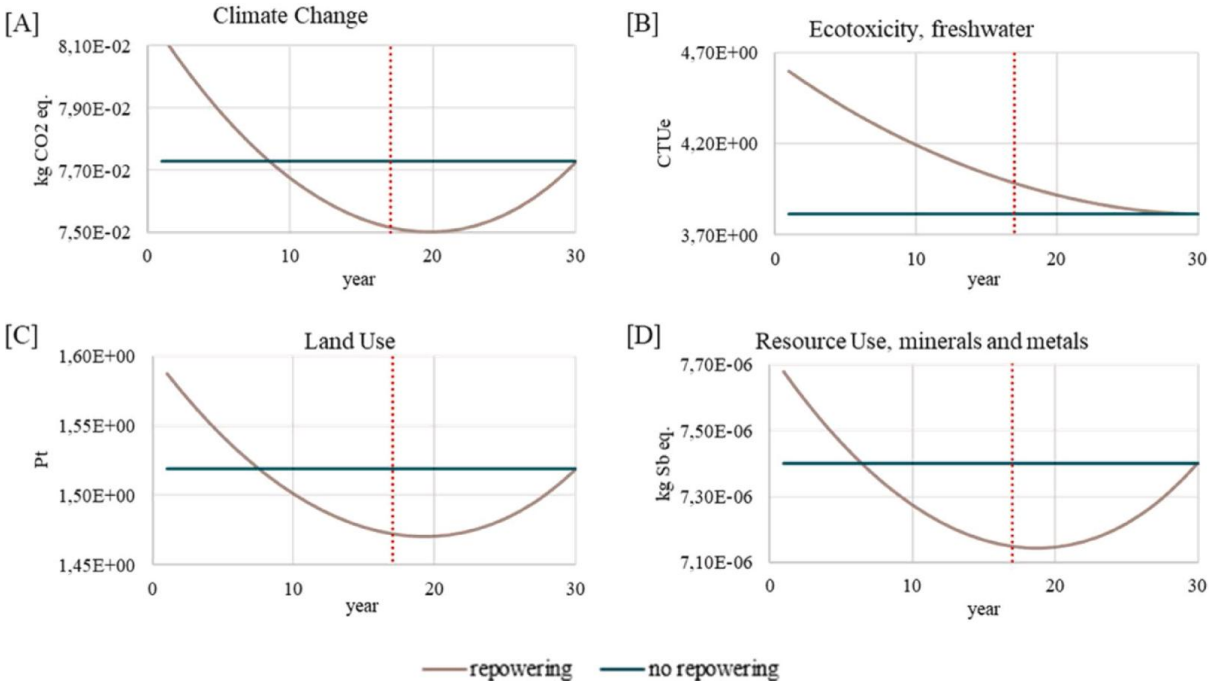
Repowering Impact on Carbon Footprint

Repowering existing assets vs development of greenfield has impact on carbon footprint. However, the impact on carbon footprint on greenfield is significantly higher. Solar plant modernisation delivers major embodied-carbon savings compared to greenfield development. In a new build, emissions from steel and foundations are high, civil works generate significant carbon, grid infrastructure is entirely new, and transportation of materials adds further embodied CO_2, resulting in a total embodied CO_2 of 100%. In contrast, repowering largely avoids emissions from steel and foundations, minimises civil works, allows existing grid infrastructure to be reused, and significantly reduces transportation-related emissions, lowering total embodied CO_2 to approximately 30–45%. Avoiding steel-intensive foundations alone makes renewable asset modernisation one of the most effective decarbonisation levers in the solar sector. In addition, repowering contributes to greener energy production by reducing resource consumption, minimising land-use impact, and extending the life of existing solar assets, making it a highly sustainable and environmentally responsible strategy for accelerating the transition to low-carbon energy.

The figure below shows how repowering ageing PV systems reduces carbon footprint per kWh when done at the right time, becoming beneficial after 9 years and optimal around 20 years, as modern PV output outweighs manufacturing and end-of-life impacts.



Comparison of environmental impacts (including climate change/carbon footprint per kWh) for repowered and baseline PV systems over time, showing lower embodied CO_2 outcomes when repowering is applied at the optimum point. Source: Life cycle assessment of PV module repowering, Energy Strategy Reviews (Herceg et al., 2022).

[A] Climate Change, [B] Ecotoxicity, freshwater, [C] Land use and [D] Resource use, minerals and metals.

It can be concluded that Repowering can make renewable energy truly renewable and drive the whole solar industry towards sustainability and a greener future. Repowering enables solar plant refurbishment instead of new construction, photovoltaic performance enhancement on existing land, and long-term solar lifetime extension. Beyond operational improvements, it minimises environmental impact, reduces resource consumption, and avoids the need for additional land, making solar energy deployment more responsible and sustainable. This approach not only maximises the potential of existing solar infrastructure but also contributes to the ultimate goal of creating a better world in a changing climate.

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