



# Environmental and Circular Analysis of Spanish Ceramic Tiles

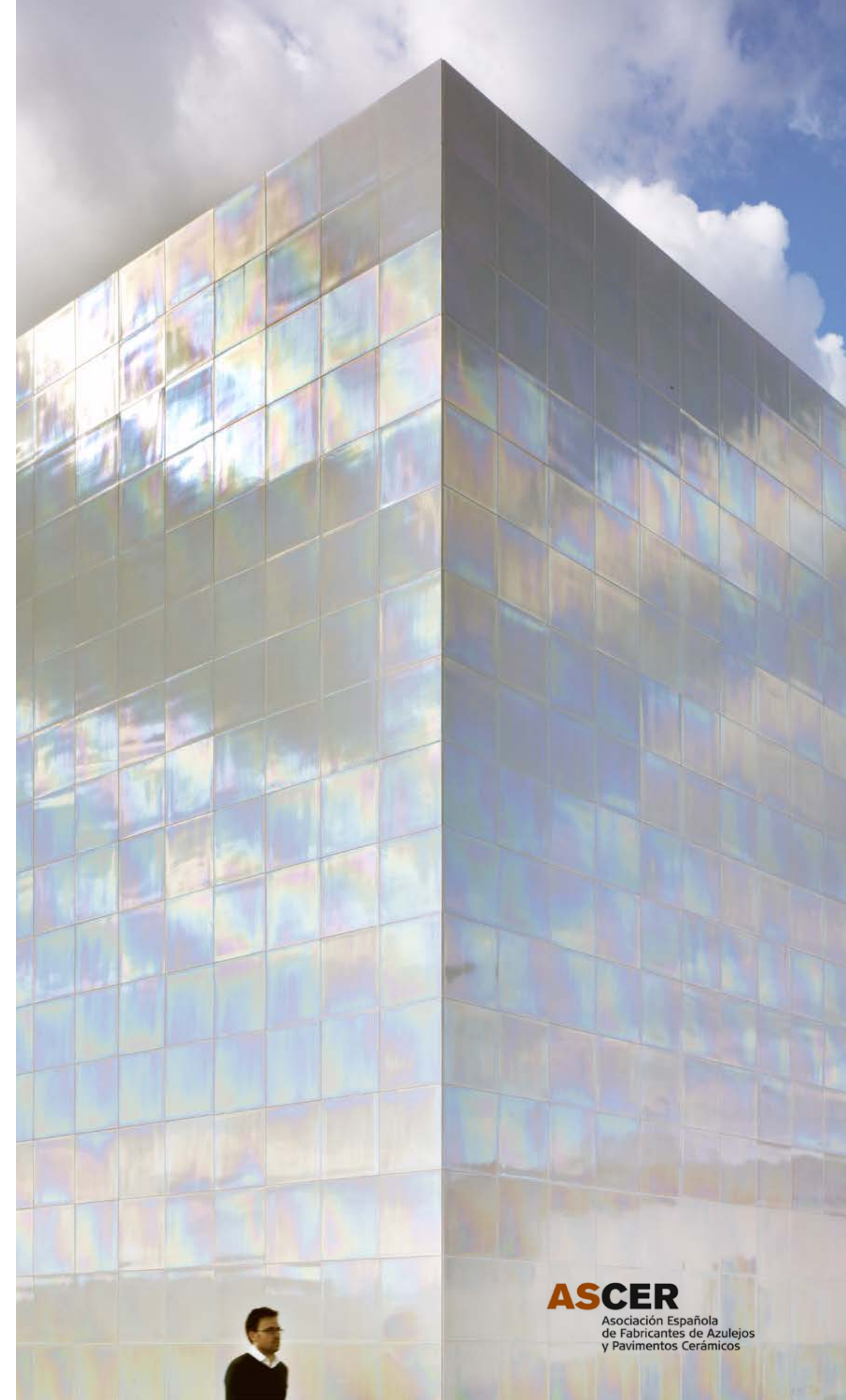
Relevant information for the Public Administration





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# 1. Introduction

This report has been developed with the aim of positioning the Spanish ceramic tile sector in the international market from the perspective of a circular economy, considering aspects of its impact on indoor air quality and its carbon cycle.





A literature review for the Spanish and international ceramic tile industry has been carried out, analysing different aspects of the ceramic tile:

- The material's intrinsic characteristics;
- The carbon cycle of the ceramic tile and an analysis of the life cycle of the material compared to other types of flooring;
- The contribution of ceramic tiles to sustainable building programmes;
- The positioning of ceramic tiles in product certification programmes;
- Alignment of the Spanish ceramic tile industry with the 2030 Agenda for Sustainable Development.

This analysis reflects the commitment of the Spanish ceramic tile sector industry's commitment to be aligned with the paradigm shift towards a circular economy with a positive social, economic, and environmental impact.



# The Spanish ceramic tile industry and its environmental performance



**137**  
companies



**16,100**  
occupied



**€3,842M**  
total sales



**€2,941M**  
(76%) exports



**187**  
countries

2020 Data

Determined to adapt its production processes to achieve net zero greenhouse gas emissions by 2050, the ceramic tile sector has been making technological and innovative improvements to its production processes to achieve results that go beyond reducing its carbon footprint. Its goal is also to optimise processes in other areas, such as raw materials and water management.

# Carbon footprint reduction

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For decades, the Spanish ceramic tile industry has been adopting energy efficiency measures and the best available technologies to reduce the sector's carbon footprint and decrease CO2 emissions. The most representative measures adopted include:

- **Waste heat recovery,**
- **Replacement with more efficient burners in furnaces and the consequent reduction of gas consumption,**
- **High efficiency furnaces,**
- **High efficiency cogeneration systems,**
- **Use of natural gas (cleanest fuel currently available).**

Due to constant application of innovative technological improvements in energy efficiency, the total CO2 emissions of the ceramic tile industry per tonne of fired product have been cut by 60% since 1980.

# Reuse of production process waste

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In the product process, the use of recycled material is encouraged, turning remnants into raw material for new products to cut down on waste. The sector manages to reuse an estimated 100% of the clay waste before it is fired and an effort is made to recover as much of the fired pottery as possible to lower the environmental impact of using virgin raw materials.



# Water consumption and management

The sector makes efficient use of water resources to minimise water consumption per square metre of product manufactured. A total 80% of raw water consumption is for atomisers, where it is almost completely evaporated in the process. The remaining 20% of water consumption is part of a closed cycle in the production process, in which all wastewater is recycled and reused. This means that the wastewater discharge in the ceramic tile production process is equal to zero.

## Environmental Product Declaration (EPD)

The Spanish ceramic tile industry has pioneered the development of a sectoral EPD for ceramic tiles at the European level, on the basis of a representative sample of Spanish tile production. The Spanish Association of Ceramic Tile Manufacturers (ASCER, as per the Spanish acronym) spearheaded this sectoral eco-label, which was developed in 2019. A significant number of ceramic tile manufacturers have also developed EPD's for their products.



High efficiency furnaces



100% (approx.) of raw materials are prepared with heat from cogeneration



100% of waste from the production process is recycled



Reduction of raw material use



100% recycling and recovery of wastewater

# Characteristics of ceramic tiles



## Natural, plastic-free and free of toxic substances

Mostly composed of inorganic minerals, water and fire, and free from VOCs.



## Local

The raw material (clay) is abundantly found in nature, often locally.



## Hygienic, anti-allergic and aseptic

Waterproof, harmless, odourless and allergen-free material.



## Easy maintenance

Easy to clean, without the use of harsh chemicals, enhancing indoor air quality.





### Flame retardant

Material naturally flame retardant and free of toxic fume emissions when exposed to fire.



### Resistant and durable

Resistant to high and low temperatures, to water and humidity and to contact with aggressive chemicals. It is long-lasting.



### Energy efficient

It provides with an insulation layer protection and ventilation of the building envelope provides acoustic insulation and thermal conductivity and inertia.



## 2. The future of ceramic tiles

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The European Union wants to be climate neutral by 2050 and one of its first goals to do so is to reduce greenhouse gas emissions by 55% by 2030.






In 2020 the European Commission defined an action plan for the circular economy to promote circular products and processes and to identify strategic sectors for their implementation. One of the sectors identified was the building and construction sector, as it is responsible for more than 35% of carbon dioxide (CO2) emissions in Europe. Consequently, new construction and renovation projects will have to prioritise environmental criteria to meet the targets set by the European Union.

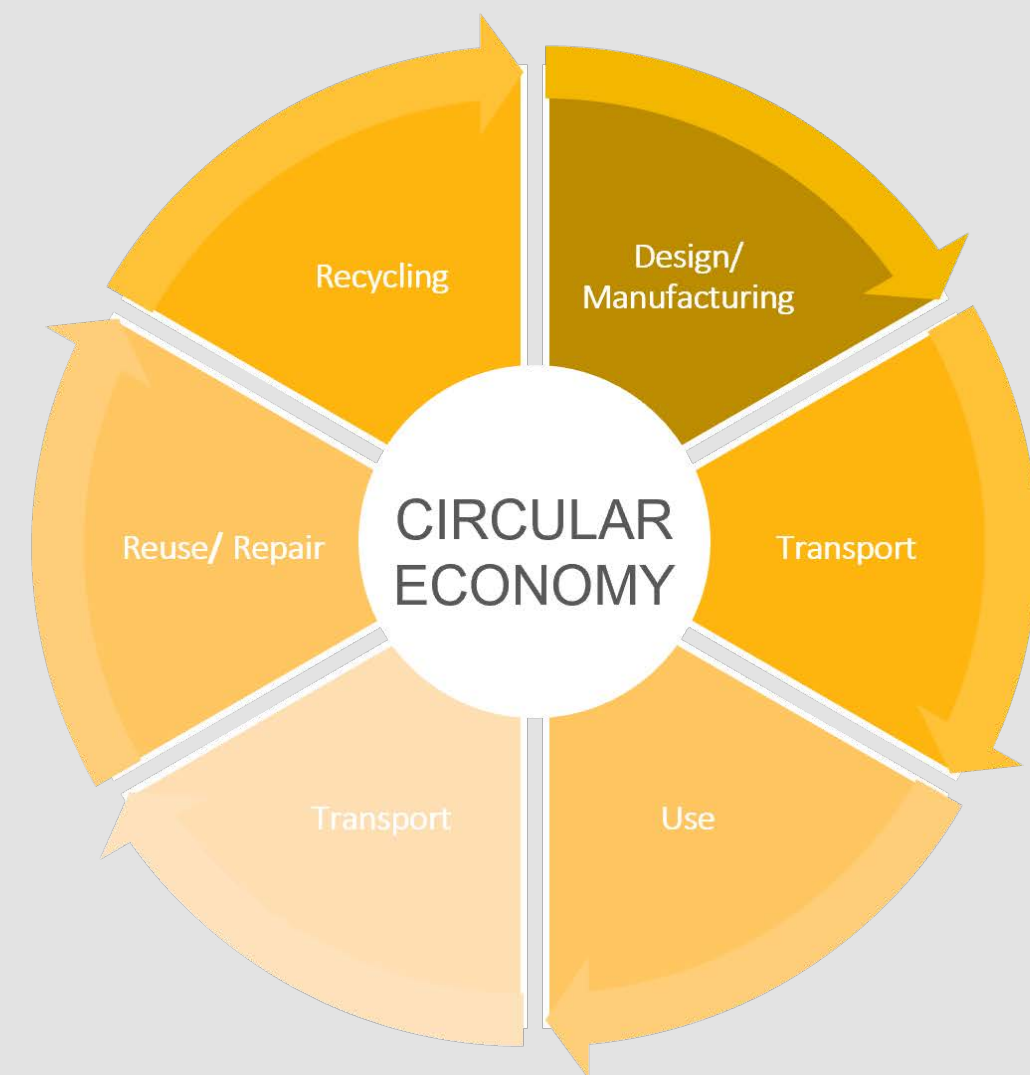
As for Spain, it has also established its own Circular Economy strategy under the European precepts: "Spain Circular 2030" (EEEC in its Spanish acronym), which establishes the necessary actions to implement circularity and lays the foundations to promote a new production and consumption model at a national level.

In general terms, the circular economy establishes a more sustainable model of production and consumption, based on the following principles:

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1. **Eliminate waste and contamination from the design phase**
  2. **Maintain products and materials in use**
  3. **Regenerate natural systems**

In other words, the circular model seeks to design durable products, where materials and resources remain in use for as long as possible. In addition, it aims to minimise waste generated and increase materials reuse, recovery and recycling strategies. Therefore, when a product ends its life cycle, it can be used as a nutrient or raw material in the life cycle of another product.

# The potential of ceramic tiles in a circular economy



In this context, ceramic tile is a product aligned with European and national objectives, thanks to its circularity potential and its ability to reduce negative environmental impacts. Made from 100% natural raw materials and found in abundance in nature, this material has a percentage of recycled raw materials in new products, it is designed to be durable and can be recovered at the end of its useful life, making it a raw material for other products, as long as the necessary conditions are provided to do so. It is also fire retardant and resistant to chemical abrasion, and therefore has the potential to accompany buildings throughout their life cycle.

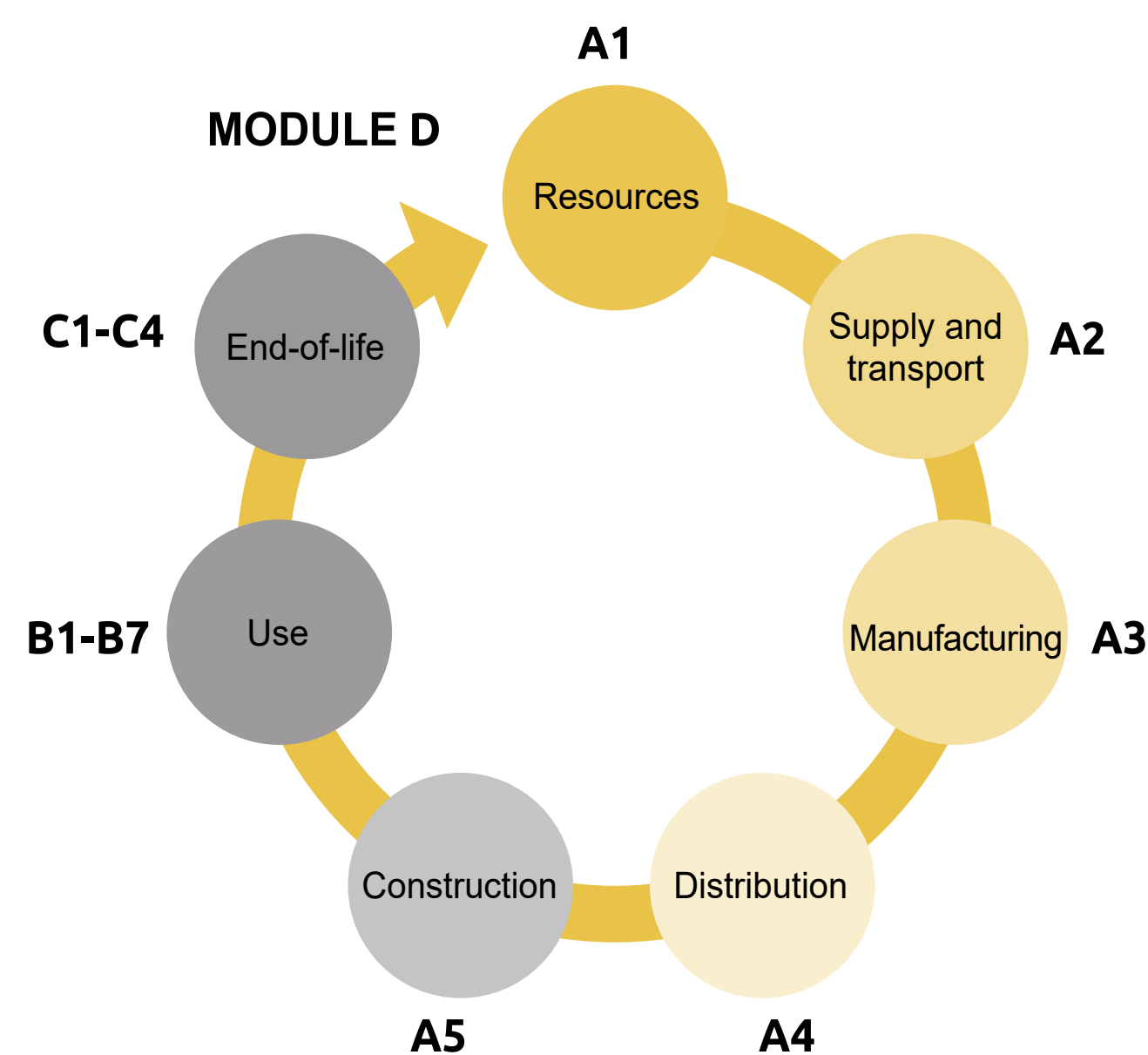
The fact that it is a durable material and has a long-life span, estimated at 50 years, means that ceramic tiles are replaced less often. This characteristic contributes to reducing the use of virgin raw materials and the greenhouse gas emissions associated with their manufacture.

It should be noted that the quality and quantity of ceramic material that can be recovered will depend on how efficiently it is collected, sorted and separated from other construction waste, dust and residues. High sulphate or lime contents from other building materials may impede their possible reuse. Therefore, implementing measures to improve the separation when a building is demolished and consolidating a by-product market are key to exploiting the circularity potential of ceramic tiles, as well as to increasing the circularity potential of the whole construction sector.



# The environmental impact of ceramic tiles during their life cycle

Stages of a product life cycle



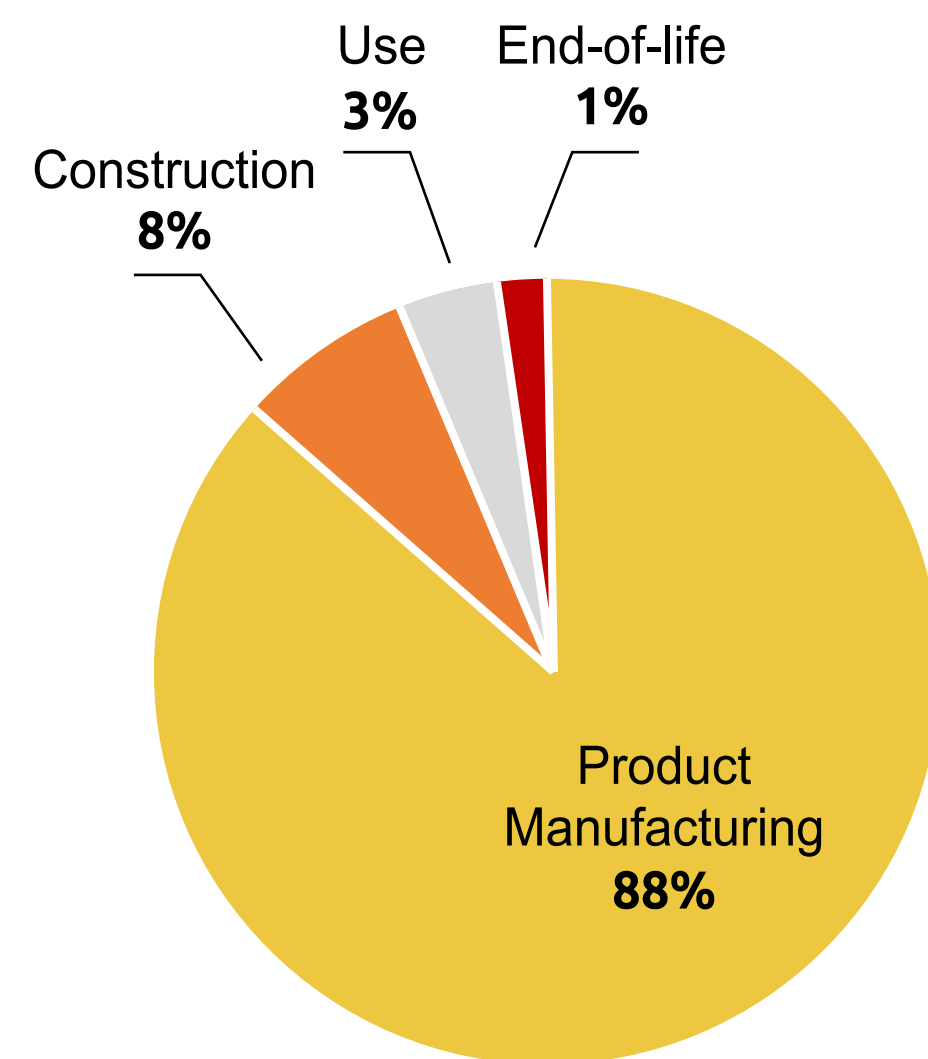
The main impact of the ceramic tile life cycle is in the extraction of raw materials and in the product manufacturing stage.

## Resources, Supply and Transport, Manufacturing

These stages account for 88% of the emissions generated throughout the entire ceramic tile life cycle. Of this value, 17% corresponds to the extraction of raw materials (Resources), 68% to the Manufacturing stage and the remaining 3% corresponds to emissions related to Transport.

The environmental impact of the Manufacturing stage, the largest in the entire ceramic tile life cycle, comes mainly from the combustion of natural gas and the energy consumption of the equipment used for firing the pieces (furnaces) and the drying of raw materials and shaped pieces.

Global Warming Potential of Ceramic Tile during its life cycle



### **Distribution and Construction**

The environmental impact is due, on the one hand, to the fact that 65% of ceramic tile production is exported. On the other hand, the impact is associated with the use of mortars or glues for laying the product, which also makes it difficult to recover the tile at the end of its life cycle.

### **Use**

The environmental impact generated depends exclusively on the pattern of use and frequency of cleaning.

### **End of the Life Cycle**

The environmental impact of the ceramic tile is directly related to the type of waste management it receives. In Spain, its most frequent destination is the landfill, together with other construction waste, which makes its recovery within a circular economy model difficult.



# Actions that contribute reducing the environmental impact

## Ceramics sector

The ceramics industry has been working for decades to reduce the environmental impact of its products. During this time, it has managed to reduce CO2 emissions per square metre produced by 60% compared to those emitted by the sector in the 1980s, and total CO2 emissions by 24% compared to the 1990s. All this progress has been possible thanks to the energy efficiency measures rolled out by the industry.

To meet the European Union's targets, the future production must be aligned with the use of 100% renewable fuels. Under this premise, some of the alternatives proposed for the ceramic tile sector are:

- Replacing natural gas used in the cooking and drying process with low-carbon fuels, such as green hydrogen or biofuels.
- Increasing the deployment of on-site renewables for self-generation of energy to cover the whole process' electricity requirements, such as purchasing electricity from 100% certified renewable sources.

# Public Administration

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The Public Administration can carry out actions to contribute to not generating more greenhouse gas emissions linked to ceramic tiles, as well as to encourage responsible actions by citizens:



## Consumption

It is possible to push for all energy and circular developments to take place before consumption. This is achieved by **increasing the demand for products with transparent information, sustainable and produced with clean energy. By doing so, investment in these parameters is boosted and thus the massification of these trends.**



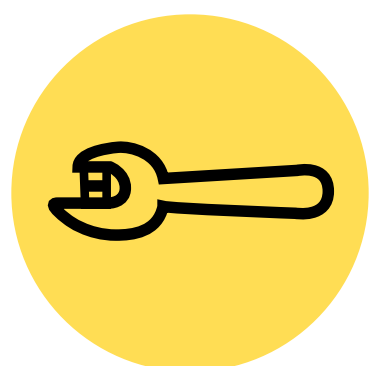
## Transport

The vast majority of ceramic tiles produced in Spain are exported to Europe or the rest of the world. Only a third portion is consumed in Spain. In this sense, **the environmental impact of exports could be reduced if there were greater support and incentives from the Public Administration for national products such as ceramic tiles.**



### **Mortars or glues**

During the application of this product, if certain mortars or glues are used, the environmental impact of the ceramic tile is increased and its recovery at the end of its life cycle is made more difficult. **Dry tile installation, or the search for cement glue alternatives that prove to be more environmentally friendly, are the most responsible options.**



### **Maintenance**

Ceramic tiles require virtually no maintenance throughout their life cycle. Therefore, CO2 emissions generated at this stage depend exclusively on the use and frequency of cleaning. **Choosing ecological and sustainable cleaning products may contribute to the reduction of GHG emissions in this stage and also improves the health of the people living indoor, as they do not breathe or come into contact with toxic substances.**



### **End-of-life**

The most common destination is the landfill, along with the rest of the construction waste. If this is the case, **it is crucial orienting and encouraging companies to correctly dismantle and separate the product and its fractions so as at the end of its useful life the material re-enters another cycle as a raw material, as it is composed of materials of natural origin and is completely inert.**



# 3. Ranking of floorings in the construction sector

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The impact of materials used in the construction sector varies greatly depending on the type of product.

People spend on average 90% of their time indoors, so the use of healthy materials is essential to safeguarding their health. In addition, many studies directly relate the health of spaces to workers' productivity.





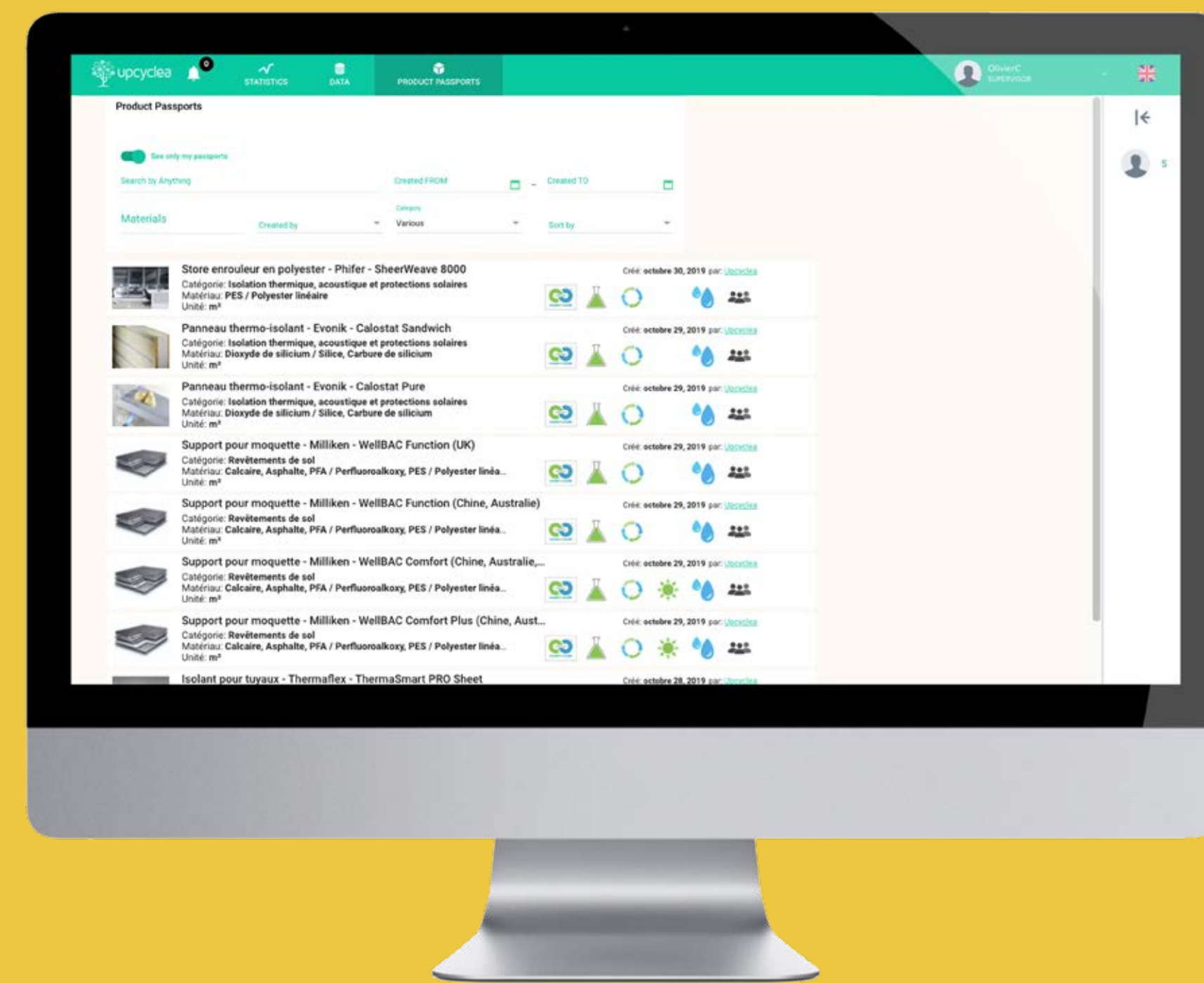
It is clear that the technical characteristics of products and their price are of the utmost importance when choosing them, but it is also of utmost importance to assess the carbon footprint of their life cycle, their circularity potential and their toxicity.

To gain this global vision of products, the use of tools such as the Materials Passport is essential, since it can compare all these impacts between materials and products and can facilitate informed decision making.

## Material Passport

The Material Passport is the product's ID or, in other words, a digital duplicate of the product used in a building. Its function is to provide the description of products used in a building and to ensure they can be traced.

It provides all the information on the composition, the proportion of recycled and new materials, their possible future uses, and their environmental and social impacts.





# Comparison of floorings

The results obtained from the Material Passports from Upcyclea platform have been used to compare floorings, as well as other indicators that provide a broader overview of the advantages and disadvantages of each product. The floorings taken into consideration were the following:

Ceramic tile



Wall-to-wall carpet



Wooden floor (parquet)



Luxury Vinyl Tile (LVT)



The parameters of comparison have been:



### **Durability**

Potential product lifetime, directly linked to its environmental impact and its circularity. The longer a material lasts, the lower its environmental impact.



### **Environmental Impact**

Carbon footprint calculated for each material over its entire life cycle.



### **Cyclability Potential**

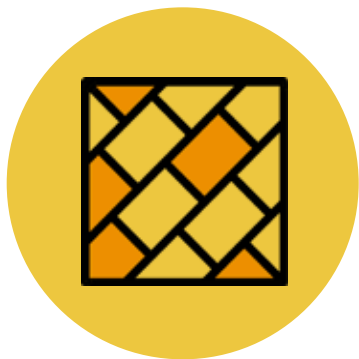
Analysis of the potential of each material to be cyclable, in accordance with the principles of Circular Economy.





### **Toxicity**

Material free of substances toxic to human and environmental health, a key parameter for a material to be circular.



### **Use Phase**

Advantages and disadvantages that the product presents during its use and installation phase. (Aesthetic characteristics of each flooring not taken into account).



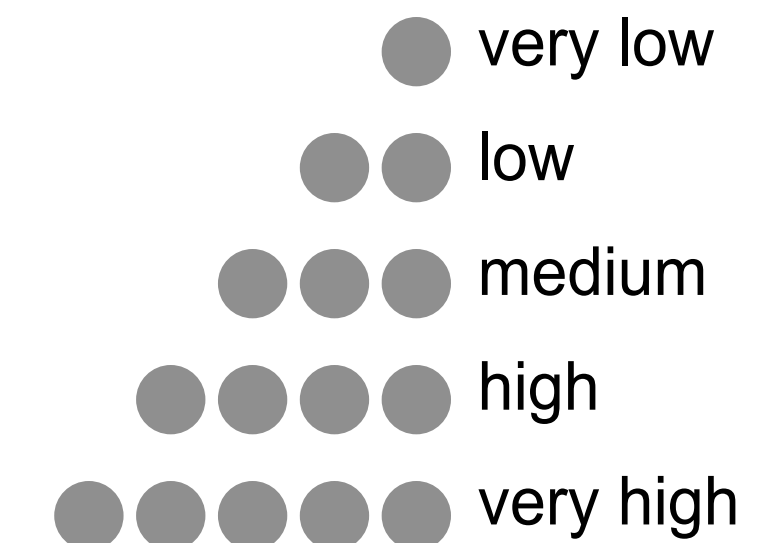
### **Cost**

Decisive factor in the choice of a construction material. The combination of this parameter with environmental criteria can be useful when choosing healthier alternatives within a given budget.

# Flooring comparison results

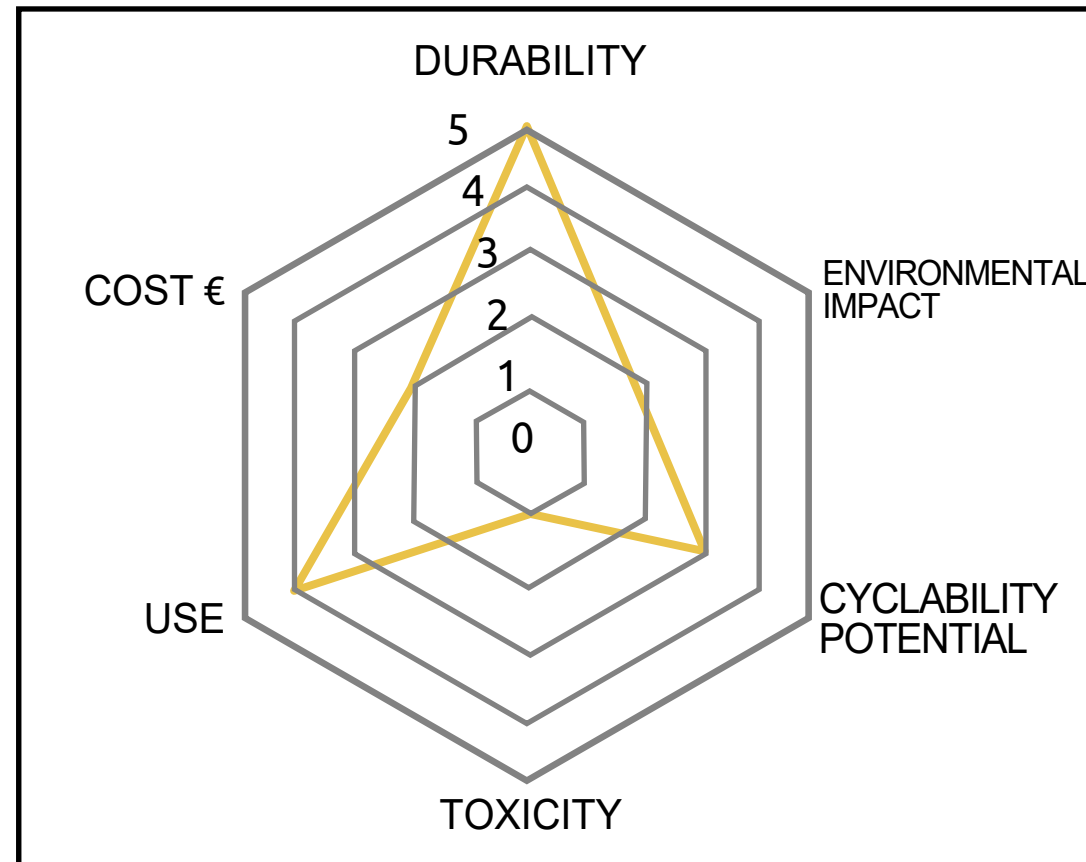
For each criterion, scores are awarded from 1 to 5, depending on whether the materials meet the criteria to a greater or lesser extent. The criteria used to award scores for each indicator to each of the materials analysed are detailed in the methodological notes section of the annexes.

Criteria	Ceramic tile	Vinyl tile	Wooden floors	Wall-to-wall carpet
Durability	●●●●●	●	●●	●
Environmental impact	●●	●●●●●	●	●●●
Circularity	●●●	●●●	●●●●	●●●●●
Toxicity	●	●●●●	●	●●
Use	●●●●	●●●●	●●●	●●●
Cost (€)	●●	●●	●●●●●	●●●●





## Ceramic tile



### ADVANTAGES

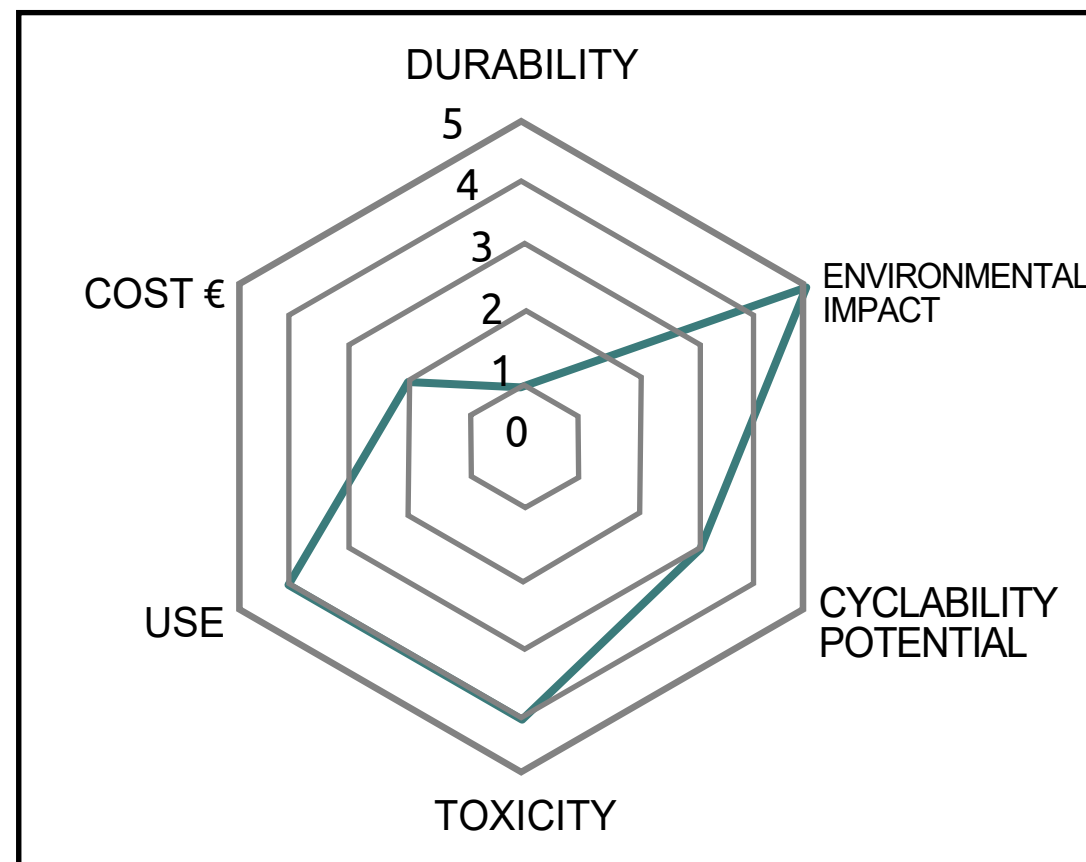
- Customisation options.
- Free of toxic emissions.
- Strong and durable material.
- Easy to clean and low maintenance.
- Provides thermal inertia.
- Suitable for reuse and recycling.



### DISADVANTAGES

- Material perceived as cold.
- Application with mortars and glues.

## Vinyl tile (LVT)



### ADVANTAGES

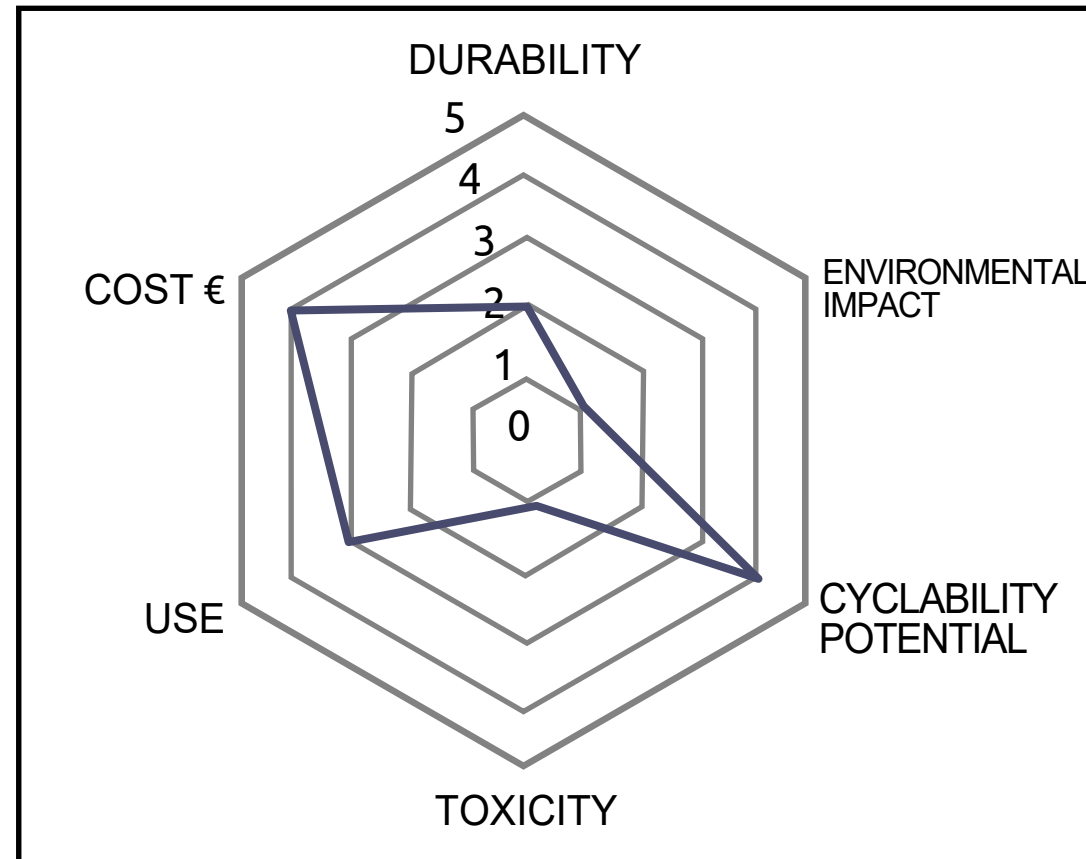
- Customisation options.
- Material easy to clean and maintain.
- Easy to install.
- Economical material.



### DISADVANTAGES

- Potentially toxic to humans and the environment.
- Not resistant to more aggressive detergents.
- Impossible to recycle due to its chemical composition.

## Wooden floors (parquet)



### ADVANTAGES

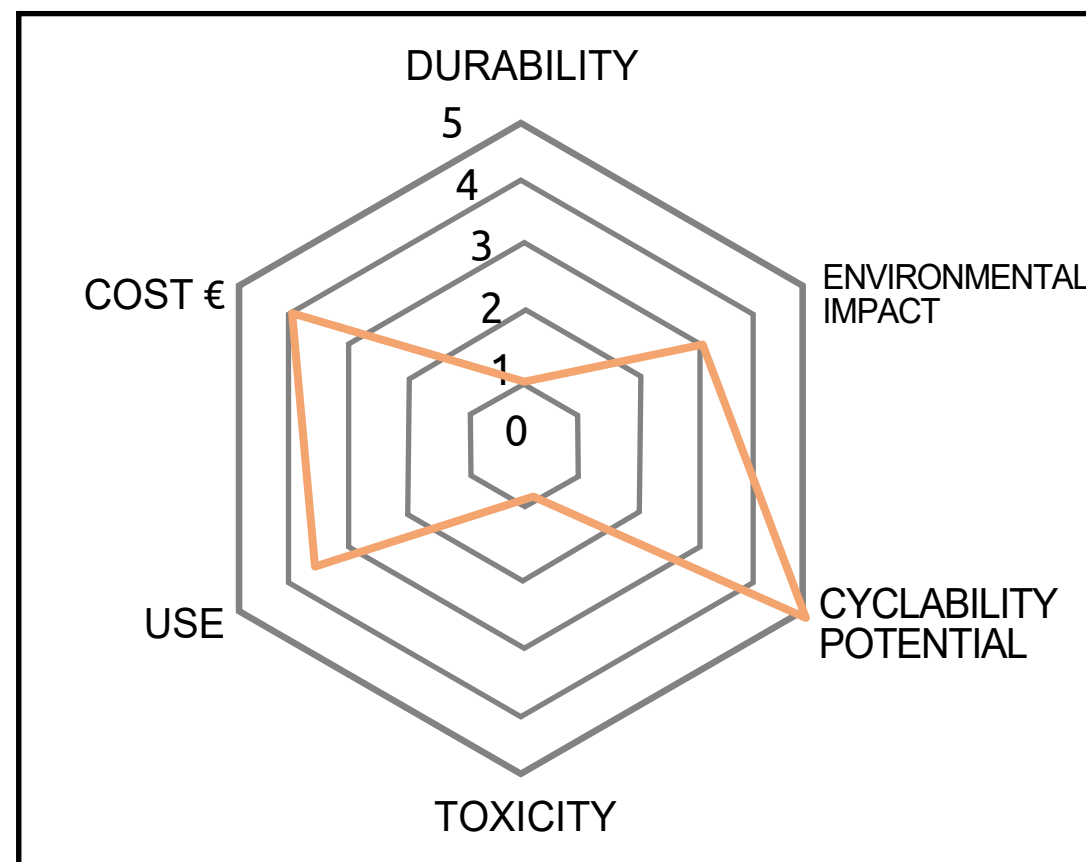
- Natural material with low toxicity, depending on the type of treatment received.
- Provides comfort and hygiene.
- Natural heat and cold insulator.
- Suitable for reuse and recycling.
- CO2 sink.



### DISADVANTAGES

- Low possibility of customisation.
- Delicate material and difficult to maintain.
- Vulnerable to chemicals, humidity, sun exposure, knocks and scratches.
- High price.

## Wall-to-wall carpet



### ADVANTAGES

- Customisation options.
- Provides a feeling of warmth and comfort.
- Easy to install.
- Insulating, anti-slip and shock-absorbing properties.

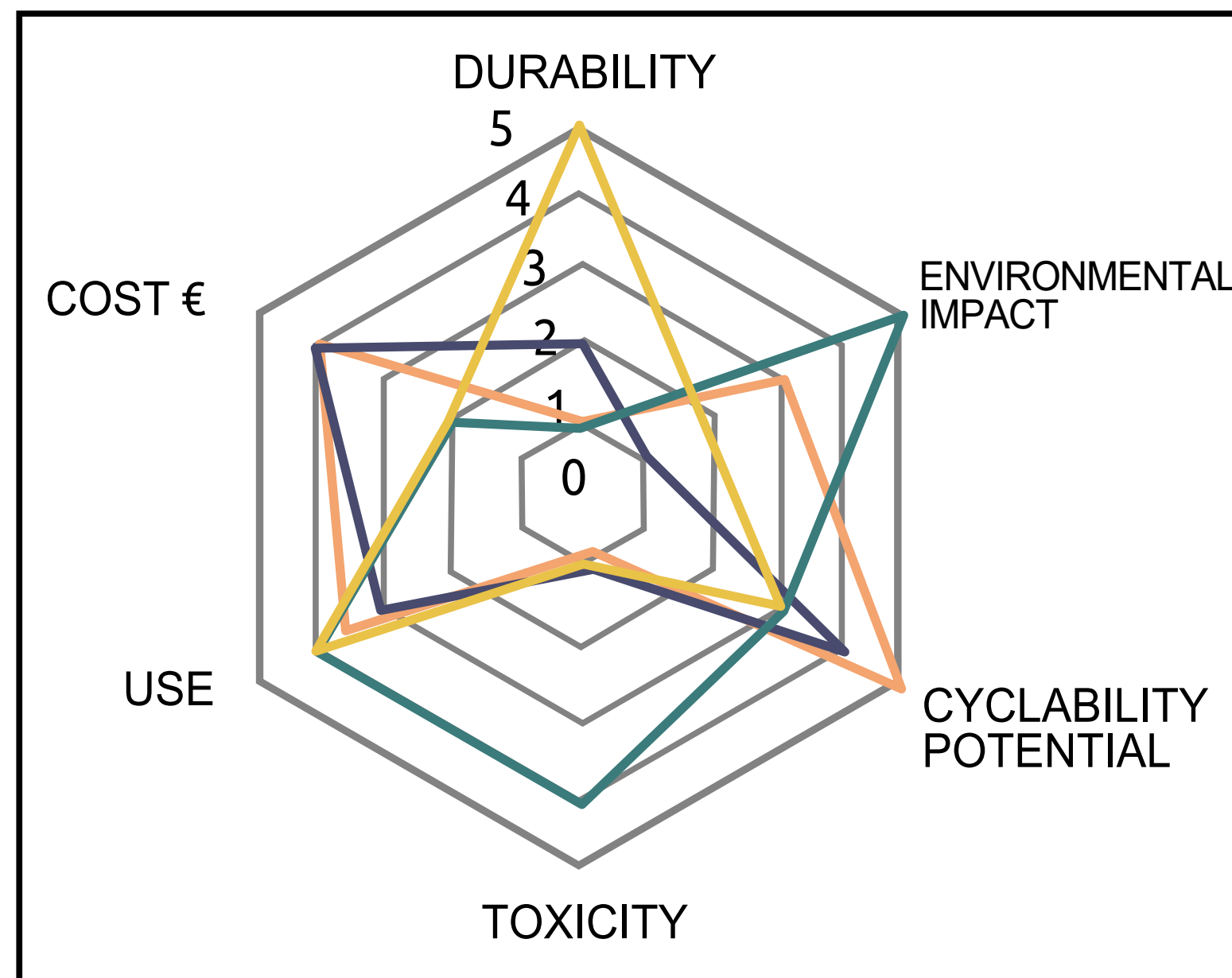


### DISADVANTAGES

- Accumulates dust mites and allergens in the use phase.
- Can cause mould growth.
- Requires a lot of maintenance and cleaning.
- Vulnerability to chemicals, stains, moisture and fire.
- May be composed of materials with a negative impact on human health and the environment, such as polyester.



# Ranking Conclusions



CERAMIC TILE  
LVT

WOOD  
CARPET

Each of the flooring analysed has advantages and disadvantages in the different criteria considered, but the prioritisation of one criterion or another will depend on the level of transparent information available and the conditions of each project.

The more the adoption of healthier and more circular products is promoted, the more this trend will be reflected in market offers. On the other hand, European regulations regarding Circular Economy and the decarbonisation of the construction sector, allied to the conditions set out by local administrations, also have the power to further enhance this paradigm shift.

Encouraging the use of durable, non-toxic materials with a low environmental impact during their life cycle is a timeless action.

## 4. Ceramic tiles in green building certifications

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Over the last decade, society has become increasingly aware of the importance of living and working in healthier and more sustainable spaces. This has been reflected in an increase in the demand for and supply of spaces with green building certifications.



There is currently a wide variety of sustainable building certifications for different building typologies (residential, offices, retail, integral refurbishment, new construction, etc.) and with different scopes. Most certifications analyse multiple aspects of sustainability and include requirements in terms of energy efficiency, use of green materials, water efficiency, indoor air quality, location, etc., such as LEED, BREEAM®, DGNB®, or VERDE. Others are more focused on specific environmental aspects, such as Passivhaus standard, which seeks to maximise energy efficiency; or WELL™ focused on improving the health and well-being of building occupants.

Most of these standards are promoted by institutes and private non-profit organisations. But it is also worth mentioning initiatives at European level such as Level(s), promoted by the European Commission, to create a common framework for sustainable building design.

Some standards are specific to the national territory, such as VERDE or BREEAM®-ES, although most of them are of global application, with certified buildings in the five continents.

Ceramic tiles can contribute to meeting the requirements defined in the different certification programmes.



# Sustainable Construction Programmes

Highlighted below are some of the sustainable building programmes that are most widely implemented internationally today:



## LEED

*Leadership in Energy and Environmental Design*, of North American origin (USGBC), is one of the most widely used and most widely recognised programmes worldwide. It covers different types of spaces and reviews multiple areas of sustainability (energy efficiency, sustainable use of water and materials, comfort, indoor air quality, etc.).



## BREEAM®

It is a certification of British origin (BRE). It is currently present in more than 90 countries with more than 500,000 certified buildings. There are different versions of the standard adapted to the reality of different countries. BREEAM®-ES certification, like LEED, covers different types of buildings and analyses multiple areas of sustainability.



### **WELL BUILDING STANDARD™**

Originally from North America (IWBI), but with an international scope, it is newer and complementary to the previous ones. It focuses on the health and well-being of occupants in buildings.



### **DGNB®**

This is a German standard (DGNB e.V.) for the development of buildings, interior spaces and urban districts. It provides a system for the application, measurement and comparison of sustainability applied to built spaces, whether new or existing, and can be applied from the initial design phases to the construction and use phase of the space.



### **VERDE**

This is a sustainability assessment tool for new residential and corporate buildings mainly, and has been developed by Green Building Council Spain (GBCe). Its application is focused on the Spanish building sector, but it also makes use of the DGNB® assessment system.



### **Passivhaus**

A central European standard (Passiv Haus Institute), focused on reducing the energy consumption of buildings to a minimum while maintaining high levels of comfort inside. Currently, there are Passivhaus buildings on all five continents, but the areas of greatest implementation are Europe and North America.





## Level(s)

A programme developed by the European Commission to create a common framework for measuring sustainability in residential and office buildings. It is based on the implementation of circular economy principles within the Construction sector.

Certification Programme	Organisation	Geographical scope	Typologies of buildings in which it is applied	Certification Levels	Areas of analysis to which ceramic tiles contribute
LEED, Leadership in Energy and Environmental Design	US Green Building Council	International	<ul style="list-style-type: none"> <li>• New Construction</li> <li>• Integral reforms</li> <li>• Interior refurbishment</li> <li>• In use</li> <li>• Housing</li> <li>• Neighbourhoods</li> </ul>	<b>4 levels:</b> <ul style="list-style-type: none"> <li>• Certificate</li> <li>• Silver</li> <li>• Gold</li> <li>• Platinum</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable plots</li> <li>• Energy and atmosphere</li> <li>• Materials and resources</li> <li>• Indoor Environmental Quality</li> <li>• Innovation</li> </ul>
BREEAM®	Building Research Establishment (BRE)	International There is a specific guide for Spain: BREEAM®ES	<ul style="list-style-type: none"> <li>• Housing</li> <li>• New Construction</li> <li>• Custom-built</li> <li>• In use</li> <li>• Town planning</li> </ul>	<b>5 levels:</b> <ul style="list-style-type: none"> <li>• Correct</li> <li>• Good</li> <li>• Very good</li> <li>• Excellent</li> <li>• Outstanding</li> </ul>	<ul style="list-style-type: none"> <li>• Management</li> <li>• Health and well-being</li> <li>• Energy</li> <li>• Materials</li> <li>• Waste</li> <li>• Pollution</li> </ul>
WELL Building Standard™	International Well Building Institute (IWBI)	International	<ul style="list-style-type: none"> <li>• Complete building</li> <li>• Constructed spaces</li> </ul>	<b>4 levels:</b> <ul style="list-style-type: none"> <li>• Bronze</li> <li>• Silver</li> <li>• Gold</li> <li>• Platinum</li> </ul>	<ul style="list-style-type: none"> <li>• Air</li> <li>• Water</li> <li>• Thermal comfort</li> <li>• Acoustic comfort</li> <li>• Materials</li> <li>• Mind</li> </ul>

Certification Programme	Organisation	Geographical scope	Typologies of buildings in which it is applied	Certification Levels	Areas of analysis to which ceramic tiles contribute
Passivhaus	Passiv Haus Institute	International	<ul style="list-style-type: none"> <li>Existing buildings</li> <li>New construction</li> </ul>	3 levels	Energy Efficiency
VERDE	Green Building Council España (GBCe)	Spain	<ul style="list-style-type: none"> <li>New construction, adaptable to refurbishment and existing buildings</li> <li>Residential</li> <li>Office buildings</li> <li>Industrial buildings</li> <li>Equipment</li> </ul>	5 levels of “VERDE leaves”: <ul style="list-style-type: none"> <li>0 to 0.5 - zero leaves</li> <li>0.5 to 1.5 - one leave</li> <li>1.5 to 2.5 - two leaves</li> <li>2.5 to 3.5 - three leaves</li> <li>3.5 to 4.5 - four leaves</li> <li>4.5 to 5 - five leaves</li> </ul>	<ul style="list-style-type: none"> <li>Energy and atmosphere</li> <li>Natural resources</li> <li>Indoor environment quality</li> <li>Quality of service</li> <li>Social and economic aspects</li> <li>Innovation</li> </ul>
DGNB®	German Sustainable Building Council (DGNB e.V.)	International	<ul style="list-style-type: none"> <li>New construction</li> <li>Renovation and existing buildings</li> <li>Buildings in use</li> </ul>	6 levels of certification: <ul style="list-style-type: none"> <li>Bronze</li> <li>Silver</li> <li>Gold</li> <li>Platinum</li> <li>Diamond</li> <li>Climate Positive</li> </ul>	<ul style="list-style-type: none"> <li>Environmental quality</li> <li>Economic quality</li> <li>Socio-cultural and functional quality</li> <li>Technical quality</li> <li>Process quality</li> </ul>



Certification Programme	Organisation	Geographical scope	Typologies of buildings in which it is applied	Certification Levels	Areas of analysis to which ceramic tiles contribute
Level(s)	European Commission	Europe	<ul style="list-style-type: none"> <li>• Office space</li> <li>• Residential</li> <li>• New construction</li> <li>• Integral reforms</li> </ul>	<p>3 implementation levels</p> <ul style="list-style-type: none"> <li>• Level 1 – Conceptual Design</li> <li>• Level 2 - Detailed Design and Construction</li> <li>• Level 3 - As built and in use phase</li> </ul>	<ul style="list-style-type: none"> <li>• Greenhouse gas emissions over a building's life cycle</li> <li>• Resource-efficient and circular material life cycles.</li> <li>• Healthy and comfortable spaces.</li> <li>• Adaptation and resilience to climate change</li> <li>• Optimised life cycle cost and value.</li> </ul>

# Performance of ceramic tiles in green building programmes

Ceramic tiles, thanks to their intrinsic properties, can contribute to compliance with the requirements of the different certification programmes mentioned. In general terms, this contribution is due to:



## **Free of toxic emissions into the air**

The use of ceramic tiles makes it possible to reduce the concentration of chemical pollutants that can affect the indoor air quality of spaces, as they are non-emissive materials and free of Volatile Organic Compounds (VOCs). Furthermore, the ceramics sector has complete solutions available, with mortars, bonding and joint pastes, and other materials used in the installation of ceramic tiles that comply with the limits defined in the different certifications.



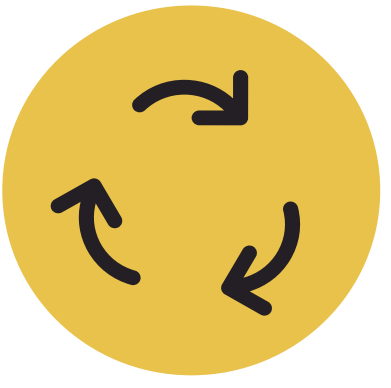
## **Easy cleaning and high solar reflective colours**

The use of ceramic tiles for roofs and light-coloured flooring contributes to mitigating the Heat Island Effect. Their easy cleaning and durability guarantee this long-term performance.



### **Recyclable and with recycled material**

Ceramic tiles are fireproof materials, and at the end of their use they are easily recyclable to obtain new aggregates that will be raw material for other types of materials such as road agglomerates, among others. In addition, many ceramic products, currently incorporate material of recycled origin.



### **Circularity**

The ceramics sector is implementing strategies to improve the circularity of its products. It is worth noting that, in the ceramic tile manufacturing process, almost 100% of the waste generated in the production process and 100% of the process water are reused, thus achieving "zero waste".



### **High durability**

Ceramic tiles, due to their high durability and low wear and tear, are materials that can be reused. Moreover, because they are so durable, the environmental impact over their entire life cycle, which can be more than 50 years, significantly reduces the environmental impacts associated with the product.





### **Impact on energy efficiency**

Ceramic tile is a material with high thermal inertia, which contributes to delaying energy losses and regulating the interior temperature, being advantageous in climates with large temperature variations. It can be used in ventilated façades, in systems with radiant ceramic tiles, raised ceramic floors, flat roofs or solar protection with ceramic lattices, contributing to the energy improvement of spaces.



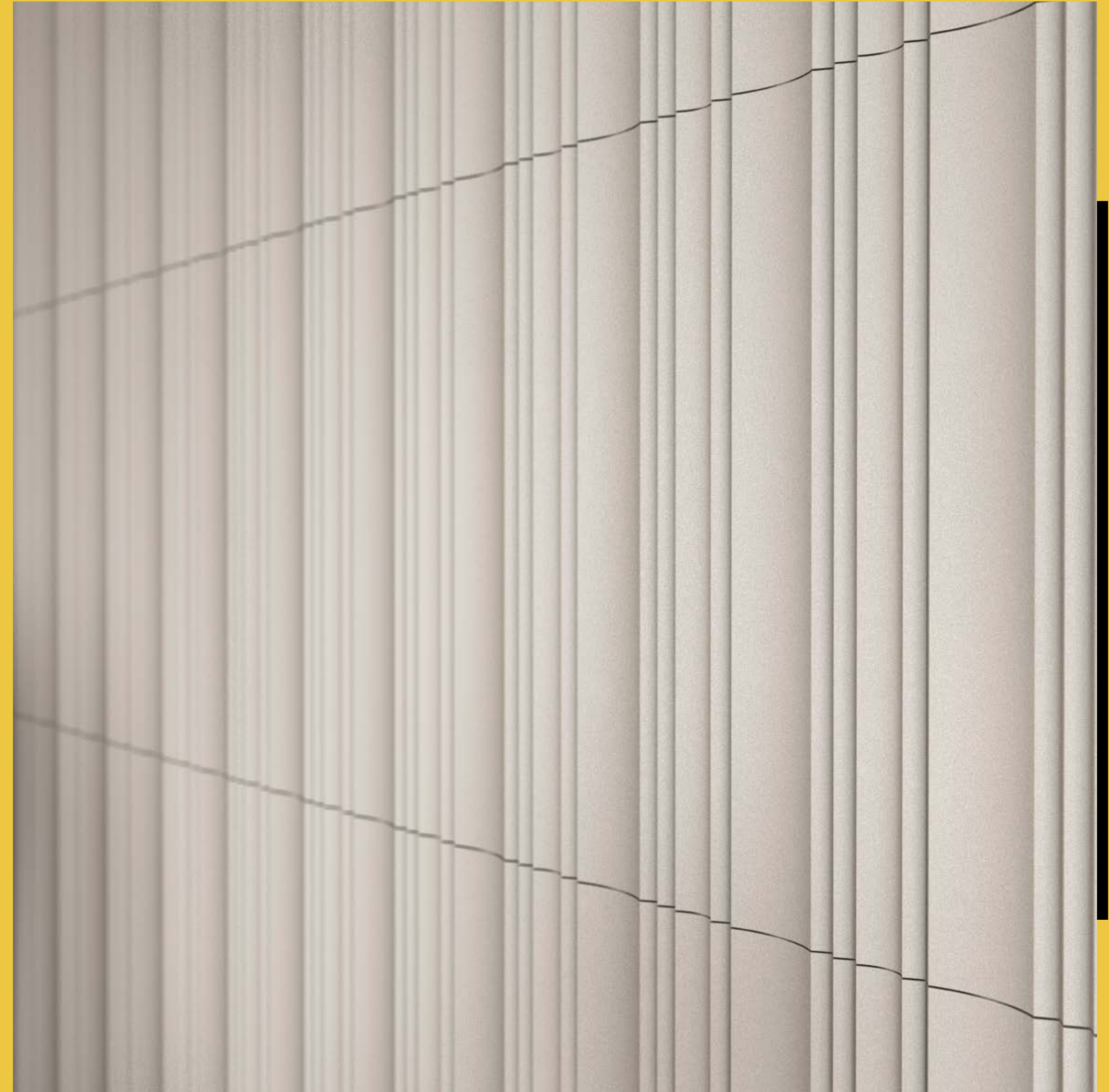
### **Transparency and quantification of environmental impacts**

Transparency regarding the origin of raw materials is an increasingly widespread practice in the sector and many manufacturers make this information on their products public. Sectoral and product-specific Environmental Product Declarations (EPDs) are also available, which assess the impacts of ceramic tiles throughout their life cycle. Many ceramic tiles already have a specific or sectoral EPD, such as the sectoral EPD promoted by ASCER.

# 5. Ceramic tiles in product certification

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Product certification provides proof that a manufacturer produces products that meet certain quality, safety and environmental requirements. Having the accreditation of a certifying body sets the product apart and generates more trust in the brand and the quality it represents.



When a manufacturer opts for product certification, it shows its commitment to information transparency in the construction materials industry and allows professionals and consumers to make decisions based on verified information.

There are countless certifications that can be used as a reference in the analysis of the ceramic tile with regard to their compliance with rigorous standards of sustainability, circularity and toxicity. The criteria analysed can encompass issues such as the quality of the manufacturing process; the use of natural resources such as raw materials, water and energy; greenhouse gas emissions during the product's life cycle; the level of toxicity contained or emitted by the product; and the social impact of the product, to name a few.

In order to contextualise ceramic tiles in product certifications and to understand their performance in the broad field of sustainability, the most recognised and widely implemented standards worldwide have been reviewed:

- Cradle to Cradle Certified<sup>®</sup>,
- EU Ecolabel,
- Greenguard Certification,
- Indoor Air Quality Product Performance Standard for Building Interiors.



# Product Certifications



## **Cradle to Cradle Certified®**

It is an internationally recognised multi-attribute programme developed by the Cradle to Cradle Products Innovation Institute, a global benchmark in the promotion of the circular economy applied to products. It assesses products and their manufacturing process from the perspectives of the impact on human health and the environment, the circularity of materials and the corporate responsibility of manufacturers.



## **EU Ecolabel**

It is a certification programme developed by the European Commission dedicated to identifying sustainably designed products. It aims to promote innovation, circular economy and the contribution towards climate neutrality in the European Union by 2050. The assessed products must comply with the most relevant criteria of the main international green building programmes applied in Europe.



### **GREENGUARD® Certification**

This is a certification programme promoted by UL, a multinational consulting and certification company that assesses products for compliance with stringent safety and quality standards. It aims to recognise products that help reduce indoor air pollution and the risk of chemical exposure to workers and users.



### **Indoor Air Quality Product Performance Standard for Building Interiors**

It is a standard developed by SCS Global Services, an international leader in the development of standards and certifications in the field of sustainability. As far as building materials are concerned, it has two certifications that assess their level of impact on indoor air quality (IAQ), namely the FloorScore® and the Indoor Advantage Gold - Building Materials. Both, the first one dedicated to the certification of floors and the second one to building materials in general, aim to promote safe and healthy spaces for people. They also confer transparency and credibility to manufacturers who are committed to products that contribute to indoor air quality.



All of the above programmes are recognised and can award points in the main internationally recognised green building certifications such as LEED, BREEAM®, DGNB®, WELL™ and VERDE.

Certification Programme	Organisation	Geographical scope	Product category in which the ceramic tile is analysed	Certification Levels	Areas of analysis to which ceramic tiles contribute
Cradle to Cradle Certified®	Cradle to Cradle Products Innovation Institute	International	Construction materials	<ul style="list-style-type: none"> <li>• Bronze</li> <li>• Silver</li> <li>• Gold</li> <li>• Platinum</li> </ul>	<ul style="list-style-type: none"> <li>• Material health</li> <li>• Product circularity</li> <li>• Clean air &amp; climate protection</li> <li>• Water &amp; soil stewardship</li> <li>• Social fairness</li> </ul>
EU Ecolabel	European Commission	Europe	Hard coverings	<ul style="list-style-type: none"> <li>• General criteria: Mandatory</li> <li>• Specific criteria: Score from 0 to 100, with 50 being the minimum to achieve certification.</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel consumption for drying and firing</li> <li>• CO2 emissions</li> <li>• Process water consumption</li> <li>• Atmospheric emissions of dust, HF, NOx and Sox</li> <li>• Waste water management</li> <li>• Reuse of process waste</li> <li>• Glazes and inks</li> </ul>



Certification Programme	Organisation	Geographical scope	Product category in which the ceramic tile is analysed	Certification Levels	Areas of analysis to which ceramic tiles contribute
GREENGUARD® Certification	UL	International	Building materials and interior finishes	<ul style="list-style-type: none"> <li>• GREENGUARD</li> <li>• GREENGUARD Gold</li> </ul>	<ul style="list-style-type: none"> <li>• Chemical composition</li> <li>• VOCs emissions</li> </ul>
Indoor Air Quality Product Performance Standard for Building Interiors	SCS Global Services	International	<ul style="list-style-type: none"> <li>• Floor coverings</li> <li>• Building materials</li> </ul>	<ul style="list-style-type: none"> <li>• FloorScore®</li> <li>• Indoor Advantage™ Gold</li> </ul>	<ul style="list-style-type: none"> <li>• Product quality control</li> <li>• Chemical composition</li> <li>• VOCs emissions</li> </ul>

# Performance of ceramic tiles in product certifications

From a cross-sectional view, it can be stated that ceramic tiles have the potential to meet the most stringent criteria of such certifications focused on people's health, the environment and the quality of manufacturing processes.

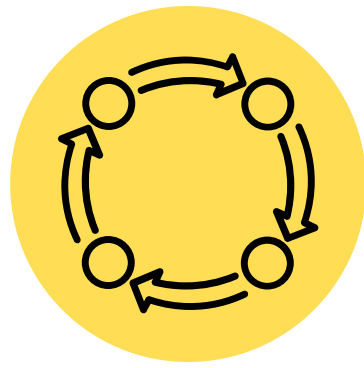


## Material health

As a natural material made up of inorganic minerals and water, and because it is fired at high temperatures, ceramic tiles are free of components and emissions of toxic substances. As far as glaze and stain formulations are concerned, the Spanish sector tends to reduce the use of heavy metals, always complying with the relevant regulations.

*It can contribute to the assessment criteria of:*

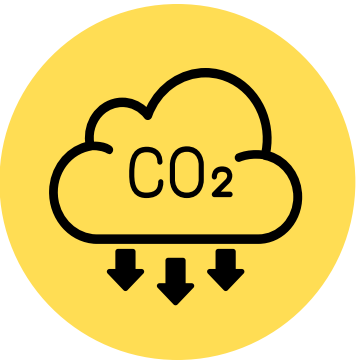




## Circular Economy

The high reuse rates of raw materials in the production process of ceramic tiles constitute a fact in the sector. In addition, ceramic tile is a material that can be easily reused or recycled at the end of its useful life, and can become part of the composition of other types of construction materials.

*It can contribute to the assessment criteria of:*



## Energy management and greenhouse gas emissions

The ceramic tile industry is committed to energy efficiency measures and optimisation of fuel use in the manufacture of its products. The Spanish sector has been using natural gas as a fuel since 1980 and has high-efficiency furnaces and energy cogeneration systems in order to reduce its energy consumption and, consequently, its greenhouse gas emissions into the atmosphere.

*It can contribute to the assessment criteria of:*



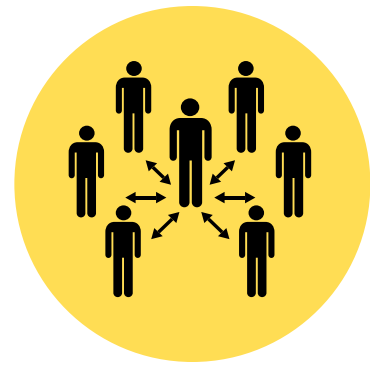




## Water Resources

The sector has the treatment and recovery of practically 100% of the water that remains in the production cycle, without generating a negative impact on soil and water pollution.

*It can contribute to the assessment criteria of:*



## Corporate Responsibility

Beyond the characteristics of ceramic tiles and the practices and trends of the Spanish ceramic tile sector, product certifications usually also have criteria that are more related to the practices of each manufacturer, and from this may result in higher or lower scores for each certified product in a given programme. Examples of such criteria may include the need to demonstrate that the company has adequate quality control or that it fosters a diverse, inclusive and socially equitable work environment.

*It can contribute to the assessment criteria of:*



## 6. Aligning of the Spanish ceramics industry with the UN 2030 Agenda





### **Good health and well-being**

The material is naturally free of toxicity and VOCs emissions. It does not transmit odours and its waterproof and innocuous nature makes it more hygienic, anti-allergic and aseptic.



### **Clean water and sanitation**

Water resources used as raw material, coolant and cleaning agent in the ceramic tile manufacturing process. 100% of the waste water is reused, achieving the zero waste goal.



### **Affordable and clean energy**

The natural gas used as a transition fuel, the commitment to renewable energies and high-efficiency cogeneration of energy result in the constant reduction of global greenhouse gas emissions in the industry.



### **Decent work and economic growth**

Almost 90% of the industry's workforce is on indefinite term contracts and there are few temp jobs. For every direct job generated, 2.8 additional jobs are provided to the Spanish economy.





### **Industry, Innovation and Infrastructure**

Commitment to technology and R&D&I-based projects, in addition to ongoing investment in sectoral projects promoted by specialised institutions.



### **Responsible production and consumption**

Reintroduction of nearly 100% of the waste generated in the manufacturing process, enabling the recovery of the remaining waste and reducing the need for virgin raw materials. Its durability and long life cycle delays replacement and reduces unnecessary consumption.



### **Climate action**

60% fewer emissions in the Spanish ceramics sector than in 1980, mainly thanks to the adoption of natural gas as a fuel and cogeneration. In addition, innovations to use as little material as possible while maintaining the same characteristics (thin large tiles).

# Methodological notes

## Benchmark study of future scenarios:

To undertake this study, the Life Cycle Assessment (LCA) carried out for the production of 1m<sup>2</sup> of ceramic tile covered by the Environmental Product Declaration for the Spanish ceramic tile sector, valid until 2024, was used.

## Benchmark study of coverings in the construction sector

The criteria for assigning points for each indicator are shown below:

SCORING CRITERIA	Estimated useful life (years)	Score	Carbon footprint (Kg de CO <sub>2</sub> eq)	Score	Circularity (%)	Score	Cost (€/m <sup>2</sup> )	Score
	Between 10-15	1	Between 0-5	1	Between 0-20%	1	Between 0-30	1
	Between 16-20	2	Between 6-10	2	Between 21-40%	2	Between 31-55	2
	Between 21-25	3	Between 11-15	3	Between 41-60%	3	Between 56-80	3
	Between 26-30	4	Between 16-20	4	Between 61-80%	4	Between 81-100	4
	Over 30	5	Over 20	5	Over 80%	5	Over 100	5

SCORING BY FLOOR TYPE	Material	Estimated useful life (years)	Score	Carbon footprint (tn CO <sub>2</sub> eq/tn product)	Score	Circularity (%)	Score	Cost (€/m <sup>2</sup> )	Score
	Ceramic tile	50	5	0.613	2	41	3	37.00	2
	Vinyl tile (LVT)	15	1	2.68	5	60	3	33.00	2
	Carpet	10	1	1.50	3	93	5	95.00	4
	Wood	20	2	0.242	1	70	4	118.00	5



# Glossary of acronyms and terms

**Life Cycle Assessment:** Life Cycle Assessment (LCA) is a tool to systematically assess the environmental aspects of a product or service system at all the stages of its life cycle.

**Best Available Technology (BAT):** The best available technology to achieve a high overall level of environmental protection, developed on a scale that allows implementation in the relevant activity under economically feasible conditions.

**Volatile Organic Compounds (VOCs):** Hydrocarbons that occur in a gaseous state at normal ambient temperature or are highly volatile at normal ambient temperature. They are classified into three levels of risk to human health and the environment, ranging from extremely hazardous to low impact. They can enter the human body through the respiratory tract or the skin and bioaccumulate in the body. Their health effects are reflected in respiratory problems, eye and throat irritation, dizziness, irritability, concentration difficulties, etc. In the long term, they may cause kidney, liver or central nervous system damage or even have a carcinogenic effect.

**Environmental Product Declaration (EPD):** Ecolabel type III, according to ISO 14020. It provides quantified, relevant, objective and verified information on the environmental impacts of a product throughout its Life Cycle Assessment (LCA).

**Greenhouse gases (GHG):** Gaseous components of the atmosphere, natural or anthropogenic, that absorb and emit radiation through the atmosphere and clouds, causing the greenhouse effect. The primary greenhouse gases in the earth's atmosphere are water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and ozone (O<sub>3</sub>). In addition to CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> added by human activity, the atmosphere contains a number of greenhouse gases of entirely anthropogenic origin, such as halocarbons or other substances containing chlorine and bromine, together with sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFC) and perfluorocarbons (PFCs).

**REACH:** Registration, Evaluation, Authorisation and Restriction of Chemicals is a European Community Regulation of 18 December 2006.

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