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Main CE practices in the Construction industry for the six carbon-intensive materials

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Abstract:

CE practices are Refuse, Rethink, Reduce, Reuse, pave the way for the construction sector to become less material- and carbon-intensive. However, for CE quantification by climate mitigation models, one must first identify the CE practices along a product (or material) value chain. In this review, we map CE practices used within the value chain of 6 construction materials to understand how these practices influence and can be considered in climate mitigation modelling. The main sub-categories of steel, cement, glass, clay-brick, insulation materials, and wood were used to identify which Rs are currently addressed at the lab and industrial scales: refuse, reduce, rethink, repair, reuse, remanufacture, refurbish, repurpose, recycle, and recover. The CE practices were reviewed using scientific repositories and grey literature, validated by European-wide stakeholders. Although ideally, the CE practices should be mapped across all the life-cycle stages of the six materials – extraction, manufacturing, use, and end-of-life (EoL), this was limited to the manufacturing and EoL stages. This is because it was found that information for the construction materials could be identified mainly at these stages since the extraction phase pertains to resources, such as sand, and not to materials, and the use phase focuses on products, for example, buildings. All reviewed CE practices that were identified to be implemented at the industrial scale were quantified at the European level. For example, regarding EoL reinforcement steel, it was found that 1-11% is currently reused in the EU and 70-95% is recycled. CEM I manufacturing is reduced by up to 60% by using supplementary cementitious materials in the making of concrete. A major barrier to closed-loop recycling is the need for sorting and separation technologies. On the other hand, open-loop recycling synergies are found at the industrial scale between, for example, flat glass and glass wool value chains.