



IMPROVE TECHNIFICATION AND
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TASK 01.A3. COMPARATIVE STUDY ON LIFE CYCLE ANALYSIS (LCA) OF CLAY PRODUCTS.

TASK 01.A3.

COMPARATIVE STUDY ON LIFE CYCLE ASSESSMENT (LCA) OF CLAY PRODUCTS



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INTRODUCTION

“Growing concern and environmental regulation, coupled with the increasing importance and pressure of public opinion, progressively raise the question of the energy and environmental performance of buildings, increasingly on the agenda of building construction, as well as the materials used in their construction and their Relation with the surrounding space” (CTCV, 2012).

In this tasks O1.A3, a comparative study report about the existing Life Cycle Analysis related to clay products, as well as placing these products in construction sites in the partner countries and EU has been developed.

This comparative study is focused on Environmental Product Declarations (EPD) of construction of the participant countries. Currently, there are products with its environmental declaration, i.e. a document which reports on environmental impacts, such as kilograms of CO₂ equivalents generated in the manufacturing process of the products of ceramic sector. This document covers all phases through which passes a product, from extraction of the raw material with which it is manufactured until the product is completely finished.

In summary, this task will compile the EPDs of the previous materials used in the multimedia materials of the project and analyse the basic data that will be used in the interactive tool (IO3) (CO₂ emissions, ecological and carbon footprint, etc.). All partners of the BIMclay project have participated in this report.

The results of this comparative study will be collected focused on its implementation in the BIMclay Multimedia Cards.

1. ENVIRONMENTAL PRODUCT DECLARATION (EPD)

The ecolabel allows for affirming the positive environmental performance of a product. Therefore, these ecolabels are awarded to products with lower environmental impact accounting for their life cycle. There are three types: ecolabel type I, environmental self-declarations (type II) and environmental product declarations (III). The first ecolabels are voluntary schemes that affirm the least environmental impact of a product, the next, the manufacturer performs it with or without certification of a competent authority, and the latest are verified and they establish the environmental behaviour of the product.

In general, the ecolabels assess such aspects as: extraction and selection of raw material, production process (power consumption, water usage and

consumption, emissions in the atmosphere and water, etc.), waste management or emission of hazardous substances.

The methodology to establish the Environmental Product Declaration (EPD) assumes the UNE-EN ISO 14025 (Labelling Type III: Environmental Product Declarations). In Spain, later appears the UNE-EN 15804 that establishes Product Category Rules (PCR), and it allows for defining the common rules to perform a specific DAP for product families.

It must be pointed out that, according to EU, from July 2013 the construction products must declare their environmental impact on the basis of the LCA, such as EPD.

2. TYPES OF EPD

Like DAP Habitat in Portugal, there are other international EPD systems that allow the verification and certification of declarations issued by entities, while providing resources for their realization, contributing to the worldwide standardization of EPDs. Several systems are presented below, some of which analyse products from Portuguese companies:

The organisms that emit EPD with repercussion in participant countries of BIMclay project are:

- EPD System: an international organization based in Sweden. It performs EPD and PCR for all types of products. EPDs are fully accessible and it can be seen if they have been made for a particular company in a country. Although there are EPDs for construction products, it is not specific to these types of products.

Web: <http://www.environdec.com/es/>

- EPD Habitat system: Within the framework of the European initiatives mentioned above and in order to take part in them, Portugal entities developed the DAP Habitat System, a national registration program for Type III Environmental Declarations for housing products. The EPD Habitat system was built within the framework of the Sistema de Apoio a Ações Coletivas (SIAC) project, approved in the context of the Cluster Habitat Sustentável collective efficiency Strategy (QREN POFC 01 / SIAC / 2011 n^o18653).

The objective of this project was to develop a system of verification and registration of housing EPD, based on objective and independent criteria. These criteria allow the creation and availability of Product Category Rules

(PCRs), which in turn support the preparation of EPDs validated in a publicly accessible database.

Web: <https://daphabitat.pt>

- EPD Aenor (Global EPD): Based in Spain. It performs EPD and PCR, mainly, for now, for construction products. There are still few accessible (of around of 15), but the number is increasing. Complete EPDs are available in pdf format. Agreements with the EPD system have also been signed for Aenor's EPDs to be internationalized. The Technical Building Code (CTE) is the policy and regulatory framework that establishes the requirements that buildings in Spain must meet. The CTE has a General Registry regulated by Order VIV/1774/2008 and created to increase the transparency and public control of the instruments that facilitate the implementation of the CTE. Within this register is the General Register of Environmental Certifications of the life cycle analysis in which the first EPDs were registered in September 2015 for long steel and cement products sectors verified by AENOR within its GlobalEPD. In Spain, there are currently two Program Managers:
 - GlobalEPD Program of the Spanish Association for Standardization and Certification (AENOR). Applicable to all industrial sectors but especially active in the construction sector. It has General Instructions complying with ISO 14025 and specific requirements for the construction sector based on EN 15804. It has issued PCR and EPD in the steel, ceramic, cement and plaster sectors, and is working in others such as mortars, bricks and tiles or furniture. It forms part of the approved European Association ECO Platform Programs and has issued Declarations of its brand.
 - EPDc Program of the Sustainable Construction Agenda. Applicable to construction and centred in Catalonia.

In Spain, the tasks of elaboration of technical standards are carried out in AEN/CTN 150/SC 3 "Ecological Labelling and LCA" horizontally and in the AEN/CTN 198 "Sustainability in construction".

Web: <https://www.aenor.es/AENOR/certificacion/mambiente/globalepd.asp#.WB4qMi3hC00>

- EPD construction: developed by ITEC and COAAT DE Barcelona. Specific for construction. All EPDs are accessible in EPD format. PCRs are not performed because it is according to ISO 21930.
Web: http://www.csostenible.net/index.php/es/sistema_dapc
- OPENDAP: open system, where environmental assessments of constructive solutions of the CTE are established. Held by the Torroja Institute and collaborating with the ARCO₂ team, at present there are no

open EPDs available, only the available information is the CO2 emissions emitted by the materials in the analysed phases. Specific scope of construction.

Web: <http://www.opendap.es/>

- **PRODUCT ENVIRONMENTAL FOOTPRINT:** developed by the EU, aims to be a reference portal for European EPDs, in a similar way to ecolabel (type I labelling). Currently, no EPDs has been developed, but those that are made will be available in open. General scope, not specific to construction. On the other hand, the European Commission has included within the Single Market initiative for green products a proposal for a product environmental footprint (PEF). This methodology seeks to establish a series of rules for calculating and communicating environmental information and would be in line with the criteria of International Standard ISO 14025, framework for EPDs. A number of pilot projects are currently being developed for the development of PCRs for these products. From the construction point of view, there is only PCR for insulation materials.

Web: http://ec.europa.eu/environment/eusssd/smgp/ef_pilots.htm#pef.

- **GBC Spain:** although GBC is not a EPD certifying body, it has established procedures for EPDs to be easily integrated into the environmental certification tools of that agency (GREEN and LEED). Specific field of construction.

Web: <http://www.gbce.es/es/materiales/dape>

- **SUSTAINABLE LIFE:** Environmental footprint obtained through the PEF seal. The environmental footprint presents a global vision of the impact on the environment of a product or organization; while the carbon footprint focuses on climate change by quantifying greenhouse gas (GHG) emissions. On the other hand, the water footprint analyses and quantifies the use of water using different methodologies; While the ecological footprint is a concept developed long ago by the Global Footprint Network to indicate the surface of air, land and water ecologically productive necessary to produce resources consumed by a population or group and to assimilate their residues. The study of the environmental footprint includes and calculates the carbon footprint according to ISO 14067 or ISO 14064 and the calculation of the water footprint according to ISO 14046 of the product or organization analysed. The analysis carried out by the Foundation Sustainable Life has exclusively covered companies, so it doesn't evaluate products for now.

Web: <http://www.vidasostenible.org/empresas/sellos-de-huella/metodologia-de-analisis/>

- ECO-Platform: The main European Program Managers have formed the ECO-Platform Association, for the EPDs in the construction sector. This Association seeks to harmonize criteria to facilitate the free circulation of products in Europe, avoiding technical barriers based on environmental criteria. All EPDs recognised by this Association must comply with the European Standard EN 15804 and carry a double logo: that of the Program Manager in which the verification is carried out and that of the ECO-Platform.

Eco Platform applies a peer auditing system to approve EPD Verification Program Administrators, from which it publishes a list of Programs that can use the ECO Platform Mark. The first Programs to be approved in this Association (in 2014) were the Spanish GlobalEPD of AENOR, the Swedish International EPD AB, the German IBU and the Austrian Bau-EPD. The first EPDs of this Association were delivered on 16 October 2014 in Brussels. In parallel, several Program Administrators are establishing bilateral mutual recognition agreements, such as the International EPD AB, IBU and AENOR GlobalEPD.

Web: <http://www.eco-platform.org/>

- Institut Bauen und Umwelt e.V. (IBU): created through an initiative of manufacturers of construction products that decided to support the expansion of sustainability in the construction sector. Within this program companies can obtain EPDs for their construction products. In a first stage PCR are developed if they do not already exist for the product under analysis. In the second phase, the EPD is reviewed by third parties and published after verification by the IBU. The institution already has more than 1,000 EPDs published.

Web: <http://ibu-epd.com>

- Données environnementales et sanitaires de référence pour le bâtiment (INIES): Managed in a participatory manner by entities from the construction sector, including public authorities, INIES is the French national database of environmental and health declarations of products, equipment and evaluation services of construction performances.

Web: <http://www.inies.fr>

3. COMPARATIVE ANALYSIS OF CERAMIC AND CLAY PRODUCTS

In summary, the companies active in participant countries that issue and certify EPD are: EPD system (verified by TECNALIA), EPD AENOR (own verified), DAPHabitat System (several verifiers), DAP construction (ITEC verifier) and GBC (Bureau Veritas verifier).

In order to understand the EPDs already carried out at national level, both in the DAP Habitat system and in other international systems, the following EPDs are from countries from participants of the BIMclay project, which are registered in systems such as those mentioned above, as well as their associated characteristics.

The following comparative table shows the ceramic products which have an EPD in the mentioned certifier bodies currently available (latest access 29 June 2018), only for participant countries (Portugal, Greece and Spain):

Product/Service	Organism	Company	Validity	Product	Phases assessed
Glazed stoneware tiles	GlobalEPD	Novogrés S.A.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Porcelain stoneware tiles	GlobalEPD	Azulev S.A.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Porcelain tiles	GlobalEPD	Peronda Cerámicas S.A.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Extrudec ceramic tiles	GlobalEPD	Gres de Aragón	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (Bla classification according to EN 14411:2013)	GlobalEPD	Pamesa Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (B1b classification according to EN 14411:2013)	GlobalEPD	Pamesa Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Ceramic tiles, glazed ceramic tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Pamesa Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIII clasification according to EN 14411:2013)	GlobalEPD	Pamesa Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Geológica Tile S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIb clasification according to EN 14411:2013)	GlobalEPD	Geológica Tile S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Geológica Tile S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIII clasification according to EN 14411:2013)	GlobalEPD	Geológica Tile S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIb clasification according to EN 14411:2013)	GlobalEPD	Geológica Tile S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Ceramic Tile International S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIb clasification according to EN 14411:2013)	GlobalEPD	Ceramic Tile International S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Ceramic Tile International S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Ceramic tiles, glazed ceramic tiles (BIII clasification according to EN 14411:2013)	GlobalEPD	Ceramic Tile International S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Azulejos Foset S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIb clasification according to EN 14411:2013)	GlobalEPD	Azulejos Foset S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Azulejos Foset S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIII clasification according to EN 14411:2013)	GlobalEPD	Azulejos Foset S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Navarti Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIb clasification according to EN 14411:2013)	GlobalEPD	Navarti Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIIa clasification according to EN 14411:2013)	GlobalEPD	Navarti Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIII clasification according to EN 14411:2013)	GlobalEPD	Navarti Cerámica S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Ceramic tiles, porcelain tiles (Bla clasification according to EN 14411:2013)	GlobalEPD	Mythage S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (Bib clasification according to EN 14411:2013)	GlobalEPD	Mythage S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIla clasification according to EN 14411:2013)	GlobalEPD	Mythage S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, glazed ceramic tiles (BIll clasification according to EN 14411:2013)	GlobalEPD	Mythage S.L.U.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (Bla clasification according to EN 14411:2013)	GlobalEPD	Vives Azulejos y Gres S.A.	21/02/2020	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, porcelain tiles (Bla clasification according to EN 14411:2013)	GlobalEPD	Porcelánicos HDC S.A.	18/02/2021	Ceramic	Cradle-to-Cradle (from A1 to D)
Ceramic tiles, grazed ceramic tiles (BIll clasification according to EN 14411:2013)	GlobalEPD	Porcelánicos HDC S.A.	18/02/2021	Ceramic	Cradle-to-Cradle (from A1 to D)
Techlam® láminas cerámicas	GlobalEPD	Levantina y Asociados de Minerales S.A.	29/10/2022	Ceramic	Cradle-to-Cradle (from A1 to D)
Baldosas cerámicas de gres porcelánico	GlobalEPD	Hijos de Fco. Gaya Forés S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Baldosas cerámicas de gres esmaltado	GlobalEPD	Cerámicas Ibero Alcorense S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Baldosas cerámicas de gres porcelánico	GlobalEPD	Azulejera Técnica S.A.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Baldosas cerámicas de gres porcelánico	GlobalEPD	Ceracasa S.A.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Baldosas cerámicas porosas	GlobalEPD	Cerámica Latina S.L.	16/09/2018	Ceramic	Cradle-to-Cradle (from A1 to D)
Tejas cerámicas según la Norma UNE-EN 1304	GlobalEPD	Asociación Española de Fabricantes de Ladrillos y Tejas de Arcilla Cocida (HISPALYT)	11/06/2022	Tiles roof	From A1 to C4
Tableros cerámicos según la Norma UNE 67041	GlobalEPD	Asociación Española de Fabricantes de Ladrillos y Tejas de Arcilla Cocida (HISPALYT)	11/06/2022	Ceramic panels	From A1 to C4
Adoquines cerámicos según la Norma UNE-EN 1344	GlobalEPD	Asociación Española de Fabricantes de Ladrillos y Tejas de Arcilla Cocida (HISPALYT)	11/06/2022	Paved	From A1 to C4
Ladrillos cerámicos cara vista. Pieza "U" según la Norma UNE-EN 771-1	GlobalEPD	Asociación Española de Fabricantes de Ladrillos y Tejas de Arcilla Cocida (HISPALYT)	11/06/2022	Brick	From A1 to C4
Bovedillas y casetones cerámicos según la	GlobalEPD	Asociación Española de Fabricantes de	11/06/2022	Ceramic vaulted	From A1 to C4

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Norma UNE-EN 15037-3		Ladrillos y Tejas de Arcilla Cocida (HISPALYT)			
Ladrillos y bloques cerámicos para revestir. Pieza "P" según la Norma UNE-EN 771-1	GlobalEPD	Asociación Española de Fabricantes de Ladrillos y Tejas de Arcilla Cocida (HISPALYT)	11/06/2022	Brick	From A1 to C4

In addition, it is shown some examples of comparison of EPDs of Ceramic and clay products all over the world:

Product/Service	Organism	Company	Validity	Product	Phases assessed
Ceramic Floor Tiles	EPD system	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.	14/05/2023	Ceramic	From A1 to C4
Ceramic Wall Tiles	EPD system	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.	14/05/2023	Ceramic	From A1 to C4
Creavit Fine Fire Clay China Ceramic Sanitaryware	EPD system	Çanakcılar Seramik Sanayi ve Ticaret A.Ş. (Creavit)	16/12/2019	Ceramic	From A1 to C4
Creavit Vitreous China Ceramic Sanitaryware	EPD system	Çanakcılar Seramik Sanayi ve Ticaret A.Ş. (Creavit)	16/12/2019	Ceramic	From A1 to C4
Kalesinterflex® Porcelain Ceramic Slab	EPD system	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.	14/05/2023	Ceramic	From A1 to C4
Vitreous China (VC) & Fine Fire Clay (FFC) Ceramic Sanitaryware	EPD system	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.	14/05/2023	Ceramic	From A1 to C4
Porcelain Stoneware Tiles	EPD system	Cerámica Saloni SA	01/03/2023	Ceramic	From A1 to C4

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Product/Service	Organism	Company	Validity	Product	Phases assessed
Porcelain Tiles	EPD system	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.	14/05/2023	Ceramic	From A1 to C4
Porcelain stoneware slabs 10 mm	EPD system	Graniti Fiandre SpA	13/12/2021	Ceramic	From A1 to A3
Porcelain stoneware slabs 6mm	EPD system	Graniti Fiandre SpA	13/12/2021	Ceramic	From A1 to A3
Seranit Porcelain Tiles	EPD system	Seranit Granit Seramik Sanayi ve Tic. A.S.	06/01/2020	Ceramic	From A1 to A3 and C4
Heluz Hollow bricks and brick products	EPD system	HELUZ cihlářský průmysl v. o. s.	07/09/2020	Brick	From A1 to A3

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