

Green Public Procurement and construction sector: EPD and LCA based benchmarks of the whole-building

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OBJECTIVES

1

To fix and improve LCA benchmarks related to construction materials, buildings elements and whole-buildings

2

To use Life Cycle Assessment (LCA) and Environmental Product Declarations (EPDs) in Green Public Procurement (GPP) for building sector

3

To propose a new way to public administrations to verify the GPP criteria achievement using EPDs

LCA and EPD in GPP-CRITERIA

GPP-Buildings	LCA	EPD		LCA	EPD		LCA	EPD			
Austria	●	●		Germany	●	●	●	Poland	●	○	○
Belgium	●	●		Greece	●	○	○	Portugal	●	○	○
Bulgaria	●	○		Hungary	●	○	○	Romania	●	○	○
Croatia	●	●		Ireland	●	○	○	Slovakia	●	○	○
Cyprus	○	○		Italy	●	●	●	Slovenia	●	○	○
Czech Republic	○	○		Latvia	○	○	○	Spain	●	○	○
Denmark	●	●		Lithuania	●	●	●	Sweden	●	○	○
Estonia	●	○		Luxembourg	●	●	●	Norway	●	●	●
Finland	●	●		Malta	●	○	○	Swiss	○	○	○
France	●	○		The Netherlands	●	●	●	UK	●	○	○

- present
- not present
- criteria under development
- information not available



LCA and EPD in ITALIAN-CAM

GPP for buildings in Italy sets the ...

CAMs, which improve requirements, services and environmental performances.

CAMs set ...

mandatory recycled content percentage value for construction materials.

CAMs require ...

to the contracting authorities to check the criteria achievement with the use of environmental/energy building certifications (i.e. LEED, BREEAM, etc.) and environmental labels (type I, II and III).

but the LCA information contained in the EPD are not used in CAMs



RESEARCH STEPS

01

Setting LCA-based benchmarks for construction materials from EPDs of eight product categories

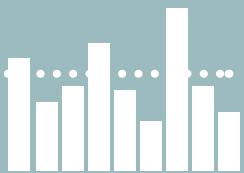


cement, bricks, wood-based materials, steel, gypsum plasterboards, glass wool, stone wool and ceramic tiles

02

Integration of LCA benchmark values in GPP criteria, setting environmental sustainable levels of building product

LCA benchmark



03

Benchmarking methodology application to fix benchmarks of buildings elements



04

Benchmarking methodology application to fix benchmarks of whole-buildings





01

RESEARCH STEPS: REFERENCE SAMPLE

BENCHMARKING METHODOLOGY

based on scientific literature analysis; the method is based on statistical analysis of LCA data contained in the EPDs

REFERENCE SAMPLE

eight different product categories: cement, bricks, wood-based materials, steel, gypsum plasterboards, glass wool, stone wool and ceramic tiles

GEOGRAPHICAL LOCATION

EPDs of products manufactured in Europe and related to the recent production and construction European practices

EPD AND LCA COMPARABILITY

European standard EN 15804:2012 “Sustainability of construction works” and mutual Product Category Rules (PCRs) of Program Operators

PROGRAM OPERATORS

EPDs collected from European EPD Program Operators
BAU EPD (Austria), IBU (Germany), International EPD® System (Sweden), GlobalEPD (Spain), EPD Danmark (Denmark), DAPHabitat System (Portugal), FDES INIES (France), EPDIItaly (Italy) and EPDNorge (Norway)



01

RESEARCH STEPS: LCA DATA

LCA SYSTEM BOUNDARIES

EPDs cradle-to-gate and EPDs cradle-to-grave
1 kg of product

LCA STAGES AND STEPS

Production Stage - phases A1 (Raw material extraction)
A2 (Transport)
A3 (Manufacturing)

LCA BENCHMARKS

Three benchmark levels: Limit, Reference and Target values

LCA IMPACT CATEGORIES

Ten LCA environmental impacts
(1) Global Warming Potential – GWP; (2) Ozone Depletion Potential - ODP; (3) Acidification Potential - AP; (4) Eutrophication Potential - EP ; (5) Photochemical Ozone Creation - POCP; (6) Abiotic Depletion of Non-fossil resources - ADNP; (7) Abiotic Depletion Potential for fossil resources - ADP; (8) Total use of Renewable Primary Energy resources - PERT; (9) Total use of Non-Renewable Primary Energy resources - PENRT; (10) Use of Fresh Water - FW



RESEARCH STEPS: BENCHMARKING METHOD

BENCHMARKING METHOD

Statistical interpretation of LCA data collected from the EPDs and definition of an evaluation scale

TARGET VALUE

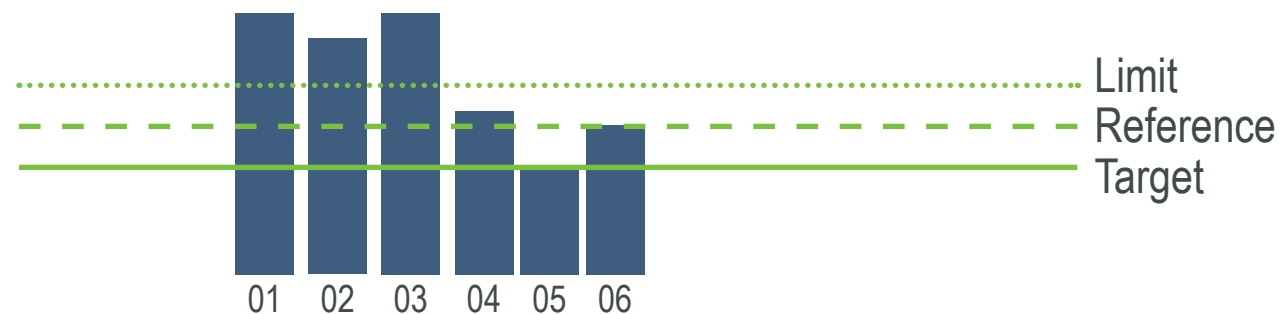
1° Quartile = value 25% lower than the Reference value. the better environmental practices accepted

REFERENCE VALUE

Median value the current construction practices / manufacturing processes.

LIMIT VALUE

3° Quartile = value 25% higher than the Reference value. the lowest acceptable value in the evaluation scale

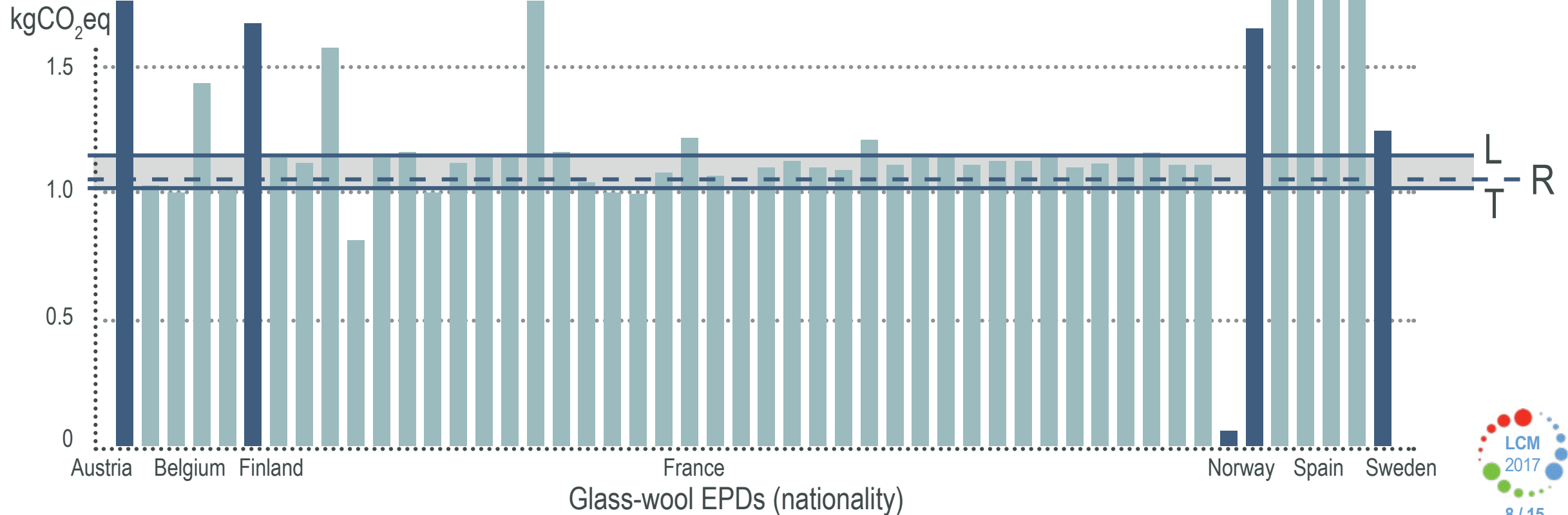




01

RESEARCH STEPS: LCA BENCHMARKS

	Limit (L)	Reference (R)	Target (T)
Glass-wool (1 kg)	1.12E+00	1.08E+00	1.06E+00





01

LCA BENCHMARKS OF CONSTRUCTION MATERIALS

	Limit (L)	Reference (R)	Target (T)
Brick	2.63E-01	2.56E-01	2.18E-01
Cement	8.49E-01	7.52E-01	6.48E-01
Ceramic tiles	4.89E-01	3.56E-01	3.25E-01
Plasterboard	2.59E-01	2.22E-01	2.12E-01
Glass-wool	1.12E+00	1.08E+00	1.06E+00
Stone-wool	1.22E+00	1.19E+00	8.86E-01
Steel	1.24E+00	5.46E-01	5.11E-01
Wood fibreboard	-9.81E-01	-1.20E+00	-1.22E+00

LCA benchmarks for GWP
(kgCO₂eq) impact category
of 1 kg of product

CAMs environmental requirements for glass-wool panels:

- ▶ recycled content greater than and equal to 60%

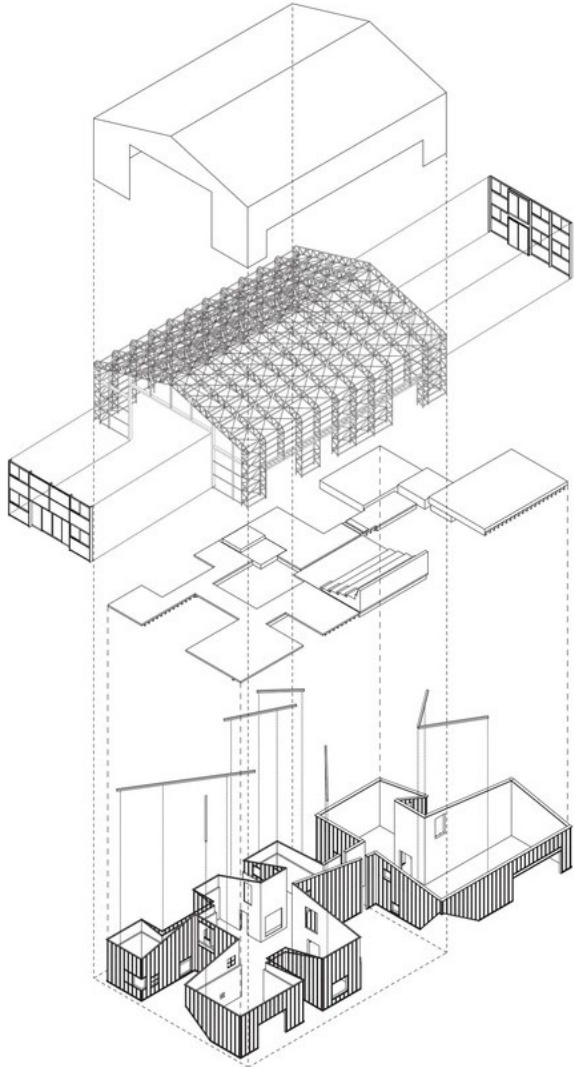
CAMs requirements with LCA benchmarks

- ▶ recycled content greater than and equal to 60%
- ▶ GWP impact value in a range of 1.12E+00 and 1.06E+00

How is it verified ?

Impact value verified by contracting authorities using the LCA data contained in the EPDs

LCA BENCHMARKS OF BUILDING ELEMENTS



01 building elements

structure frame, floors, roof,
external walls and internal walls

03 year and context

Year: after 2005

Context: national

05 LCA boundaries

LCA cradle to grave
(from A1 to C4)

07 normalization

impacts normalised on 1 square
meter of the building element

02 building types

commercial, educational, retail,
healthcare, residential buildings

04 database

national databases with buildings
environmental certified

06 reference service life

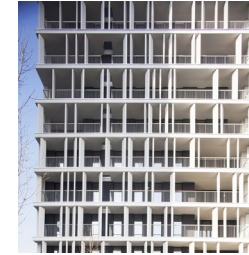
reference study period of 100
years

LCA BENCHMARKS OF WHOLE BUILDING

01 benchmarks obtained through ...

A statistical analysis of LCA data of a specific context

B reference building based on national standards



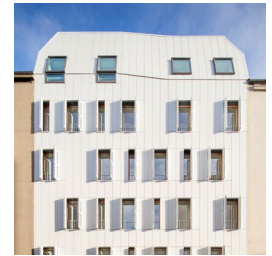
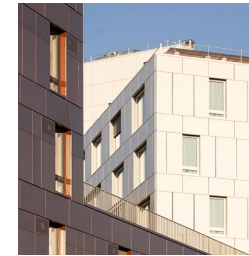
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Year: after 2005

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03 building types

commercial, educational, retail, healthcare, residential buildings



04 LCA boundaries

LCA cradle to grave
(from A1 to C4)

05 reference service life

reference study period based on 100 years

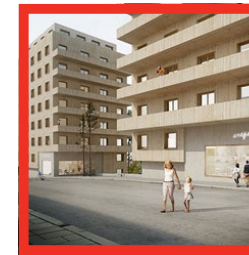


06 normalization

impacts normalised on 1 square meter of gross floor area

07 example

Folkhem wood residential house certified with an EPD





04

WHOLE BUILDING EPD - FOLKHEM'S CONCEPT BUILDING

GWP (kg CO₂ equiv / 1 m² of heated controlled space)

A1-3 Production	2,1E+02
A4-5 Construction	4,8E+01
B1 Use	0,0E+00
B2 Maintenance	5,2E+00
B3 Repair	2,6E+00
B4 Replacement	5,4E+01
B5 Refurbishment	5,9E+00
B6 Operational energy	2,5E+02
B7 Operational water	4,3E-04
C1 Deconstruction	7,2E-01
C2 Transport	1,8E+00
C3 Waste processing	6,2E-01
C4 Disposal	2,1E+00

LCA Ranking



Programme operator

EPD International AB

Company name

Folkhem Produktion AB





CONCLUSIONS

- To promote the use of environmental benchmark values in GPP criteria and the use of EPDs to facilitate the verification activities of public administrations
- To promote the use of LCA benchmark values in GPP criteria for buildings, stimulating the use and the production of EPDs in the market and their integration of LCA in the GPP criteria
- EPDs as an instrument for contracting authorities to verify the GPP criteria achievement with specific environmental requirements
- Use of LCA benchmarks and EPDs to stimulate the building market towards new environmental sustainability levels, incentivizing the sustainability in construction standards and directives



CONTACT

Thank you for the attention

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