Freight carries real weight. It is not only an important component of the UK’s transport network but freight is also a significant contributor to the economy accounting for £74.5 billion annually and employing 2.3 million people. Yet, freight accounts for about 35 million tonnes of CO₂ every year. With the Government committed to ambitious carbon reduction targets, what can the sector do to play its part?

At the Institution we believe that:

- **The freight sector has the potential to make a substantial contribution to the reduction of emissions from transport** both directly and indirectly.
- **Less polluting freight modes are currently underutilised.** Sea and rail freight are less polluting than road freight – by far the biggest polluter, which continues to contribute over 90% of the sector’s emissions.
- **Government should pursue a more holistic approach to the movement of goods,** which considers the best emissions outcome for journeys by creating a hub and spoke network using all modes and fully utilises the most emissions efficient means. Much of such a network is already in place and the planned increases in rail capacity will help further.
- **Past infrastructure investment in roads, rail and ports has been fragmented** with no clear aim. Further development decisions should be as integrated as possible.

Improving the world through engineering
The UK freight sector is vital to our economic prosperity. The efficient movement of goods keeps our industries running, our stores stocked and our businesses profitable. However, we currently waste around £10bn. per annum stuck in congestion and continue to emit vast amounts of greenhouse gases into the atmosphere. Indeed, over 8% of the UK road network is already subject to very congested conditions and is set to get worse. Congestion and emissions are therefore likely to rise. An integrated approach to freight, which utilises the most efficient transport mode, can help solve this conundrum.

Our goods are moved about on a number of different modes. Some move more goods than others and some are more damaging to the environment per tonne kilometre of freight moved. Here you’ll find a discussion of the main modes:

**ROAD FREIGHT**

Road freight dominates the domestic freight transport sector both in terms of market share and emissions. Road freight accounts for 35% of total UK transport emissions and 92% of domestic freight emissions (the combination of HGVs and LGVs). With a rising trend in the level of activity, these figures would be worse had it not been for improved fuel consumption mainly through better engine technology and improved fleet management. Importantly road freight produces around 8 times more carbon per tonne kilometre than rail freight and 9 times more than sea.

Accounting for such a major share of emissions, the re-routing of road freight to other less polluting modes clearly offers the best scope for reductions. Apart from any direct reduction in emissions through modal shift, there will be other less tangible benefits to other road users through easing congestion. Road freight does, however, offer greater flexibility than some other means and in many applications such as rural areas there is no realistic alternative.

**RAIL FREIGHT**

Rail freight is experiencing somewhat of a renaissance. The steady reduction in rail freight over the past few decades appears to have been reversed from a low of 12 billion tonne kilometres in 1995 to 21.5 billion tonne kilometres in 2007 – representing just under 10% of market share. With this increase coming mainly at the expense of road, an estimated 2 million tonnes of pollutants and 6.4 billion lorry kilometres have been saved. With growing industrial awareness of carbon impacts and a willingness to change established practice, rail freight offers an attractive alternative: rail freight emits far less than road freight per tonne kilometre by a factor of 8 and is inherently safer.

Indeed, rail freight’s market share is predicted to rise by 8% by 2030. Such a shift would require an increase in rail freight capacity of 13.04 billion tonne kilometres, which the present system simply cannot accommodate. Infrastructure has benefited from significant investment recently including the upgrading of the West Coast main line. These improvements and the recently announced Government plans to introduce high speed rail should free up some capacity on existing lines for extra freight services. However, the actual additional capacity that will become available for freight is difficult to quantify due to a large number of variables. However, even the most optimistic forecast falls well short of that required to accommodate an 8% rail freight increase. Indeed, even if there were the capacity the impact of an 8% move from road to rail would still only deliver a 1% reduction in total transport emissions. Without further substantial infrastructure investment in new track the potential of rail freight to reduce the UK’s total transport emissions will be severely limited.

![Figure 1: Modal Shares of CO₂ Emissions from Domestic Freight Transport.](image-url)
MARITIME FREIGHT

The UK’s ports are the busiest and most successful in Europe and among the most productive in the world, handling 95% of our imports and exports by tonnage. The majority of this traffic flows through three main hubs where much of the infrastructure investment has been directed. Only 30% of domestic freight is then shipped onwards by sea.

With the UK’s proven efficiency in handling maritime freight and with 120 UK commercial ports there is much scope for emissions reduction by better utilisation of short sea shipping – which emits less per tonne kilometre than rail or road. Further infrastructure investment will be required at ports to relieve bottlenecks and to ensure seamless integration with rail and road for final delivery but there is no problem with capacity on our natural waterway.

AIRCARGO

Airfreight is of significant importance to the UK’s national economic competitiveness, contributing £5bn to GDP per annum and employing some 86,000 people, directly and indirectly. As a net importer of air cargo, airfreight is an essential tool for many UK businesses. The industry is dominated by the London airports, centred mainly on Heathrow, with 70% of cargo carried on passenger aircraft and the remainder on dedicated cargo-only planes.

Despite the size of the business and the fact that freight traffic at UK airports has doubled since 1990 – a trend expected to continue over the next 30 years – domestic airfreight accounts for just 0.1% of the UK’s freight transport emissions. However, there is no real alternative for international airfreight which, although accounting for 6% of total freight emissions, compares favourably to all other modes by carbon/tonnes due to the relatively light loads (mostly mail and parcels).

Further, the aircraft industry has clear targets set by the Advisory Council for Aerospace Research in Europe (ACARE) to reduce CO₂ emissions by 50% and NO₂ by 80% by 2020. These are very stringent but achievable targets which, if met, would result in a net balance in CO₂ emissions from aircraft in 2020.

PIPELINE

Transportation by pipeline has the least carbon impact of all modes at 10 gmCO₂/tonnekm, but with high volumes this accounts for 0.3% of total freight emissions. However, with applications for pipeline transportation being limited and very sensitive to productivity levels particularly for oil and gas, there is no projected growth for this mode up to 2015. In the future, there will be carbon savings in this area as the UK’s energy mix becomes more sustainable, because like rail, pipelines mainly employ electrical power as an energy source.

SO WHAT DO WE NEED TO DO AND HOW DO WE DO IT?

Domestic airfreight is small enough to be discounted and there is no real alternative to international airfreight. However, in the domestic environment there is a clear carbon benefit to be gained in transferring freight from road to rail or sea. Indeed, modal shift from road to rail or sea should be a crucial element in the Government’s strategy to achieve emissions reduction targets.

A holistic approach to freight movement in the UK that considers the best emissions outcome for journeys by creating a hub and spoke network is required. Ideally the UK should have an integrated freight hub network managed by a single entity where cost and delivery is structured to encourage use of the least polluting options. We need more ports as hubs together with regional hubs served by rail and sea for longer “spokes” (over 150 miles) and transfers to other hubs with road vehicles for final delivery. There will obviously still be a commercial need for some longer haul air and road freight but where delivery times are flexible sea and canal would be the preferred modes.

Much of such a network is already in place and the planned increases in rail capacity will help further but past infrastructure investment in roads, rail and ports has been fragmented with no clear aim. Further development will require significant investment and we believe that decisions should be made using an integrated planning approach. Sound data must be used based on cost and long term carbon benefit with the aim of maximising the contribution towards the 2050 emissions target. For instance rail freight, where considerable infrastructure investment would be required to achieve any significant carbon benefit, the estimated UK energy mix in 2050 should be the basis for emissions calculations.
REFERENCES

2 Eddington Review, 2006
3 DfT Britain’s Transport Infrastructure – High Speed Two – January 2009
4 CO₂ Emissions from Freight Transport in the UK: Report by Herriott-Watt University for the Commission for Integrated Transport 2004
11 The Future of Air Transport, DfT, December 2003
12 Carbonfia 2007
13 CO₂ Emissions from Freight Transport in the UK: Report by Herriot-Watt University for the Commission for Integrated Transport 2004