Leeds Flood Alleviation Scheme (Phase 2):

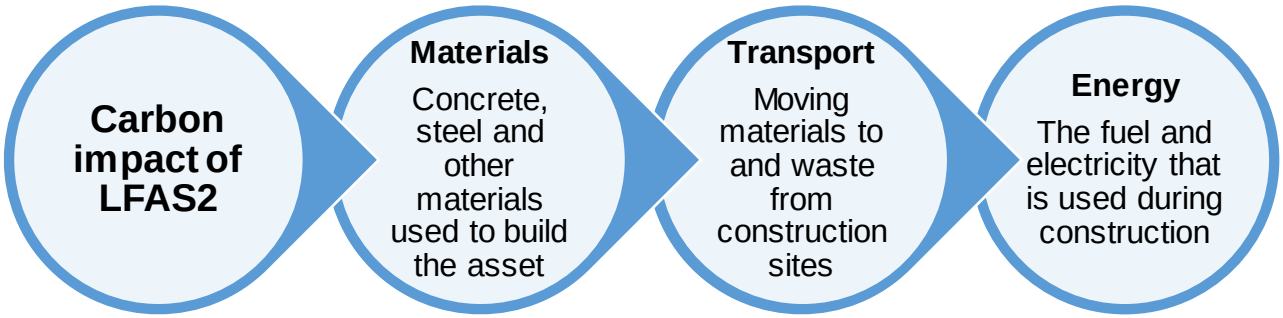
Carbon savings and low carbon innovation

This document provides an overview of the carbon impact of the Leeds Flood Alleviation Scheme Phase 2 (LFAS2). It demonstrates the carbon savings of reducing flood risk and captures some of the innovative low carbon activities taking place through the construction of the scheme.

LFAS2 aims to reduce flood risk to communities and businesses along the River Aire corridor between Leeds Rail Station and Apperley Bridge. The scheme will provide a one-in-200-year level of protection against flooding in the LFAS2 area. Once delivered, the scheme will reduce flood risk and provide better protection for 1,048 homes and 474 businesses.

Carbon and infrastructure

The construction, operation and decommissioning of assets is a major source of greenhouse gases (GHGs), henceforth referred to as "carbon equivalents"[1]. Leeds City Council (LCC) has recognised the scale of the challenge of reaching Net Zero emissions in the UK by 2050 by declaring a climate emergency in 2019 and prioritising the reduction of carbon in infrastructure projects.



LFAS2 carbon reduction

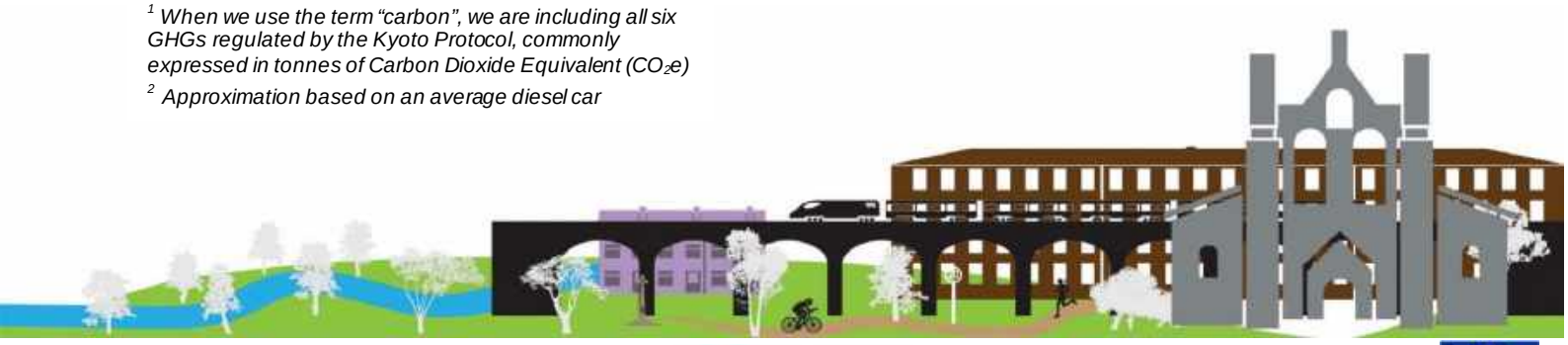
To address the carbon impact of the scheme, we established a **carbon baseline** – the quantity of carbon that would be emitted because of the scheme without additional mitigation. The baseline emissions associated with the construction of LFAS2 are estimated to be approximately 23,600 tonnes of CO_2 equivalent (tCO_2e). That is the equivalent of driving around the world 3,500 times[2].

We are working closely with engineers and contractors on the project to reach the targets set out below. Carbon specialists are sharing insights from the carbon baseline and suggesting alternative, lower-carbon approaches.

We will continue to monitor progress against our targets as the design progresses.

[1] *When we use the term "carbon", we are including all six GHGs regulated by the Kyoto Protocol, commonly expressed in tonnes of Carbon Dioxide Equivalent (CO_2e)*

[2] *Approximation based on an average diesel car*



LFAS2 carbon reduction targets



= 20% ⬇

Most of the baseline emissions are expected to arise from the use of materials. LCC has set a **20%** carbon reduction target from the use of materials. If this target is reached, this would reduce scheme emissions by approximately 3,200 tonnes – shaving off around 480 trips around the world.



= 10% ⬇

Just under 25% of carbon is associated with fuel and electricity use during construction. LCC has set a reduction target of **10%** for the carbon from construction energy use. If this target is reached, this would reduce scheme emissions by over 500 tonnes, shaving off another 80 trips around the world.

The carbon impact of flooding

Whilst measuring and minimising carbon emissions from constructing the flood walls remains the overall target, it is also important to consider the potential carbon avoided aspects. We worked with the Edinburgh Centre for Carbon Innovation at the University of Edinburgh to quantify the carbon impacts associated with flood damages within the City of Leeds. The aim of the study was to estimate the potential carbon savings associated with preventing flood damages granted by the installation of the Leeds Flood Alleviation Scheme (LFAS) Phase 1 and Phase 2.

The Carbon Management students calculated the carbon impacts associated with transport, commercial buildings, and residential buildings, respectively, in 2020. The student's reports estimated the carbon impacts associated with a 1-in-200-year event within the City of Leeds, using the extent of the 2015 Storm Eva Boxing Day flood event and modelled flood extent data as primary information sources.

Combined, the carbon impacts associated with a single 1-in-200-year flood event, and therefore the carbon emissions potentially prevented by LFAS during a similar event, were calculated to be 51,670 tCO_2e. This number provides evidence that LFAS, which is estimated to have a capital carbon footprint of 45,130 tCO_2e, delivers a potential net carbon saving of 6,540 tCO_2e by protecting the city from a single equivalent flood event*.

THE UNIVERSITY of EDINBURGH

The **carbon savings** associated with preventing a major flood event are equivalent to **one** of the journeys that we have estimated below...



Driving around the world **950 times** in a diesel car

One person flying one-way from JFK airport, New York to Heathrow airport **6,200 times**





1 million trips as a car passenger on the Dover to Calais ferry

**Although the study by students at the University of Edinburgh provides a positive message, a range of assumptions and limitations have been adopted during the analysis which may lead to an over or under estimation of the calculated carbon damage values derived. Further work is being carried out in 2021 to refine a robust methodology to calculate the carbon damage of flood events and provide an accurate framework.*

Low carbon innovation in action

Hydrotreated Vegetable Oil (HVO) – Crown Oil

We are trialling the use of HVO within the plant used for the pilings works in Zone 12 around the Home Office and Kirkstall Valley Farm site.

The carbon savings associated with HVO amount to 85-90% reduction compared to regular diesel. HVO is a more refined type of vegetable oil and burns much cleaner than diesel, which results in a cleaner exhaust with up to a third less particulate matter and hydrocarbons. This gives a 25% reduction in carbon monoxide and 10% reduction in nitrogen dioxide.

There is a slight increase in cost for the use of HVO, however the significant reduction in carbon emissions make it a viable option on many projects. The carbon emission factors for HVO is 0.34 kg CO_2e, whereas gas oil produces considerably more at 2.8 kg CO_2e.

Benefits

- Significant reduction in carbon emission when compared with traditional hydrocarbon fuel
- Environmental benefits e.g. air quality
- Applicable to a wide variety of plant
- Cost reductions as it becomes more widely used

Eco Sheet Piles – Arcelor Mittal

Sheet piles are sections of sheet materials with interlocking edges that are driven into the ground to provide earth retention and excavation support. On the Leeds FAS project these are used for flood defences.

We are using EcoSheetPiles, supplied by Arcelor Mittal, at Zone 12 at the Home Office site, which will contribute to the low carbon initiatives on LFAS2. These energy efficient products are from the range of EcoSheetPiles which are produced in mills located in Luxembourg from circa 100% scrap via electric arc furnace technology, as well as being fully reusable and recyclable.

ECO PLATFORM EPD EN 15804 VERIFIED

EcoSheetPiles™ ArcelorMittal

Benefits

- Saving of 414kg CO_2e/tonne
- Lower CO2e emissions during production than regular Sheet Piles
- 100% scrap and Electric Arc Furnace
- Fully reusable and recyclable
- Recycled scrap which avoids disposal to landfill

Electric vehicles

Electric vehicles and charging points are available at the LFAS2 site compound.

The electric pool cars on LFAS2 are used for site visits, inspections and consultation meetings with various parties. The three charging stations at the site compound are connected to the mains supply and procured from a green tariff.

Having electric vehicles on site enables us to meet agreed carbon targets and reduce project carbon emissions. Using an electric fleet also means the air quality in the environment is significantly enhanced, in comparison to traditional diesel fuel, which releases harmful gases into the atmosphere.



Benefits

- Reduction in on site carbon emissions using electric vehicles
- Commitment to meeting project carbon emission targets
- Environmental benefits e.g. air and noise quality
- Simple, convenient, and fast charging of vehicles on site
- Green tariff supply