent**10%**

of installations

but
only**1%**

of industrial emissions

Many small
installations,
few emissions

CERAMIC APPLICATIONS

The different Ceramic Applications are: Construction, Industrial Application, Consumer Goods, Household appliances, Healthcare, Renewable technologies, Electronics, Transport, Security, Defence, Aerospace.

Raw materials

Ceramics are made from mined materials (clay, bauxite, magnesite), water, fire and air. The main raw material is clay, a resource abundantly available. Technical ceramics and refractories are made from a variety of raw materials such as aluminium oxide, magnesia, graphite, corundum and silicon carbide.

Manufacturing process

Ceramics are made by taking raw materials, adding additives, powders and water, then shaping them into forms, which are dried and fired in a high-temperature kiln.

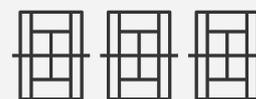
CERAMICS ARE ESSENTIAL TO OUR MODERN SOCIETY:

**800,000**

In 2021, EU citizens built almost **800,000 residential units** in durable and energy efficient clay building materials;

**115,000**

Every year, the consumption of ceramic tiles (wall & floor tiles) in Europe corresponds to a total surface area **equivalent to 115,000 football pitches!**

**1.8 million**

In 2021, the number of roof tiles used to build pitched roofs would have been **enough to cover 1.8 million tennis courts!** Some tennis courts are actually covered with recycled clay;

**45 million**

45 million **pieces of ceramic sanitaryware sold yearly in the EU** contribute daily to hygiene and water efficiency thanks to the Unified Water Label;

**100%**

Most high temperature industrial processes rely on refractory ceramics. For example, **100% of European steel is produced with refractory ceramics!**

**daily lives**

Technical ceramics contribute to all EU citizens' daily lives through applications in cars, transport, medical applications, superconductors, electronics & batteries, aerospace, and defense, etc.

Accelerating progress

Heat & fire resistance

Ceramics can withstand very high temperatures but are poor conductors of heat, factors that give them qualities of resistance and stability. Not only do ceramics contribute to fire safety in buildings but they are also used in many industries where high heat is essential for production, from steel to glass.

Insulating/thermal properties

Fired clay is naturally insulating which means that clay wall bricks are perfectly suited to the new energy performance requirements of the building sector. In addition, the high inertia of these bricks, by offering a regulation of the interior temperature whatever the season, plays a determining role in thermal comfort.

Durability and strength

Ceramic products can last thousands of years and the industry manufactures cost-effective items that last a lifetime, delivering value to consumers and industries alike. Ceramics can also be recycled easily, reducing waste streams and contributing to the circular economy.

Safety

Ceramics are safe products, and the industry's many operators throughout the supply chain adhere rigorously to the highest health and safety standards. For example, ceramic tableware and porcelain comply with European legislation on food contact materials, guaranteeing consumers health and safety.

Hygiene

Ceramic products are inert and do not emit substances in the indoor environment, preserving indoor air quality. They also contribute to hygiene thanks to their ease of cleaning and certain ceramic tiles have antibacterial properties.

Affordability

The European ceramic industry prides itself on creating accessible, affordable products that offer a lifetime of value, whether for the consumer market and affordable housing or for hi-tech applications.

Creativity

Europe's ceramics companies are at the forefront of new technological developments in the sector – in manufacturing, design and marketing.

Versatility

We make ceramic products from the simplest teacup to the most sophisticated capacitor. Creative and versatile ceramic products strengthen the resilience of this industry.

A key component of essential and strategic value chains

Ceramics are used in various industrial processes, including energy production, chemical production and metallurgy. Ceramics play an essential role as the base of everyday household items, but technical ceramics can be found in applications from electronics, healthcare, security and transport, renewable technologies, aerospace and defense.

Continuing our path towards climate neutrality Committed to the European Union's climate ambition for 2030 and 2050

With its overarching European Green Deal and the legally binding European Climate Law the EU has set ambitious climate goals and has set the continent on a clear path to decarbonisation. The European Climate Law legislates the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050.

The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55 per cent by 2030, compared to 1990 levels.

Climate neutrality by 2050 means achieving net-zero greenhouse gas emissions for EU countries, mainly by cutting emissions, investing in green technologies and protecting the natural environment. The European ceramic industry is fully committed to working with the European Union institutions to lead the transition to a net zero-carbon economy within the coming decades.

SHARE OF EMISSION SOURCES IN THE CERAMIC INDUSTRY IN 2020

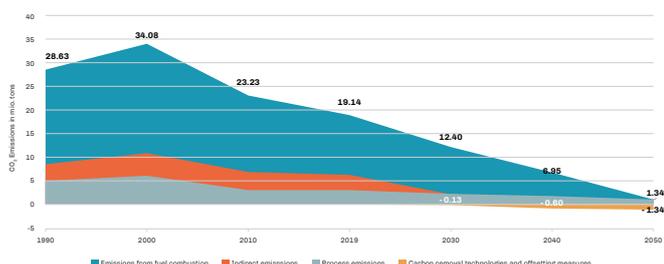
The share of emission sources in the ceramic industry in 2020 was: 64% emissions from fuel combustion, 17% process emissions and 19% indirect emissions.

Emissions linked to ceramics production can be broken down into three main categories:

- Fuel combustion for drying and heating process
- Process emissions generated by mineralogical transformation of the clay (cannot be avoided completely)
- Indirect emissions, mainly from electricity production

Around 90% of emissions comes from three sectors: bricks and roof tiles, wall and floor tiles and refractories. The proportion between the different emission types varies significantly, depending on different processes, plants, products and raw materials (particularly for process emissions which represent 30% of total emissions in the bricks and roof tiles sector and can be as high as 60% of total emissions in the clay blocks sub-segment).

CO₂ REDUCTION PATHWAY



Emissions reduction model

Our emissions reduction model combines a range of measures to achieve a gradual reduction of emissions to reach carbon neutrality by 2050. These include:

- A switch to renewable energy (green hydrogen, biofuels and decarbonised electricity).

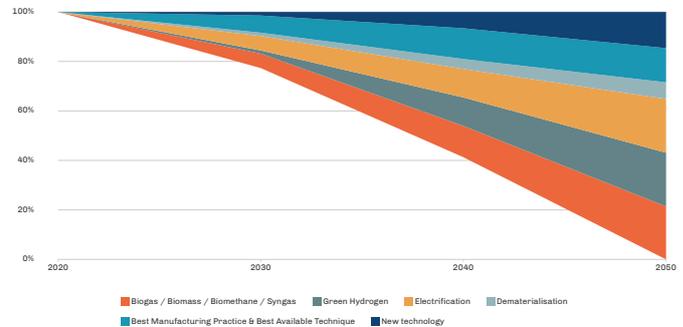
- A reduction in process emissions.
- Innovation and increased efficiency in the manufacturing process.
- CO₂ capture CCS/CCU.
- Other carbon removal technologies and offsetting measures.

Assumptions & external conditions

The CO₂ reduction model assumes that:

- There is a constant level of production and a similar product mix between 2020 and 2050.
- The real emissions for the year 2019 were taken as a basis for the estimations, as 2019 was a more representative year in terms of production levels (due to the COVID-19 pandemic, 2020 was not a representative year, as emissions were exceptionally low during this period)..
- Zero-emissions technologies, especially for the firing processes, will be available in a relatively short term, so as to allow the progressive renewal of assets, whose operational lifetime often exceeds 20 to 30 years.
- All barriers regarding the availability of alternative fuels (such as green hydrogen or biogas) are overcome, and that these fuels

MEASURES CONTRIBUTING TO THE REDUCTION OF EMISSIONS FROM FOSSIL FUEL COMBUSTION

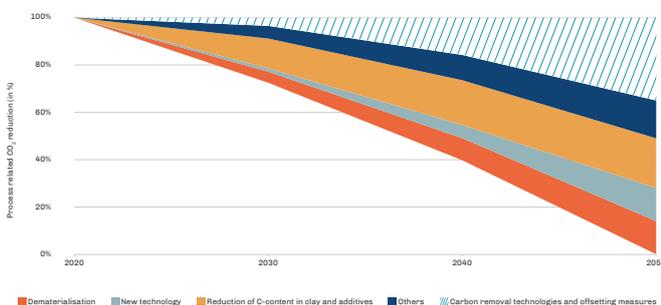


Source: Cerame-Unie

are made available in sufficient amounts and with a competitive price throughout Europe.

- Obstacles for the technical application and availability of alternative fuels will progressively be removed from 2030 and would allow the industry to move to breakthrough solutions, such as hydrogen, biogas or electricity in equal proportions.
- A gradual decarbonisation of the power supply throughout Europe.
- Gradual availability and acceptance of CCUS

MEASURES CONTRIBUTING TO THE REDUCTION OF PROCESS RELATED EMISSIONS



Source: Cerame-Unie

Under this vision of a climate-neutral industry, in 2050 the European ceramic industry would have a projected energy need of around 140,000 terajoules.

Taking into account the assumptions used for the purpose of this roadmap and detailed assessments made at national level, the ceramic industry considers that by 2030, the annual decarbonisation costs will exceed €500 million. The total cumulated abatement costs until 2050 are estimated at around 27 bn EUR.

TABLE OF ALTERNATIVE ENERGY NEEDS DERIVED FROM EMISSIONS REDUCTIONS

Year	Total energy need (TJ)	Biogas (TJ)	Green Hydrogen (TJ)	Green electricity (TJ)	Green electricity (Gwh)
2030	196,350.76	12,836.07	2,852.46	12,836.07	3,565.86
2040	166,911.25	27,811.48	25,315.58	25,315.58	7,032.67
2050	140,087.35	47,065.59	47,778.70	47,778.70	13,272.92

Source: Cerame-Unie

Supporting the Renovation Wave

Downstream effects / contribution of ceramics to decarbonisation during their use phase

Collectively, buildings in the EU are responsible for 40% of our energy consumption and 36% of greenhouse gas emissions.

The energy-saving potential, durability, and reusable qualities of ceramic construction materials (clay bricks, blocks, roof tiles, pavers, expanded clay, wall and floor tiles and sanitaryware) have been known for centuries. With a renewed focus on energy efficiency and circularity, the European ceramic industry will be central to reducing energy use and construction waste.

Renovation of our existing building stock and focusing on near-zero energy building are paramount to meeting Europe's decarbonisation objectives. Ceramic construction materials are durable, affordable and provide comfortable, energy-efficient, safe and healthy homes to millions of people in Europe.

Ceramic construction materials provide high levels of safety in case of fire or flood. They also ensure a high indoor air quality, as no toxic emissions emanate from the building fabric into the internal environment.

Ceramic wall and roof systems not only increase comfort but reduce heating and cooling costs and emissions.

Innovative ceramic sanitary appliances contribute to water and energy efficiency, notably in the context of voluntary smart tools promoted by the industry such as the Unified Water Label.

Ceramic construction materials will be pivotal to Europe's new near-zero energy building stock as well as its Renovation Wave.

Clay brick cavity walls and monolithic clay block walls with integrated insulation can normally reach any required insulation value by varying the insulation thickness. They also offer a maintenance-free solution for a lifetime.

Ventilated facades create an air chamber between the cladding material and the structural surface of the building. Such systems can easily be applied in renovation on any material. A building with a ventilated façade system can be in some cases 35% more energy efficient. Other benefits of ventilated facades include the reduction of dampness on walls, deterring the formation of thermal bridges and providing a comfortable indoor climate by preventing heat from escaping in winter and entering in summer, and improved sound absorption.



Circularity, biodiversity, zero-pollution

The European ceramic industry supports Europe's goal to move away from a linear 'produce, use, waste' model to a circular model in which resources and materials are reused, recycled, or recovered.

Resource efficiency is not only about using less, but about making better use of existing resources. Clay, our industry's main raw material, is available in abundance. Furthermore, ceramic products are resource-efficient and stand out with their high durability thanks to their long lifespan. And after the end-of-life stage, ceramic products can be reused or recycled.

The ceramic industry is already making a major contribution to the shift towards a circular economy through innovative production processes and sustainable products – for example, by minimizing raw material consumption and waste generation during the production process, optimizing raw material selection, refining product design and promoting supply-chain cooperation for recycling.

Resource efficiency is not only about 'using less', but about 'using better'. Ceramic products, and in particular ceramic construction products, are resource-efficient and have a high durability, requiring little or no maintenance. Studies show that a brick house can have an average life span of more than 150 years, as do clay pipes and buildings containing expanded clay. Research also shows that clay pavers can have a lifetime of 125 years. Sanitaryware appliances and ceramic tiles for flooring and walls can have a life span of up to 50 years, which is very high in comparison to alternative materials. Ceramic tableware and ornamentalware can last for decades.

Moreover, given the inert nature of fired clay, many ceramic products can be reused or recycled after the end-of-life stage, meeting the concept of cradle-to-cradle. In this context, the ceramic industry has developed solutions to minimise raw material consumption and waste generation during the production process, and has increased the reuse and recycling of products.

Biodiversity in action

The unique landscape, especially aquatic environments, created by quarrying operations can have a positive impact on habitats and wildlife in and around these quarries.

Examples of projects aimed at promoting or restoring biodiversity at clay quarries

The European ceramic industry is committed to adopting the best available technologies to reduce all forms of pollution from its raw material extraction and throughout its production processes. We have a long history of working with regulators and local communities to reduce pollution.



Leeuwensche Waard

Country: The Netherlands

This joint project between Delgromij and WWF focused on the management of waterways to secure new habitats for local wildlife and to create a 290-hectare nature reserve.



Noala

Country: Italy

Since 1985, the operators have created a network of ponds to promote biodiversity, integrated into the Natura 2000 network and boasting more than 190 bird species. When the operating licence was renewed in 2009, the protected section was increased from 13 to 36 hectares.

Policy recommendations

IN ORDER TO SUCCESSFULLY ENGAGE ON OUR PATH TOWARDS CLIMATE NEUTRALITY AND A CLEAN AND CIRCULAR ECONOMY, THE CERAMIC INDUSTRY WILL NEED:

Continued and sufficient carbon leakage protection

- Fair performance benchmarks representative of the sector-specific energy mix evolution, not penalising heterogeneous sectors and SMEs.
- Full consistency in the treatment of unsustainable use of biomass across the whole climate and energy legislative arsenal. All unjustified effect of biomass installations on the ETS benchmarks must be avoided.
- Carbon leakage protection measures should allow EU producers to remain competitive in export markets.

A carbon price incentivising investment

The CO₂ price should not limit the industry's ability to invest in technological transition and should not be affected by carbon market speculation from investors not covered by the EU ETS.

A stable, reliable legal framework

Investments in new kilns and machinery in ceramic processes are made for a period well beyond 20 years. Such long-term investments can only be made if the regulatory framework offers sufficient stability and predictability.

Sufficient financial support

Sufficient financial support is necessary both for research and innovation and for investments (CAPEX) as well as to mitigate higher running operational costs (OPEX). The industry should also have access to Carbon Contracts for Difference.

Secure infrastructure and a stable supply of green energy

Appropriate transportation, storage and distribution infrastructure in green energy (electricity, green hydrogen, biogas or syngas) is needed to ensure stable supply at a reasonable and competitive price.

Energy at a competitive price and better mechanisms to cope with energy crises

Ensuring access to affordable energy prices, in particular in the context of energy crises is crucial.

Equal access to green energy

The EU should firmly establish sector neutrality and equal

access to hydrogen and all other green energy sources for all end-users.

Full access to finance

Sustainable finance should be accessible to all sectors in the process of implementing their environmental and energy transition.

A holistic and integrated approach to building renovation

Cerame-Unie supports the objectives of the Renovation Wave. A holistic and integrated approach is recommended to building renovation to stimulate the whole construction sector. Both renovation and new construction should be promoted.

Supporting holistic life cycle assessment schemes

Ceramic construction products manufacturers support holistic life cycle assessment schemes for buildings, such as the use of voluntary environmental product declarations (EPDs). In this context, Cerame-Unie supports the work of CEN/TC 350 and welcomes European initiatives such as Level(s).

Supporting the New European Bauhaus initiative

The European ceramic industry welcomes and supports the New European Bauhaus initiative, which aims at shaping future ways of living according to key principles of sustainability, inclusion and quality of experience, thus contributing to the wellbeing of citizens.

A framework promoting durable products

Long-lasting, reusable and/or recyclable products should be encouraged, and a whole life cycle analysis should be binding.

Promote fair, sustainable and free trade

A strong promotion of market access, effective use of trade defence instruments and better integration of environmental considerations in trade is vital to ensure a global level playing field.

Supporting skills & qualifications

Concrete and coherent actions are necessary for the upskilling and reskilling of the EU workforce to support the just transition process.

Cerame-Unie Aisbl (CU)

is the European Ceramic Industry Association. Based in Brussels since 1962, it is the voice of the European ceramic industry to the EU institutions.

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