UNDERSTANDING RAIL WASTE: QUANTIFYING POTENTIAL FOR DECARBONISATION OF TRACK INFRASTRUCTURE USING MATERIAL FLOW ANALYSIS

ABSTRACT The rail sector is poised to experience significant growth due to urban expansion and decarbonisation goals which favour rail over other emissions-intense modes of transportation. Minimizing rail track waste is critical to alleviating the environmental burden of rail track maintenance and expansion. This study aims to characterize and quantify the management and environmental impact of UK used rail track materials (ballast, steel rail and sleepers) using material flow analysis (MFA).

To assess the decarbonisation potential of recycling and reusing rail track materials, a set of increased recycling scenarios was developed and compared with the business-as-usual case constructed with MFA. This study found that of the 2.7 million tonnes of used rail track material which are renewed per year, 2.2 million tonnes are downcycled into lower-value assets outside of the rail sector.

Given physical limitations on material recycling, 30% of ballast, 32% of concrete sleepers and >95% of steel rail could be recycled and returned to the track without impacting the strength and safety of the railway. Despite this, only 10% of used track ballast is reused on the rail network as a blend with virgin ballast, while 9.8% and 0.4% of sleepers and steel rail are reused on the track, respectively. Figure 1 depicts a Sankey diagram illustrating the flows of ballast during one year of UK track renewal.

Figure 1. Track Ballast Material Flow Analysis

Track renewals in the UK lead to over 160,000 tCO2e of emissions per year from new material production. Maximizing the quantities of reused and recycled rail track material can reduce these emissions by 49%. There is an opportunity for the UK rail sector to decarbonise track maintenance through increased material recycling, which should be analysed further to overcome key barriers identified in this study.