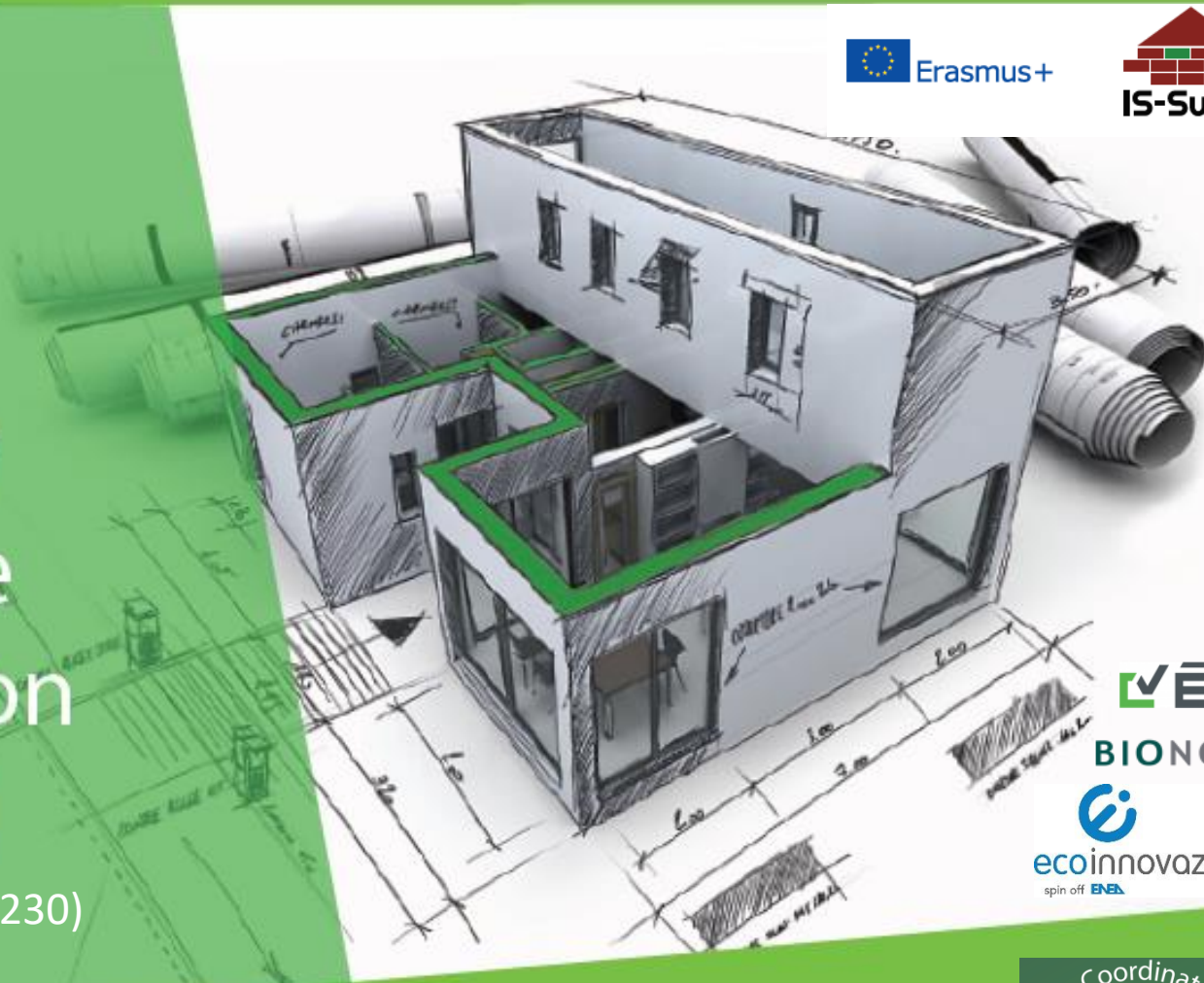


Spread of Innovative Solution for Sustainable CONstruction (IS-SusCon)

(2019-1-HU01-KA204-061230)



Role and dilemmas of life cycle costing(LCC) method

Klara Szita



Content

- Definition of LCC
- Calculation process
- Role of LCC
- Dilemmas – how to count
- Case studies of IS-SusCon project – Level 1

External wall
Internal wall
Cladding
Floor finish

Floor slab
Roof
Roof slab



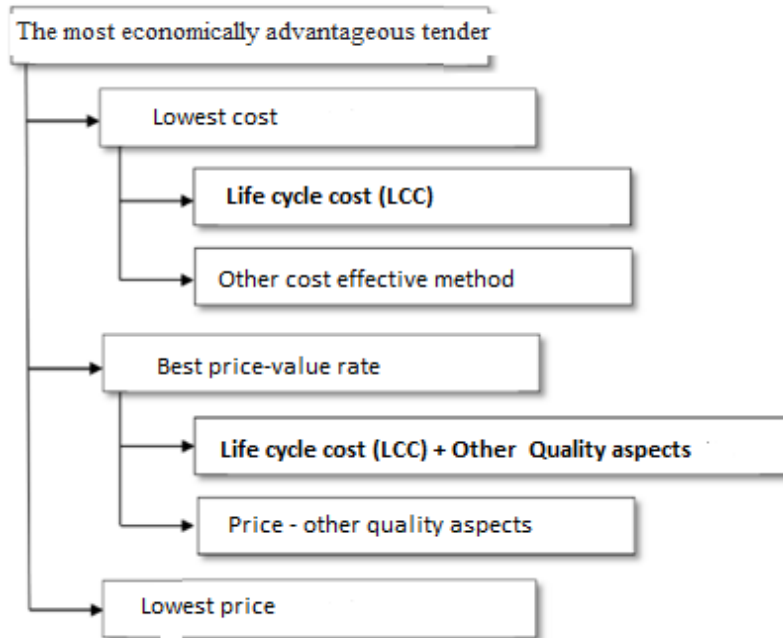
Definition of LCC

- WHAT IS LIFE CYCLE COST ANALYSIS? LCCA is a process of evaluating the economic performance of a building over its entire life. Sometimes known as “whole cost accounting” or “total cost of lifetime Products.
- The costs that it includes are the purchase price, cost to install it, cost to operate it, maintenance and repair, and upgrade cost (if any). In short, we can say the costs would include initial investment, any further investment, recurring expenses, and the disposal expenses.



Role of LCC

Evaluating of tenders in Public Procurement



Decision support for investments

- Life cycle costing is for evaluating an investment
- It is also essential if a project has several alternatives
- It helps creating a budget



Calculation Process - Dilemmas

- There are two ways to count of LCC

$$\text{LCC} = \text{Initial cost} + \text{Total (Maintenance + Replacement cost)} - \text{Residual Value}$$

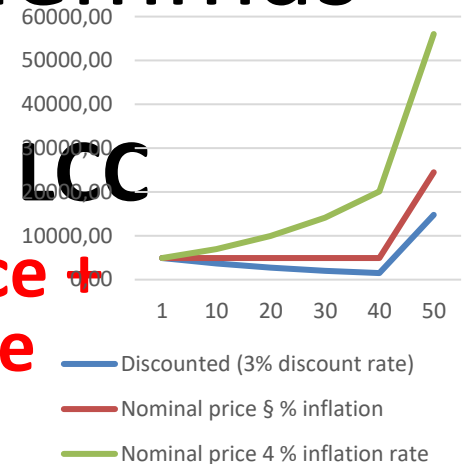
Discounted cost (by using the following formula:

$$NPV = \sum_{t=0}^T \frac{C_t}{(1+r)^t}$$

Where:

- C = Cash Flow at time t
- r = discount rate expressed as a decimal
- t = time period

Nominal cost with inflation or without it



	Discounted (3% discount rate)	Nominal price (0% inflation)	Nominal price (4% inflation)
Wall painting	4900,00	4900,00	4900,00
10,00	3646,06	4900,00	6974,23
20,00	2713,01	4900,00	9926,50
30,00	2018,74	4900,00	14128,51
40,00	1502,13	4900,00	20109,27
Maintenance cost	14779,94	24500,00	56038,50

- Changeable price and fees



Price increasing

- Demand (increasing) > Supply - limber, cement, windows, door
- Steel, Siding, and Other Materials

[The Association of General Contractors](#) noted that:

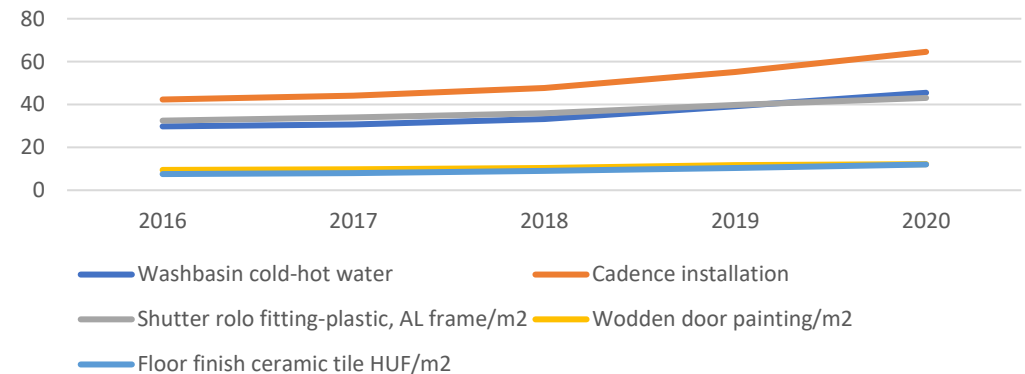
- **Steel** prices rose by **67%**
- **Brass and copper** costs increased by **49%**
- The price of **aluminum** jumped **20.5%**
- **Plastic construction materials**—PVC piping, moisture barriers, vinyl siding, paints, adhesives—even went up more than **12%**.
- In Hungary – price increased from last year (ÉVOSZ, Pénzcentrum, 2021)
 - Floorfinish, ceramic tile : **9-12 %**,
 - Gypsum carton: **23 %**
 - Insulation materials: **47 %**
 - Wodden increased: **72 %**



Renovation fees (HUF)

	Washbasin cold-hot water	Cadence installation	Shutter rolo fitting-plastic, AL frame/m ²	Wodden door painting/m ²	Floor finish ceramic tile HUF/m ²
2016	10520	14950	11500	3320	2630
2017	10870	15590	12000	3430	2800
2018	11750	16900	12710	3660	3170
2019	13850	19520	14070	4140	3670
2020	16110	22850	15260	4270	4230

Fees (EUR)



Source: penzcentrum.hu, KSH,
EUR=354,3 (avarege of 180 days)



Case studies: LEVEL1 – General notes

- Sources of cost:
 - ÉKS, 2021, in some case: internet
 - Net price + work fee (without tax)
- Lifetime was 50 years, unit 1 m²
- Replacement depend of structure: (15, 25 or 30 years)
- Eol Cost: 2,5 %
- Discount rate: 3 %
- Inflation: 0 %
- Software: OneClick LCA of BIONOVA

Investigated designs

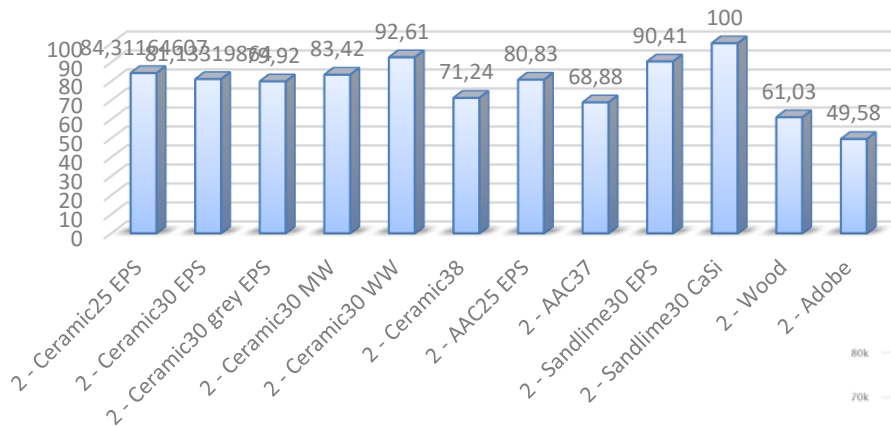
- External wall (12)
- Internal wall (7)
- Cladding (5)
- Floor finish (8)
- Floor slab (5)
- Roof (7)
- Roof slab (5)



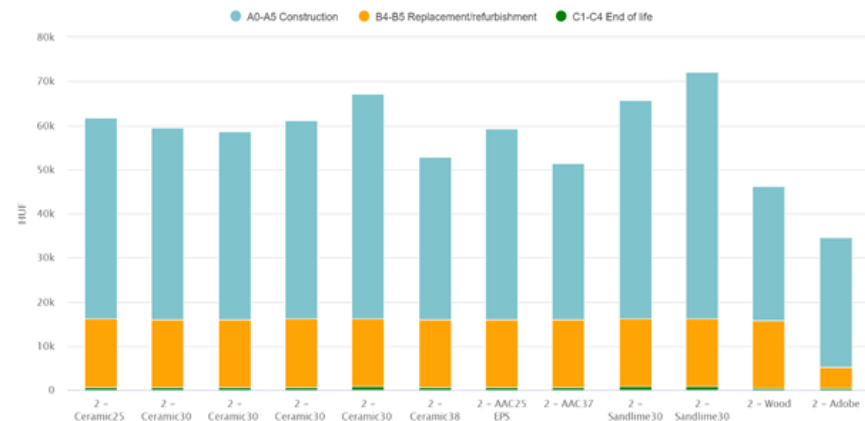
Case studies LEVEL1 – External walls

The technical parameter of each wall meet the legal requirements (U-value = 0.23-0.24 W/m²K), but materials and insulation are different

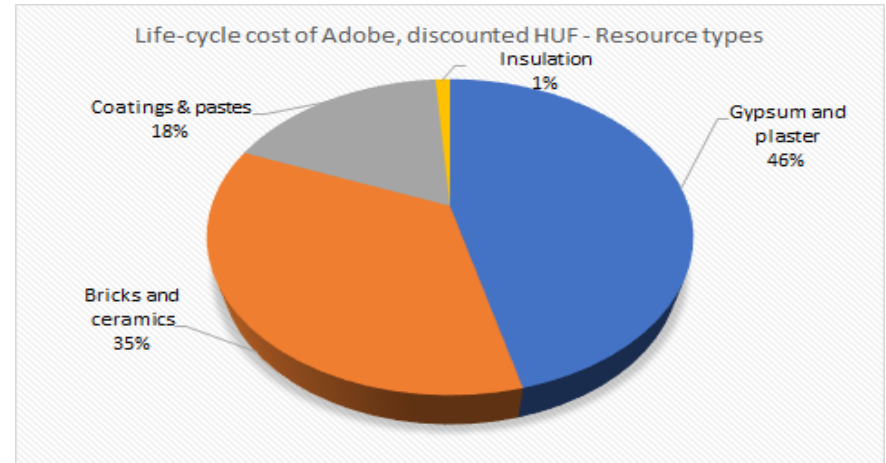
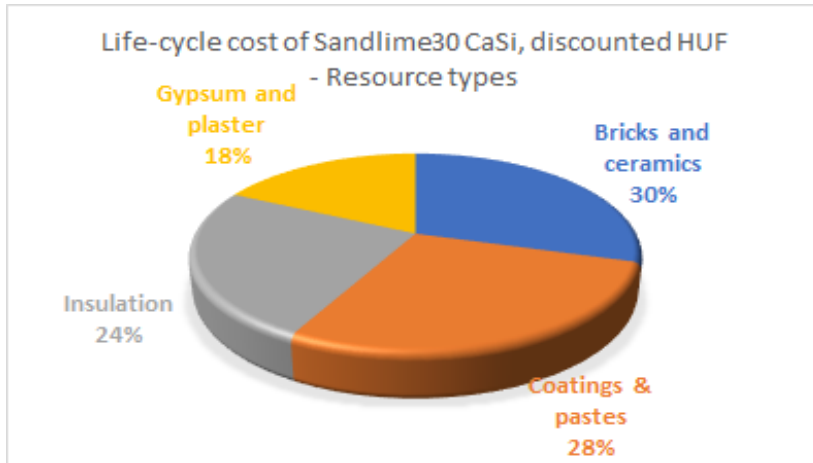
Life-cycle cost, discounted



The most expensive: Sandlime30 CaSi
 The cheapest: Adobe
 The replacement cost - as costs of coatings and pastes varies from 14% to 28 % of total LCC.

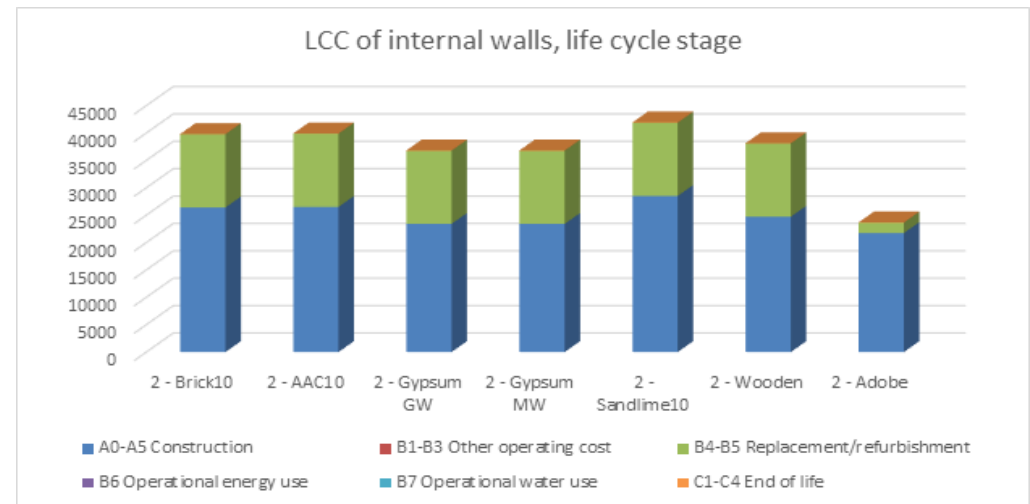
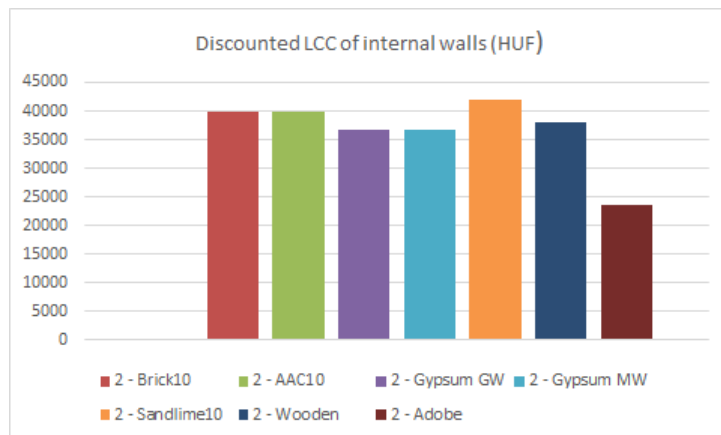


Distribution of cost between materials



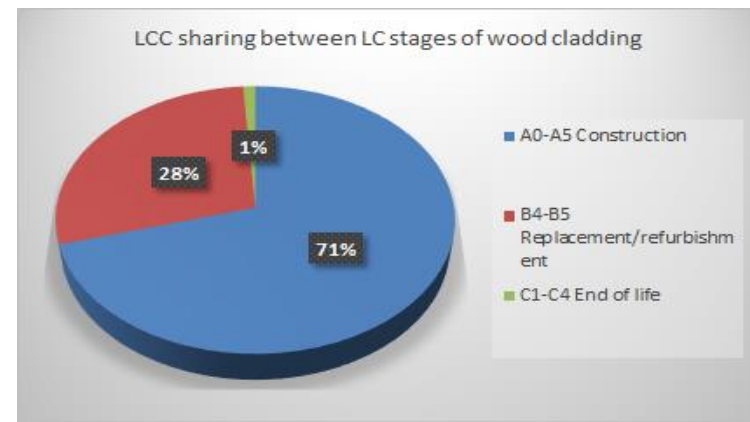
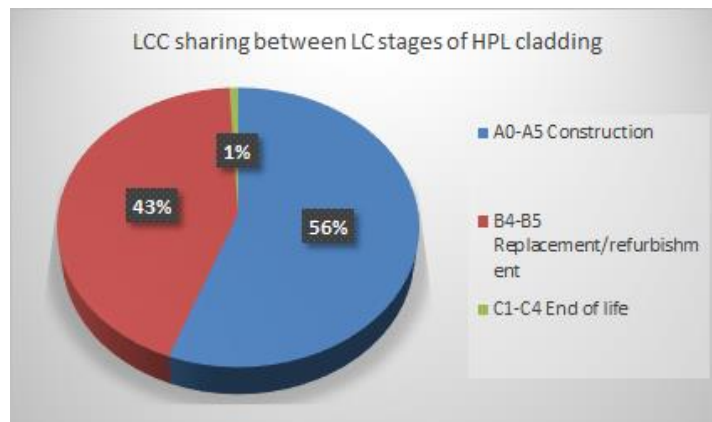
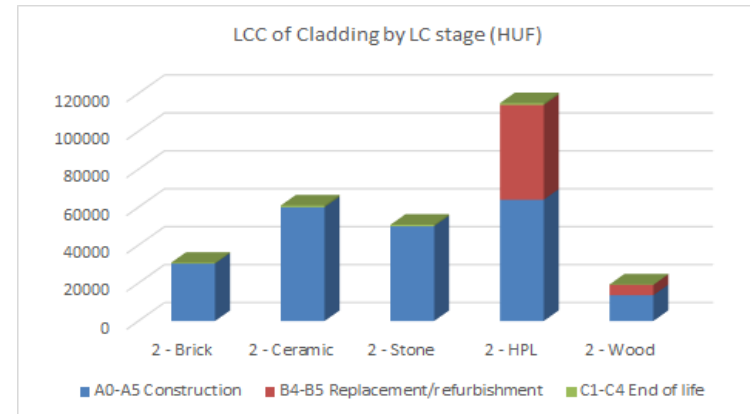
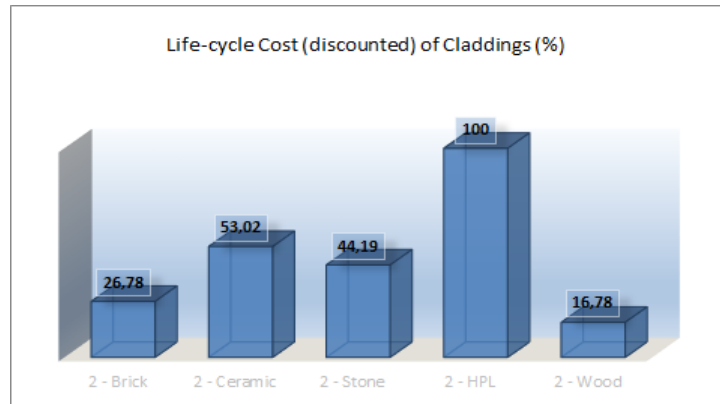
The cost distribution within each structure depends on the structural material of the walls and the insulation material used, the paints and their service life.

Internal walls - LCC



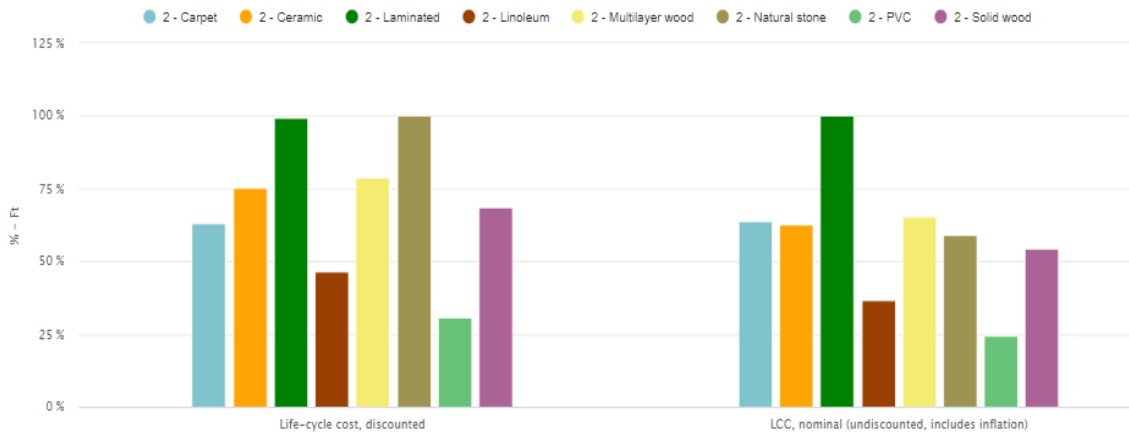
The average life cycle cost of the interior walls per 1 m² area in 50 years on average, discounted, is about 42400 HUF. The average cost of sections A1-A5 is HUF 25000. The difference is about +6000 and -17000 HUF. The most expensive is a wall made of sandlime bricks (it takes near 48000 HUF) and the cheapest is an adobe wall (25000 HUF).

Cladding



Floor finish

Life-cycle cost (ISO 15686-5 & EN 16627) - CML - All impact categories

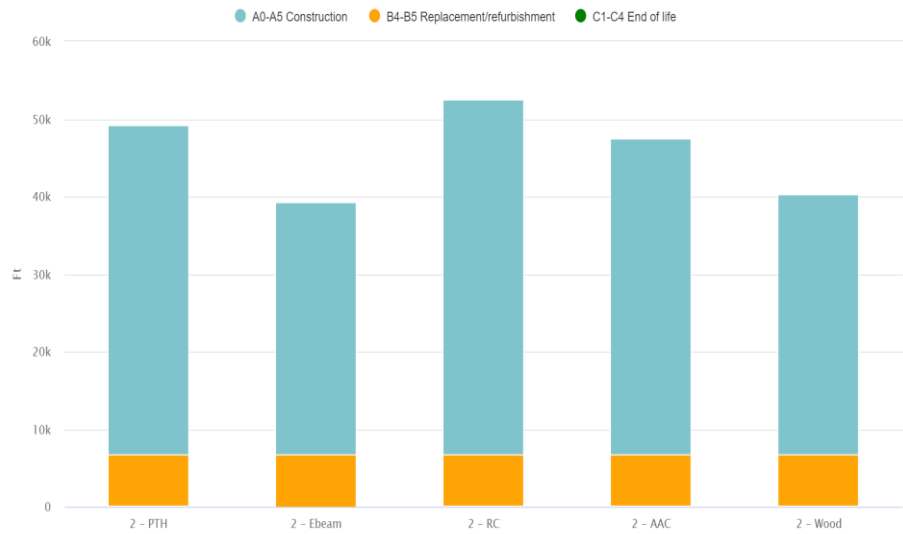
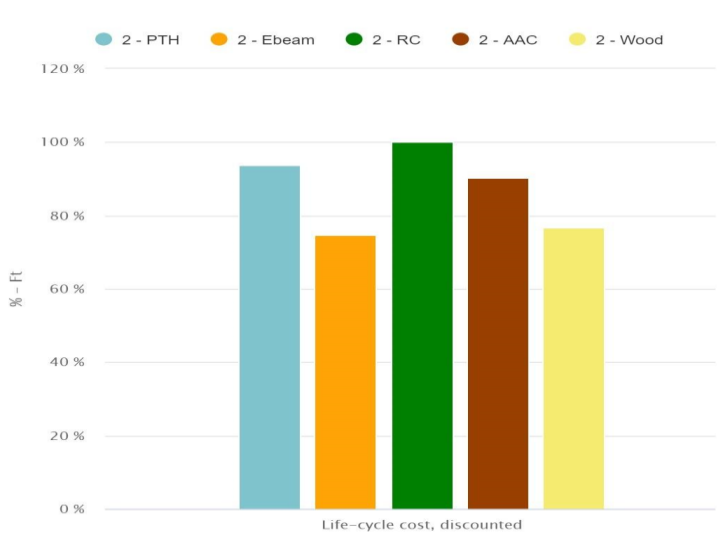


The cheapest solution of the floor finish is the PVC, and the most expensive is the natural stone. The average cost of the solutions is 25000 HUF per m².

The replacement/refurbishment cost is very variable: It is the highest in case of laminated and carpet floor (about 56 % of total LCC). The natural stone does not have replacement.



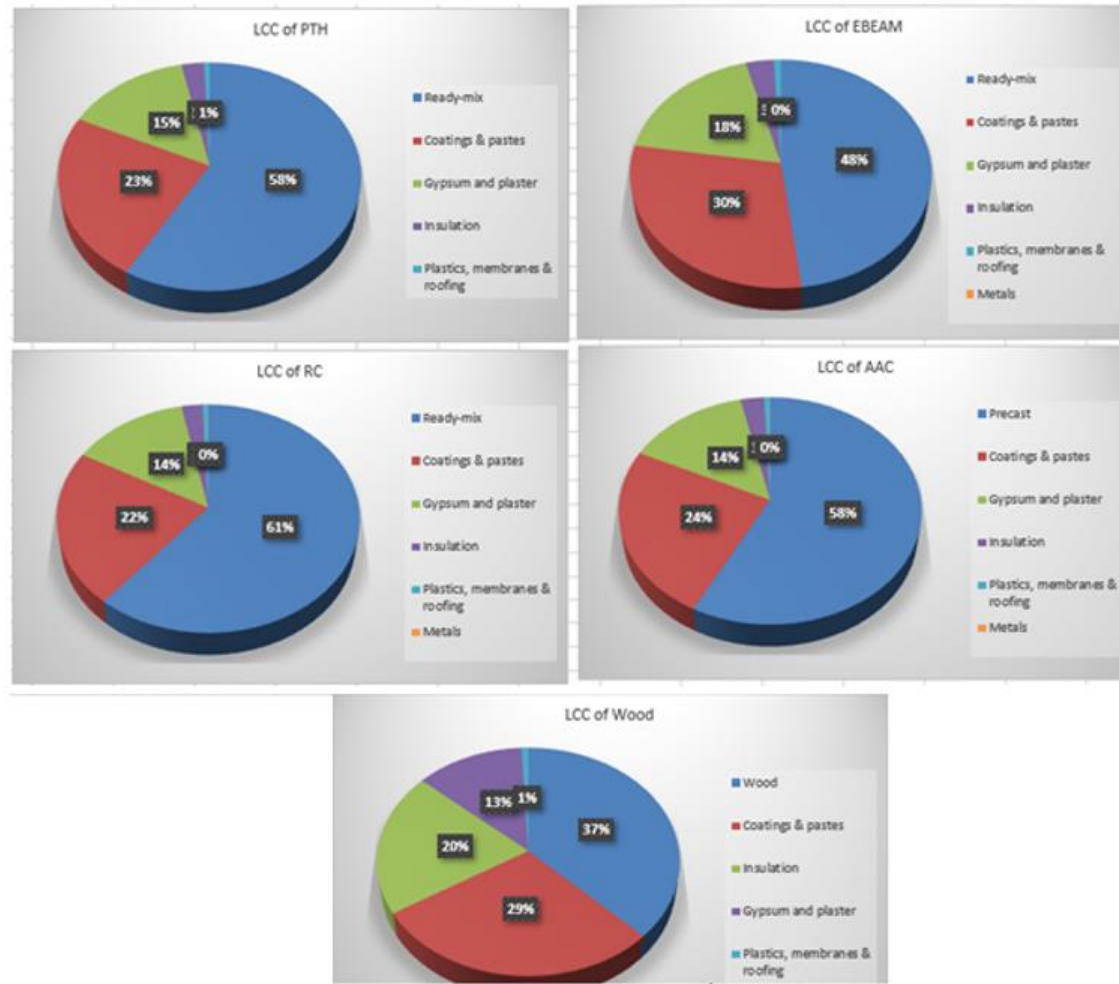
Floor slab



The RC floor slab is the most expensive option. Ebeam floor slab and the wood floor slab have near the same LCC, they are with about 25 % cheaper than the RC. The replacement costs are the same in all cases. The cost of Eol stage is negligible.

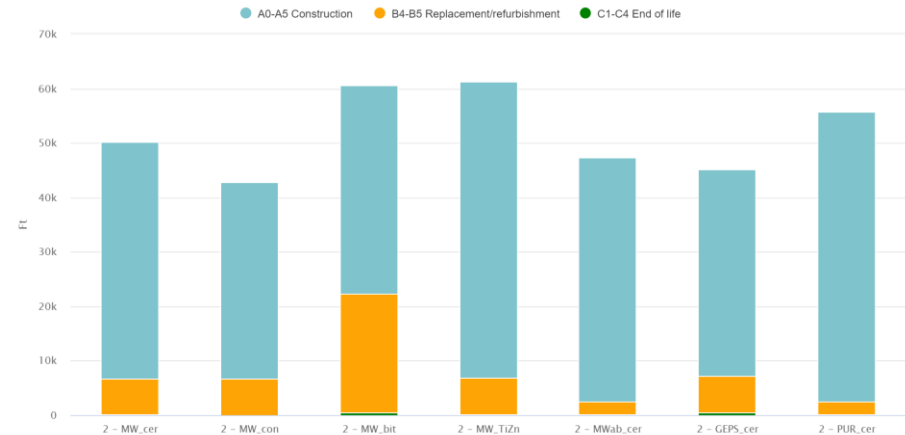
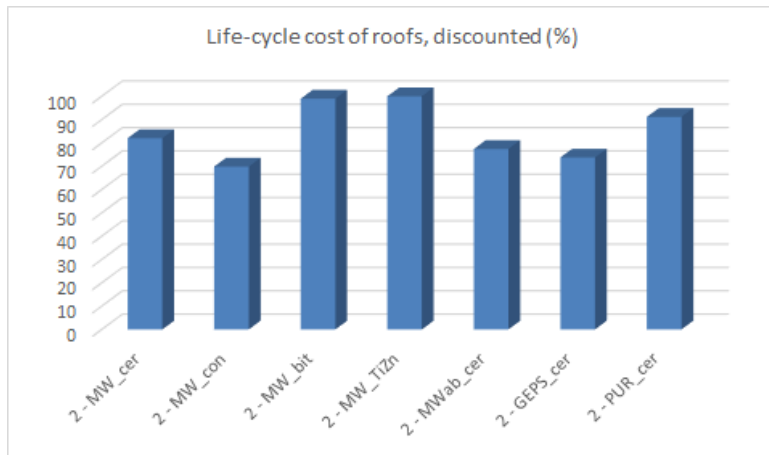


COST sharing of floor slab by elements



Roof

The average cost of one m² heated roof is HUF49000. In other words, it varies between HUF 42,000 and HUF 64500 (material cost + labour fee). The max difference of 35 %.



The most expensive roof is the MW-bit and MW-TiZn



Co-funded by the
Erasmus+ Programme
of the European Union



Thank you for your attention

Klára Szita
LCA Center

<http://howtobuildgreen.eu/>

