5. Residual emissions

As well as residual emissions in shipping and aviation, most published national statistics for total greenhouse gas emissions fail to account for the carbon footprint associated with products that are imported. As a result, the figures for CO_2 per capita and CO_2 per unit of GDP also cannot be accurately representative.

In particular, many energy-intensive industries, notably steel making, have moved from older industrialized countries to developing, lower income economies in the last few decades. However, the CO_2 emissions related to their processes are not reallocated appropriately when these commodities are exported for use elsewhere. Another important example is cement manufacturing for concrete, which is also a massive source of CO_2 emissions globally.

The CO_2 emissions from the global manufacture of steel and cement are each as high as those from the EU and together they are greater than those from the US. Through these materials inputs, the low carbon electricity supply technologies that the world is rightly adopting still have significant life cycle CO_2 emissions compared to fossil fuel power production.

Wind turbines are principally made of steel, with taller offshore structures requiring greater quantities, as will tidal stream turbines working against powerful ocean currents. Onshore wind turbines additionally need concrete foundations and land surfacing. Similarly, nuclear power stations and tidal range barrages use massive amounts of concrete and steel.

Compared to building-mounted solar photovoltaic (PV) modules, rural solar farms require greater steel/aluminium supports as well as concrete foundations and roads. Remote nuclear power stations and renewable energy farms also need long power transmission cables using copper, aluminium and alloys of other energy-intensive metals.

However, manufacturing the energy efficiency systems of double/treble glazing and mineral fibre insulation are additionally energy-intensive processes and plastic foam building insulation materials use extremely powerful greenhouse gases (HFCs) in their production.

The materials inputs and carbon-intensive energy requirements of all other energy efficiency systems and low carbon energy supply technologies, including heat pumps, batteries, hydrogen production and fuel cells, therefore crucially need carbon mitigation as well.

National and local governments, with their businesses and citizens, particularly in richer economies importing carbon-intensive products, need to correct these carbon accounting limitations. The transferred responsibility for CO_2 from more transparent and fairer analyses can also only be genuinely mitigated with a secure carbon negative technique.