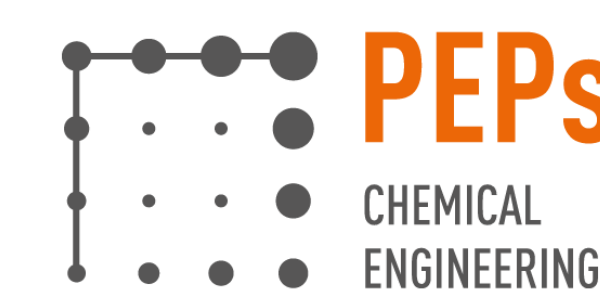


ENVIRONMENTAL IMPACT OF SANDSTONE ORNAMENTAL STONES

FROM A BELGIAN QUARRY

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PRESENTATION

Since 1990, the association **Pierres et Marbres de Wallonie** (P&M) has been promoting **ornamental stones** from Wallonia, in Belgium and abroad.

In the framework of sustainable development and the necessity of product labelling in a standardised framework, P&M is in the process of developing several **B-EPD (Belgian EPD)** to integrate the Belgian sustainability tool for construction works **TOTEM** (Tool to Optimise the Total Environmental impact of Materials).

The first two products come from the **Grès du Bois d'Anthisnes** quarry (GBA) (4171 Poulseur, BE), exploited since the 19th century.

This **sandstone** is exceptionally hard and requires no maintenance. It can be used for all types of stonework, facing stones, slabs and paving stones, and has undeniable advantages for the construction of private or public buildings and private houses. It is also ideal for interior and exterior decoration (garden, paving, pond stones, etc.).

GOAL

Life cycle assessment of sandstone products for B-EPD:

Flat cobblestone – squared ("Pavé platine")

→ sidewalks, roads

Dimensions (m):

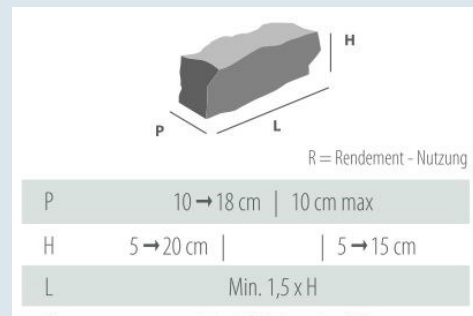
0.15 (L) x 0.15 (l) x 0.085 (h)

Cleaved rubble stone ("Moellon clivé dégrossi")

→ external wall cladding

"Average" rubble:

weighted average of sales



SCOPE

- ✓ **Functional unit (FU): 1 m² of stone**
 - Cobble: 1 FU = 195.8 kg
 - Rubble: 1 FU = 212.7 kg
- ✓ Cradle to grave – not installed
- ✓ Reference year: **2019**
- ✓ **Reference service life: 60 years**
- ✓ **EN15804+A2:2019 + "BE-PCR"** (national BE complement)
- ✓ Modules: **A1-A3, A4, B, C, D**

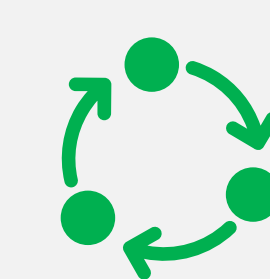
INVENTORY

- ✓ **Primary data from GBA** (quarry)
- ✓ **Background data:** Ecoinvent 3.8
- ✓ **BE grid mix 2019:** modelled from national and IEA data (29.81% fossils, 45.85% nuclear, 1.24% hydraulic, 10.06% wind, 4.2% solar, 4.33% biomass, biogas and waste (i.e. 19.83% renewable), and 4.56% from other sources)
- ✓ Quarry coproducts: **Economic allocation**
- ✓ **Global inventory for quarry** + specific routes for products: **cobblestones** and **rubbles**

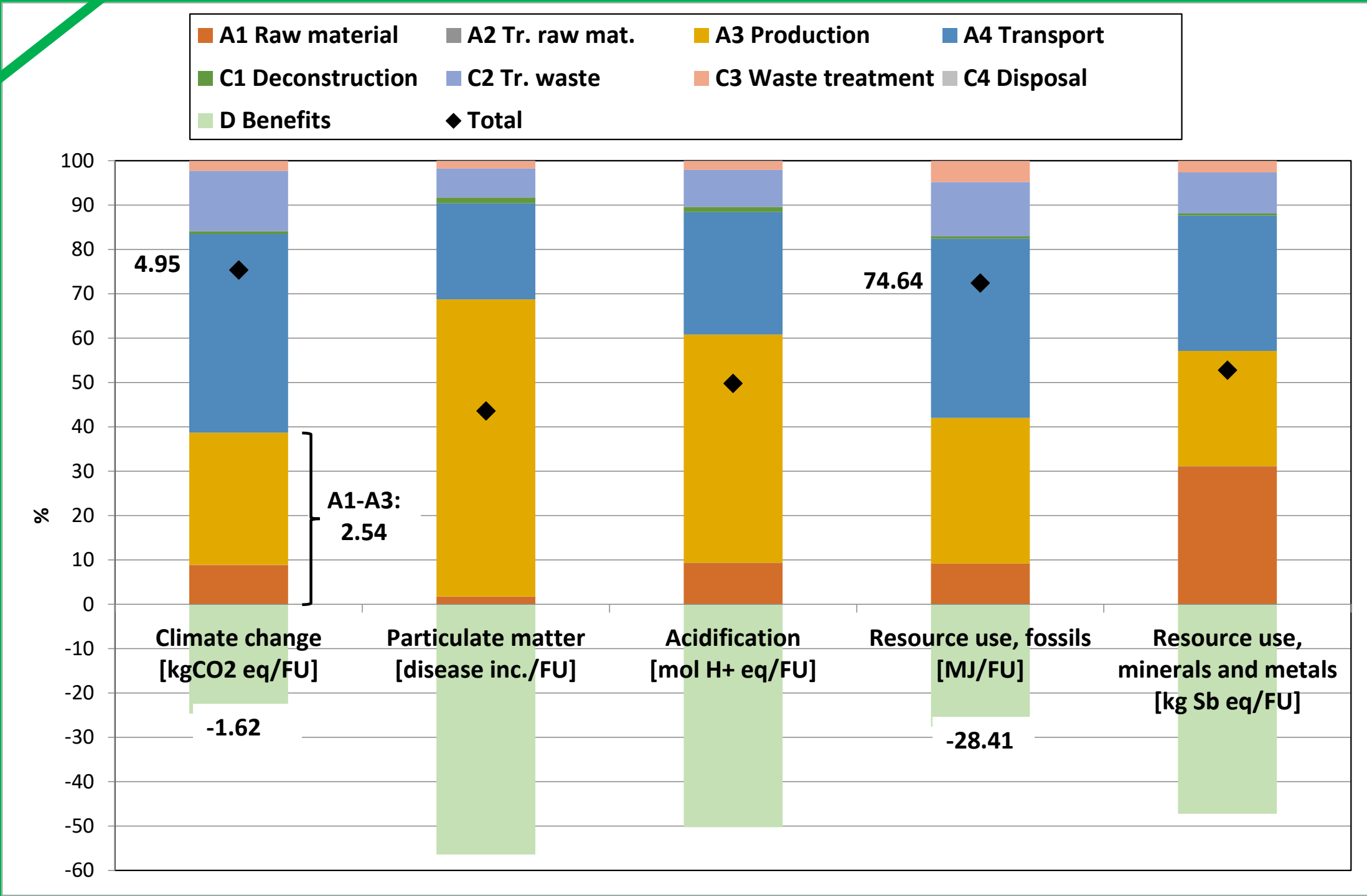
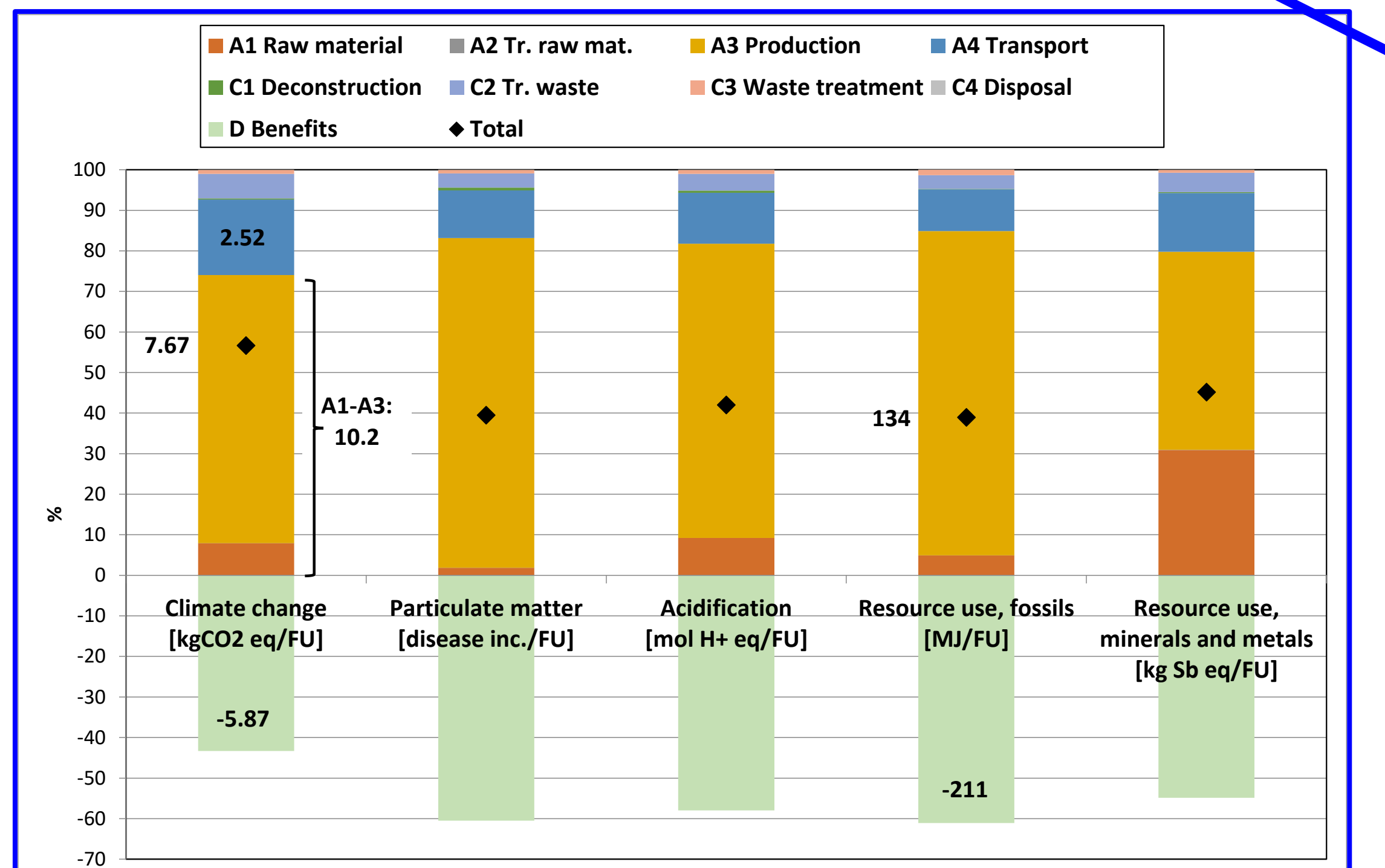
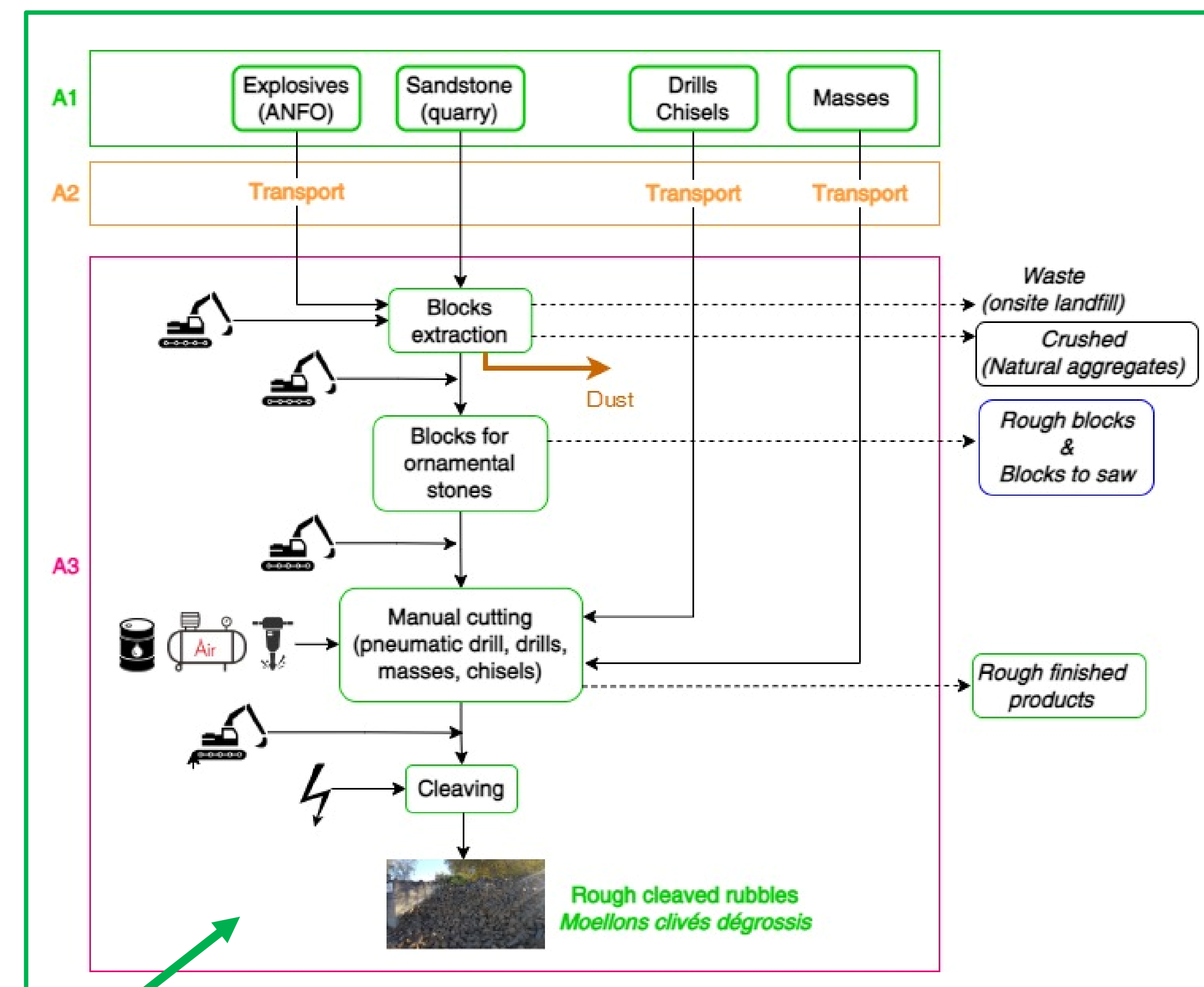
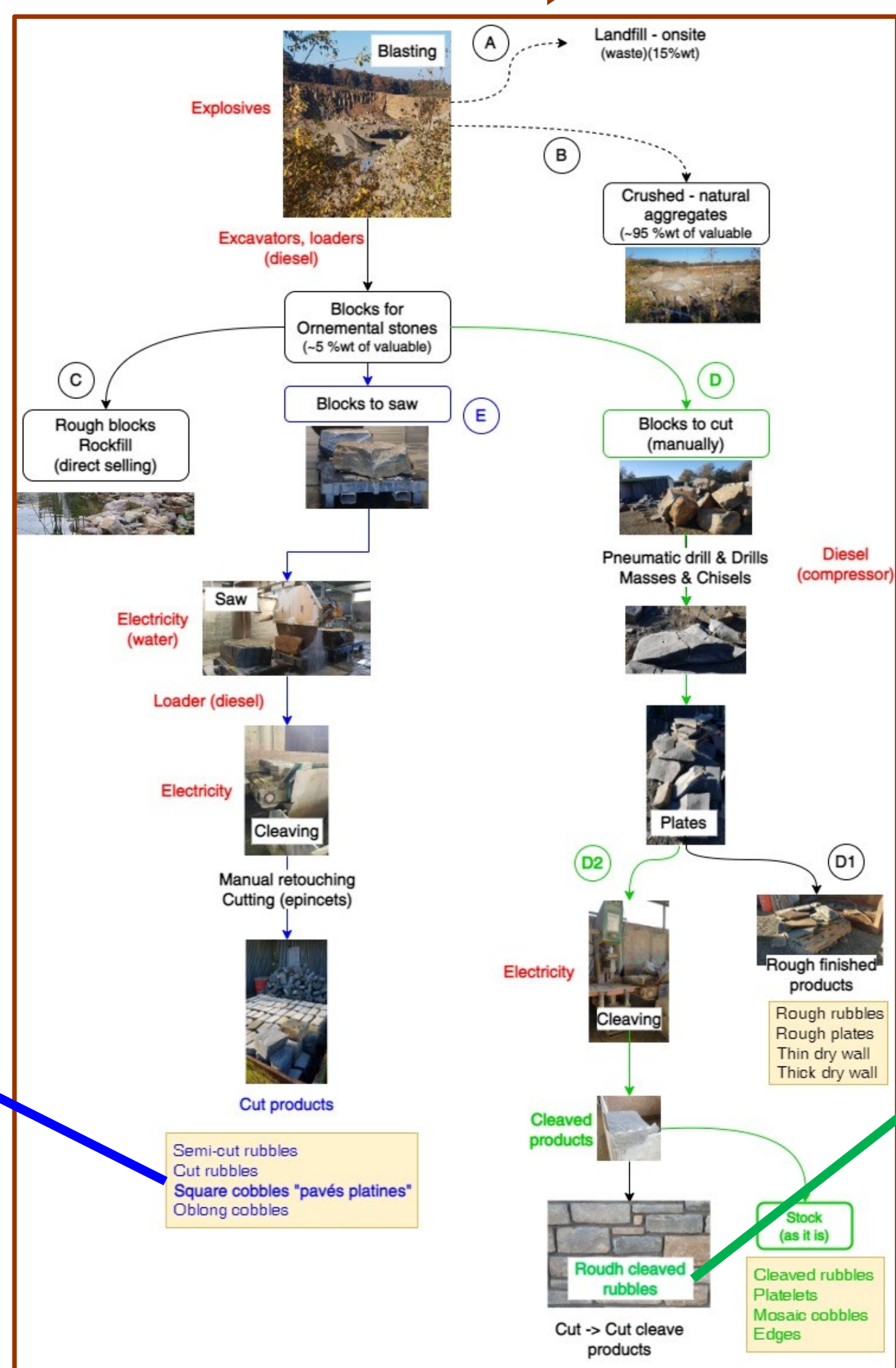
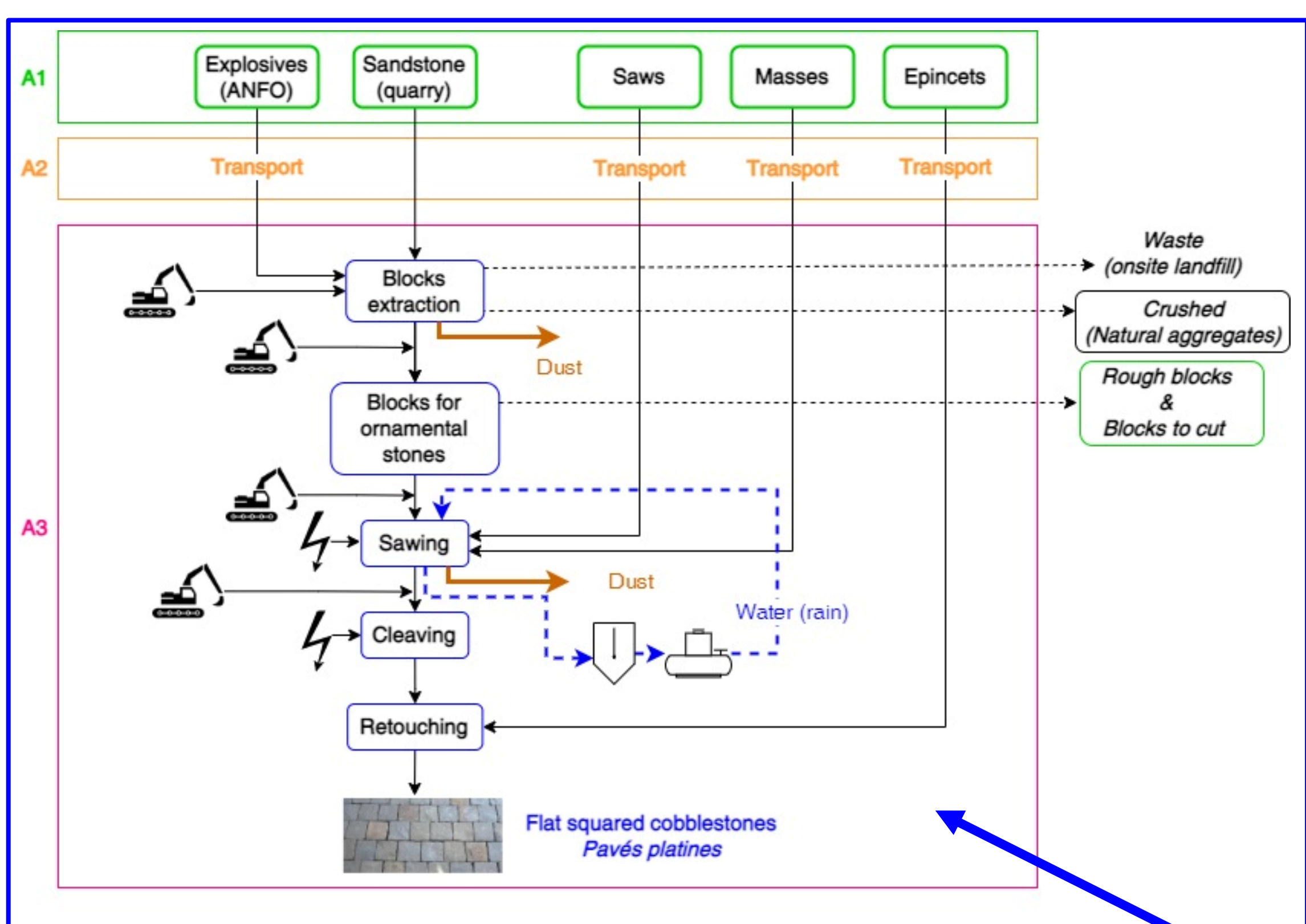
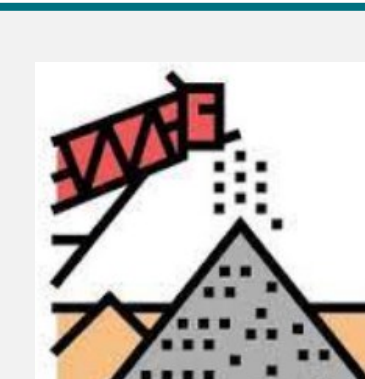


END OF LIFE: Sandstone ⇒ Robust!

Reused 85%
as cobble
as rubble
(up to 7 times!)



Recycled 15% ⇒ Crushing
95% Natural aggregates (14.25%)
+ 5% waste → landfill (0.75%)

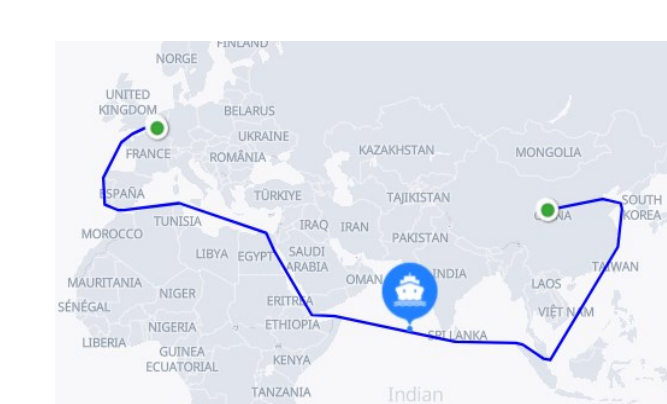


INTERPRETATION

- ✓ **Most impacting step: Production** phases (A1-A3)
- ✓ **Most impacted categories:**
 - Resource use, fossils (RU-F)
 - Particulate matter (PM)
 - Climate change (CC)
- ✓ **A3 - Production:**
 - **Cobble: electricity** (sawing) and **diesel** (quarry, sawing)
 - **Rubble: diesel** (cutting) and machines for extraction and internal transport for cleaving), and **electricity** (cleaving)
- ✓ **Important benefits (D)** due to the **reuse** (85%) of the cobbles and rubbles, and **recycling** (14.75%, as natural aggregates)

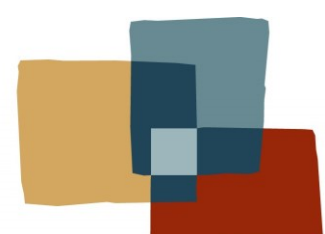
COMPETITION: Chinese cobbles (but quality? cf. peeling occurs due to "layers" issues)

- ⇒ Impact of transport **A4**
- ✓ **BE-PCR** (default value): Lorry, 121 km → **CC = 2.52 kg CO₂ eq/FU**
- ✓ **China:** Lorry/Transoceanic ship (21 650 km)/Lorry
 - **CC = 40.52 kg CO₂ eq/FU** (37.11 kg CO₂ eq/FU for the ship)



CONCLUSION: Belgian Ornamental Sandstones (GBA)

- ✓ Have **low environmental impact** globally
- ✓ Are **reusable** (and **recyclable**) at the EoL ⇒ Benefits!
- ✓ Transport environmental cost low compared to "Chinese cobbles" (16X less for CC and CO₂ eq emissions) (and guarantee of quality)



<https://www.pierresetmarbres.be/>



<https://carrieregba.be/>

