

EMBODIED CARBON

COMPARING DIFFERENT ROOFING MATERIALS

ARTA 

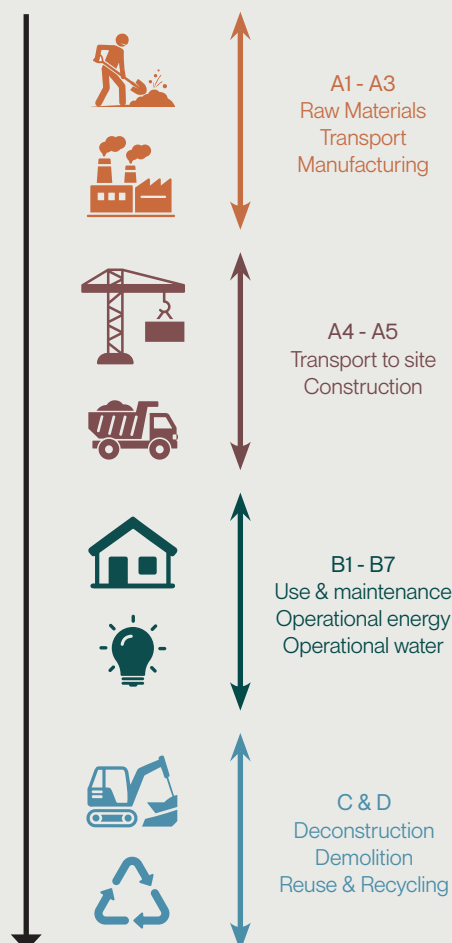
WHAT IS EMBODIED CARBON?

Embodied carbon refers to the greenhouse gas emissions generated during the manufacture, transport, and installation of a product. Products or systems with higher embodied carbon place a greater environmental burden due to the energy and resources required in their production.

HOW IS IT MEASURED?

It is measured using a life cycle assessment (LCA), which is split in numerous modules based on the building life cycle, as below:

The Building Lifecycle Modules



HOW DO ROOF TILES STACK UP?

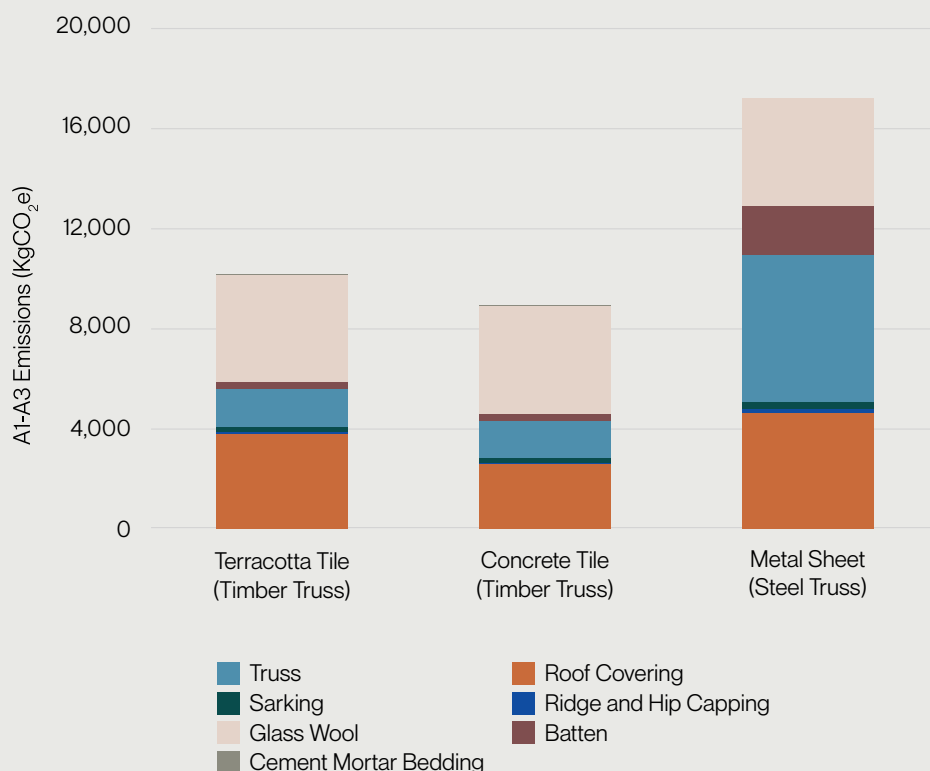


Figure 1: Roof System Embodied Carbon Comparison (Using NABERS Average Emissions Factor)

Terracotta and concrete roof tile systems have 41% and 48% less embodied carbon than a comparable sheet metal roof, respectively.

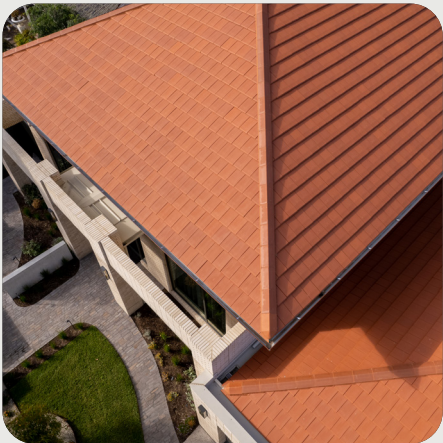
The chart above shows the total upfront embodied carbon (A1-A3) of three different roofing systems using the National Australian Built Environment Rating System (NABERS) average emissions factors.

An analysis ARTA conducted with Rebuilt showed that the metal sheet roof with steel trusses had the highest upfront carbon among the three systems. This is primarily due to the higher carbon emissions of the steel trusses. However, it is worth noting that when considering the roof covering only, metal sheet roofing still remained higher than both terracotta and concrete tiles.

Turn over to learn more about the comparison with Rebuilt →

METHODOLOGY

Rebuilt and ARTA partnered to compare the upfront embodied carbon (A1-A3) of different roof systems in a typical Australian home. It measured a standard hipped roof size for a 250 m² home with a 22.5° pitch with 540 mm eaves, using three variations:



TERRACOTTA TILE ROOF (TIMBER FRAME)

- Timber rafters (600 mm centres)
- Timber battens (38 x 38 mm pine)
- Sarking (reflective)
- R3.5 ceiling insulation batts
- Cement mortar (bedding and pointing)



CONCRETE TILE ROOF (TIMBER FRAME)

- Timber rafters (600 mm centres)
- Timber battens (38 x 38 mm pine)
- Sarking (reflective)
- R3.5 ceiling insulation batts
- Cement mortar (bedding and pointing)



SHEET METAL ROOF (STEEL FRAME)

- Sheet metal (0.42 mm BMT)
- Steel trusses (900 mm centres)
- Steel battens (40 mm top hats)
- R1.3 Anticon blanket (sarking)
- R3.5 ceiling insulation batts

COMPARING EMBODIED CARBON SOURCES

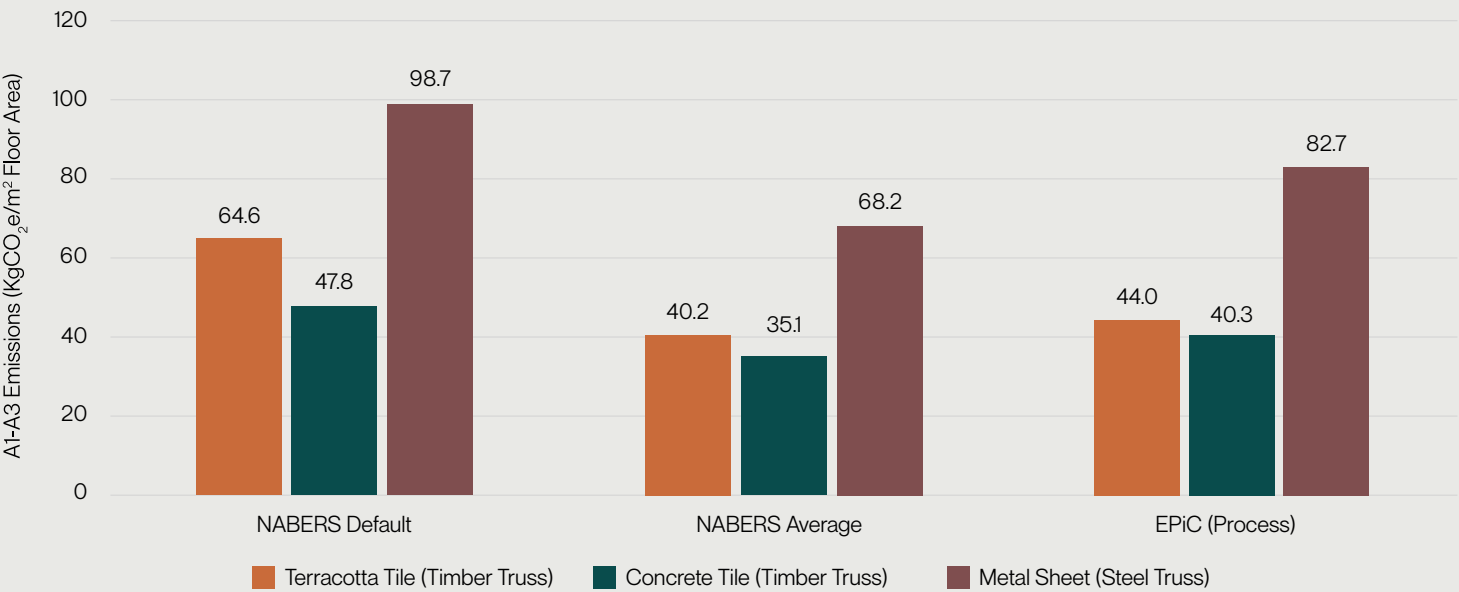


Figure 2: Roof System Embodied Carbon Comparison per m² of Floor Area (Using different Emissions Factors)

Emissions factors (EFs) from publicly available databases are used to quantify the A1-A3 embodied carbon. The chart above shows how the comparison results differ by using different EFs from NABERS and Environmental Performance in Construction (EPIC) database. Even when looking at the NABERS default emissions factors and the EPIC Database, the sheet metal roof system has consistently higher embodied carbon than the two tiled roof systems.

Not only do terracotta and concrete tiled roofs have lower embodied carbon based on these comparisons, they also have demonstrated durability, reducing ongoing maintenance, making them an environmentally responsible choice for roofing your home.