

**THE BACKBONE
OF SUSTAINABLE
CONSTRUCTION**



THE CONCRETE INITIATIVE
solutions for Europe's future

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BENEFITS OF CONCRETE

SOCIETY

Concrete enables safe, affordable and resilient housing and infrastructure

- Concrete provides the necessary foundation for a safe and resilient built environment, as well as solutions to societal challenges such as those induced by increasing urbanisation
- Affordability, flexibility and energy efficiency make concrete a material of choice for infrastructure such as hospitals, schools, public buildings and transport infrastructure
- Concrete can be cast into virtually any shape or form, which allows for design freedom and an almost infinite variety of applications

ECONOMY

Concrete construction drives economic growth, innovation and jobs

- As a central pillar of the construction sector, concrete is a driver of economic growth, with a unique multiplier effect on jobs and economic activity
- Concrete is a main enabler of modern construction, providing multiple and unique properties, flexibility and value for money
- Concrete is a local business across the entire value chain, deeply rooted in local economies. A local product for a local market

ENVIRONMENT

Concrete offers optimum whole-life performance

- Concrete absorbs temperature variations (by its thermal mass) which reduces energy consumption in buildings
- Thanks to the use of alternative fuels and by-products from other industries, and end-of-life recycling, concrete is an integral part of the circular economy
- Through quarry rehabilitation, the concrete sector contributes to creating protected local biodiversity hotspots and ecosystems

Foreword

In a world where resources are becoming more and more scarce, the European Union needs to achieve smart, sustainable and inclusive growth by becoming a resource efficient economy.

Buildings use a significant share of our resources in materials, energy, water and land, and at the end of their lives they make up a third of all waste; therefore they play an important part in this transition. If we want the European building sector to become more competitive and more viable in the future, we need to attain higher resource efficiency levels. The potential to make savings in both costs and materials and to reduce the impact on the environment in the buildings sector is an important one.

There is scope for greater resource efficiency at all the stages in the life-cycle of a building, from manufacturing of bricks and blocks, cement, insulating and roofing materials, the construction process itself, the day-to-day use of the building, its renovation and finally to waste management. But for this we need to move from today's linear models where resources are extracted, used, then thrown away, to circular models, where they are used again and again – by repairing, recycling, re-manufacturing, or re-using them – making waste a thing of the past.

To support and facilitate the transition process, the European Commission is preparing a Communication on Resource Efficiency Opportunities in the Building Sector. The objective of this initiative is to reduce the environmental impact of buildings while at the same time improving the competitiveness of the construction sector.

As The Concrete Initiative clearly shows, sustainability and business solutions can go hand in hand. I welcome your contribution towards a more resource-efficient and hence sustainable future for Europe.



by **Janez
POTOČNIK**

European Commissioner
for Environment

A handwritten signature in blue ink that reads "Janez Potočnik". The signature is written in a cursive style and is located at the bottom center of the page.



CONCRETE

THE BACKBONE OF SUSTAINABLE CONSTRUCTION

Concrete is the most widely-used construction material in the world. It is part of our everyday lives. However, its ubiquitous nature often means it is taken for granted. The Concrete Initiative aims to increase awareness of its essential role in creating a sustainable construction sector in Europe.

The Concrete Initiative is a project led by CEMBUREAU (the European Cement Association), BIBM (the European Federation of Precast Concrete) and ERMCO (the European Ready-Mixed Concrete Organisation).

Why The Concrete Initiative?

The Concrete Initiative wishes to engage with stakeholders on the issue of sustainable construction, and in particular the barriers and solutions to harness concrete's multiple benefits.

This document examines the economic, social and environmental implications of sustainable construction and the need for a balanced approach among these three pillars. It shows how the construction industry, including concrete, can help find solutions to Europe's challenges. This means increasing understanding of the significant role of concrete in all three areas of sustainable construction. This publication therefore also outlines the benefits of sustainable concrete construction to Europe, as well as revealing some surprising facts, figures and examples on the key attributes of concrete.

The Concrete Initiative's manifesto has three objectives. Firstly, it seeks to encourage policy measures and standards that stimulate growth and innovation. Secondly, it sets out to improve the environmental and social impacts of the industry. Finally, it lays out the Concrete Initiative's commitments towards Europe's sustainable future.

WHAT IS CONCRETE?

Concrete is a building material made by combining cement, water, aggregates (gravel, stone and sand) and, often, admixtures. Concrete is used in virtually all construction you can think of - from roads, to buildings, railways and bridges.

THE CONCRETE INDUSTRY

The "concrete industry" is made up of several industries. The aggregates, cement and admixtures industries all supply materials to ready-mix and precast concrete. The term "concrete industry" should be taken to mean this ensemble of industries involved in the manufacturing of concrete and concrete products.

PARTNERS

CEMBUREAU, the European Cement Association based in Brussels, is the representative organisation of the cement industry in Europe. The Association acts as spokesperson for the cement industry before the European Union institutions and other public authorities, and communicates the industry's views on all issues and policy developments with regard to technical, environmental, energy and promotional issues. Currently, the 27 Full Members of CEMBUREAU are the national cement industry associations and cement companies of the European Union (with the exception of Cyprus, Malta and Slovakia) plus Norway, Switzerland and Turkey. Croatia and Serbia are Associate Members of CEMBUREAU.



BIBM is the Federation of the European Precast Concrete industry (Bureau International du Béton Manufacturé). BIBM contributes to the development of the Precast Concrete Industry by acting at European and international levels. It provides the major platform of the sector in Europe, coordinating common development (technical and strategic) and promoting SME friendly legislation and stable standards. Furthermore, BIBM endorses the importance of sustainability and its three pillars and maintains a network of professionals, experts and industrialists to share their experience and information for the progress of the industry. Founded in 1954, it represents 15 national associations of precast concrete. The sector employs 165,000 people in 7,000 production plants across Europe (5,000 companies). Each plant employs on average 23 employees.



ERMCO, the European Ready Mixed Concrete Organization, is the federation of national associations for the ready-mixed concrete industry in Europe. ERMCO seeks to assist the development and adoption of concrete solutions based on the European Codes and Standards for the design and execution of concrete structures. ERMCO represents the ready-mixed concrete industry on CEN and other relevant European Committees, particularly in the fields of standardization, certification and the environment. ERMCO currently comprises 27 members of which 21 full members and 6 associate members from outside Europe. It is estimated that ERMCO full members have a turnover, including delivery, of € 14 billion and almost 8,000 plants spread all over Europe. Companies represented through ERMCO employ some 69,000 individuals.



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SOCIETY



“Fire safety is an important aspect of sustainable construction – we need to keep our citizens safe!”

MIKAEL SVANBERG,
European Fire Fighters Unions Alliance

CASE STUDY:

LINKING LYON CITY CENTRE TO THE SOUTH-WEST TRANSPORT HUB

Linking Lyon’s metro to the southwest of the city would bring a major transport hub within minutes of the city centre. However, this meant building a 1.8km long, 8.35m diameter tunnel under the Rhône. As the riverbed soil was unstable, this required the ingenious use of several types of concrete. An eco-friendly binder stabilised the soil before boring, followed by reinforced concrete for lining the walls and for structural elements such as pillars.

Towards smart cities

According to the European Commission, **75% of the EU population live in towns and cities**. Demographic trends suggest this proportion will continue to increase. Living space will be at a premium. This presents a range of challenges, including the need for housing, water and sanitation, energy supply and transport infrastructure.

Concrete is a highly **flexible, durable, affordable and energy-efficient** material that can effectively address a wide variety of needs. It can provide above-ground and underground infrastructure, ranging from energy-efficient buildings and housing, to water infrastructure, roads and innovative underground transport solutions. Concrete can also be cast into virtually any shape or form, which allows for design freedom and variety in applications. Concrete provides the very foundations of Europe’s “smart cities” of the future.

Affordable housing

The trend towards increasing urbanisation results in a growing need for affordable housing. The concrete sector can help tackle the shortage of housing and the need for rapid construction by providing **comfortable, affordable and energy-efficient housing**. Its flexibility means that concrete can also be found in interior settings such as kitchens and bathrooms.

Concrete’s ability to absorb temperature variations (called thermal mass) contributes to building comfort as well as lower costs. Its **durability** means **maintenance and renovation are also reduced**.

Safe, secure and resilient

Concrete is made to last. It can withstand major shocks, absorb sound, and regulate temperatures. Concrete buildings can have a minimum service life of 50 years, but may remain serviceable for hundreds of years, if properly maintained. The **durability and resilience** of concrete makes it ideal for constructing buildings that demand high safety levels. For example, nuclear power plants and hydroelectric dams are constructed almost entirely of concrete. It has properties that will be mandatory as national building codes are revised to address extreme weather linked to climate change, such as rising sea levels and storms.

Safety comes as standard with concrete. It does not require special coatings or sealers. Concrete has unsurpassed and **proven fire resistant properties**. It does not burn or melt and retains its structural stability at high temperatures. This, combined with its affordability, acoustic performance and healthier indoor air quality is why concrete is ideal for building hospitals, schools and other public buildings.



OUR COMMITMENT:

- Work with key stakeholders to accelerate the development, availability and use of affordable construction solutions across Europe and thereby contribute to filling the affordable housing gap in Europe.

POLICY REQUIREMENTS:

- EU and Member States to engage with the concrete sector as enablers and solution-providers to tackle Europe's infrastructure and affordable housing deficit.
- Involve the concrete sector in the ongoing reflection linked to sustainable development of cities (e.g. by including sustainable construction in the Smart Cities and Communities Initiative).
- Assess ways to develop a regulatory framework that incentivises and redirects sufficient financial flows to boost sustainable construction practices for transport and urban infrastructure.

Concretely responsible

The concrete industry is working hard to improve the responsible sourcing of materials throughout the supply chain. In the UK for example, by 2011 almost **96%** of **ready-mixed concrete** was certified as **responsibly sourced**. This certification covers organisational governance, supply chain management and environmental and social aspects.

Long-lasting, safe roads

Concrete's **durability, low maintenance** and **lower whole life costs and impacts** mean it is perfectly suited for road pavements. As well as offering a comfortable, safe and quiet ride, concrete roads also contribute to reducing CO₂ emissions of vehicles. On top of all this, concrete roads ensure increased fire safety in tunnels!



70% of the world's population live in **CONCRETE STRUCTURES**

THE CONCRETE
IN A STANDARD FAMILY HOUSE
COSTS LESS THAN
€7000

ECONOMY



“Financial institutions need to be convinced that sustainable construction offers better returns on investment”

PAVEL MISIGA,
European Commission, DG Environment

CASE STUDY:

THE VIDIN-CALAFAT BRIDGE

The Vidin-Calafat Bridge (also known as the Danube Bridge 2) links the cities of Calafat (Romania) and Vidin (Bulgaria). Its construction created 980 new jobs in the region, €60 million direct investment into the local economy, and dramatically improved passenger transport infrastructure. The type of concrete used was chosen for its low permeability, high density and strength.

Concrete and construction - an engine for growth

Construction drives economic growth, innovation and jobs. It is the largest single economic activity and the greatest industrial employer in Europe with some **20 million jobs**. The concrete industry as a whole employs some **550 000 people** in the EU and generates approximately **€65 000 added value** per employed capita per annum. A European Commission analysis has concluded that one job created in construction means two additional jobs are created elsewhere. Therefore the construction sector, including concrete, is fundamental to stimulating Europe's recovery. However, it needs the right economic incentives to encourage innovation, create local jobs and ensure the right skill levels in the next generation.

The sector plays a significant role in **promoting economic growth**, particularly through its links with other manufacturing sectors. For example, the transport industry relies on concrete for metro systems and railways. Concrete can help grow Europe's "Smart Cities" of the future by constructing and improving both buildings and infrastructure.

Positive economic aspects also lead to social and environmental benefits - demonstrating how the three pillars of sustainability are interlinked and interdependent.

Think local

Concrete is a **local business**, employing local people. Money and investment in construction are pumped back into the local economy.

The components that go into making concrete - aggregates, cement, and water - are also sourced locally. The production value also remains local. Most ready-mixed concrete is only transported around 20 to 30km from the production site. Some high-value manufactured concrete products are transported up to 200km. With this heavy local emphasis, the sector is vitally important to the strengthening of local economies and delivering a stable, continuous source of jobs and economic activity - **local European products for the local European market**.

Innovative

Concrete is a main enabler of modern construction. It has **limitless potential for innovation** and new ways to enhance the performance of the material, which provides ever greater returns on small investments, making a big difference to our everyday lives. Innovations include pervious concrete, which replicates the natural infiltration of water into soil thereby reducing flooding and the negative impacts of soil sealing. Meanwhile photocatalytic concretes can remove pollutants such



OUR COMMITMENT:

- Engage with education institutes to promote skills development
- Work with policy-makers and relevant stakeholders to foster advances in the knowledge and understanding relating to the economics of sustainable construction, to identify barriers and to explore new models.

POLICY REQUIREMENTS:

- Recognise the concrete industry as an essential sector in the European Commission's mid-term review of industrial policy, and ensure equal and long-term access to resources and energy to allow the European industry to compete globally.
- Recognise that EU industrial policies and standards must look at the performance of buildings or infrastructure projects, and not favour one material over another.
- Allow the full economic benefits of all materials to be gained by further developing the Green Public Procurement Guidelines and criteria that include whole-life performance and durability.

as carbon monoxide and nitrous oxide from the air - they are "smog-eating" and self-cleaning!

Best buy, beautiful and bountiful!

Concrete is **widely available** and **affordable** without compromising on **quality and strength**. It offers versatility and stunning aesthetic qualities. As concrete can be poured on-site to any required shape, it allows architects and engineers to express complex, dynamic and attractive forms. Innovation over the past 30 years in high-strength concrete gives designers even more flexibility than ever before. In addition, the strength, colour and finish can be specified.



EVERY **€1**
 SPENT ON CONSTRUCTION
 OUTPUT **GENERATES**
A TOTAL OF €3
 IN TOTAL ECONOMIC ACTIVITY
 (GDP INCREASE)

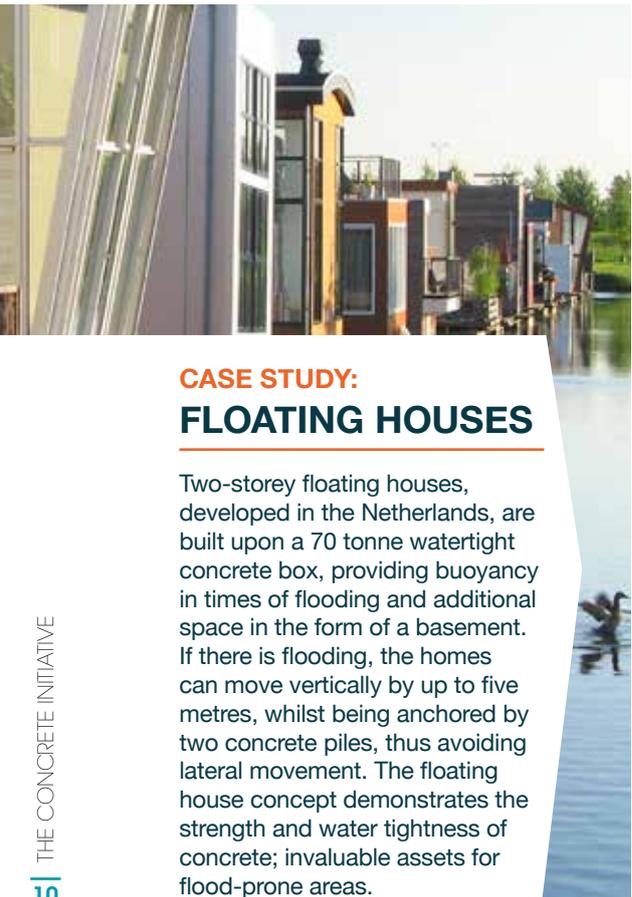
THE VALUE OF CONCRETE
 PRODUCTION IN EUROPE IS
€74 billion

ENVIRONMENT



“We should be focusing on both sustainable buildings AND neighbourhoods – an attractive place where people want to live!”

LIEVEN ROELANDT,
Matexi NV (building developer)



CASE STUDY: FLOATING HOUSES

Two-storey floating houses, developed in the Netherlands, are built upon a 70 tonne watertight concrete box, providing buoyancy in times of flooding and additional space in the form of a basement. If there is flooding, the homes can move vertically by up to five metres, whilst being anchored by two concrete piles, thus avoiding lateral movement. The floating house concept demonstrates the strength and water tightness of concrete; invaluable assets for flood-prone areas.

Working for a sustainable environment

Concrete offers the highest level of **“whole-life performance”** and the industry is continually striving to provide a net positive environmental impact throughout the lifetime of its products.

Concrete: whole-life performance

At the heart of The Concrete Initiative’s efforts is a “whole-life performance” approach. This is a concept whereby all impacts, including those from raw material extraction, manufacturing, construction, use of the building, to end-of-life disposal or reuse, are taken together when assessing the impacts of a given construction. Focusing on just part of the lifecycle would give a misleading idea of the overall impacts of buildings and infrastructure projects. When looked at from this whole-life perspective, the benefits of concrete become evident, thanks in particular to its **durability, thermal mass, and the availability and abundance of its raw materials** (including a large proportion of secondary materials).

Concrete: energy efficient buildings

Concrete buildings can provide substantial energy savings during their lifetime. The high level of thermal mass in concrete constructions means that **indoor temperatures remain stable** irrespective of

external fluctuations. This sharply reduces the need for extra heating or cooling (as well as providing greater comfort). As the energy use of buildings accounts for the largest part of their environmental impact, increased energy efficiency in buildings offsets the impact resulting from materials production.

Concrete: part of the circular economy

Cement uses alternative fuels and materials from wastes to reduce the reliance on fossil fuels and primary raw materials. The environmental impact is further reduced by using by-products from other industries, such as slag and fly ash. At the end of its life, **concrete can be fully recycled**, either into new concrete or in other applications such as road base. Therefore concrete is part of the “circular economy”.

Concrete: restoring the landscape and encouraging biodiversity

The industry recognises the impact of its resource extraction activities on the landscape. For example, the cement industry has developed a clear set of principles on quarry rehabilitation under the auspices of the World Business Council for Sustainable Development’s Cement Sustainability Initiative.



OUR COMMITMENT:

- Provide industry input to European standards to further the goals of a low-carbon Europe and maximise the use of recycled products.
- Promote life-cycle analysis of buildings in accordance with CEN standards by providing Environmental Product Declarations (EPDs).
- Provide guidance to specifiers, architects and builders on maximising the advantages of the thermal mass of concrete, contributing to greater energy efficiency.
- Further develop best practices for rehabilitating quarries as protected biodiversity hotspots.

POLICY REQUIREMENTS:

- Sustainability standards and regulations that look at the performance of the whole building rather than its individual components, are “material neutral”, and take a “whole-life” approach.
- Policy that recognises the industry’s unique contribution, by its reuse of wastes and by-products, to a resource-efficient and circular economy.
- Targets for recycling of construction and demolition waste to be differentiated by material type or by environmental impact, not simply by mass.

ative. It has also invested in quarry rehabilitation programmes. For example, the Landscape Rehabilitation Plan in the SECIL-Outão Plant (Portugal) integrated a marl and limestone quarry back into the natural landscape, and restored the native vegetation. The Concrete Initiative is committed to developing **best practices in protecting local biodiversity and ecosystems.**

MYTH

Concrete cannot be recycled

REALITY

Concrete is fully recyclable and is a growing alternative source of aggregates. Concrete also contributes to recycling of many other materials such as by-products of the steel industry or of the energy sector.

MYTH

Recycled concrete aggregate cannot be used for structural concrete

REALITY

It is generally accepted that about 20% (or more) of aggregate content can be replaced by recycled concrete for structural applications.

MYTH

Although some concrete can be recycled it is not possible to achieve high rates

REALITY

Countries such as the Netherlands and Norway achieve near complete recovery of concrete waste.

Source: Cement Sustainability Initiative

THE CONCRETE USED IN THE
CHANNEL TUNNEL
IS CONTRACTUALLY
GUARANTEED TO LAST FOR
120 YEARS

The concrete industry
transforms into a useful product
18 TIMES MORE
waste and by-products than it generates



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