



References for Coal Action Network's (2015) report Ditch Coal
www.coalaction.org.uk/ditchcoal.pdf

Appendix VI

Shipping Emissions Calculation Methodology

Port to port distances were calculated using the online tool <http://www.sea-distances.org/> (accessed 29/10/15).

CAN used example routes from ports in Colombia, USA and Russia to the ports where they deliver coal to in the UK. For ships to Hunterston CAN had to approximate using the nearest available port on the online tool, however the difference in distance because of this is negligible.

With ships travelling an average speed of 10 knots, each of the journeys took the following times:

- From Santa Marta to Ardrossan: 4171 nautical miles, 17 days and 9 hours
- From News Orleans to Immingham: 4877 nautical miles, 20 days and 8 hours
- From Riga Terminal Latvia to Immingham: 1070 nautical miles, 4 days and 11 hours

These are an approximation as the actual distance varies from journey to journey due to tides, winds and currents as well as ships taking detours to avoid low emission zones.

According to Chris Bowen, Master Mariner, an average 100,000 tonne dry bulk carrier used to carry coal burns on average 85 tonnes of fuel a day.

Heavy fuel oil, used in large dry bulk carriers, is 88% carbon. [14]

According to *Volume III Heat & Heat Engines for Marine Engineers – Reed's Practical Mathematics Series* (1963), 1lb of C requires $2 \frac{2}{3}$ of O_2 to burn completely producing $3 \frac{2}{3}$ lb of CO_2 .

This data yields the following results for CO_2 emissions for each of these routes:

Fuel burn 85 tonnes /day

Carbon content 88%

CO_2 factor 3.667

| Start Point | End Point | Duration (days) | Duration (hours) | Duration (decimal days) | Fuel Used (tonnes) | Carbon Used (tonnes) | CO_2 Generated (tonnes) |
|---------------|-----------|-----------------|------------------|-------------------------|--------------------|----------------------|---------------------------|
| Santa Marta | Ardrossan | 17 | 9 | 17.4 | 1476.9 | 1299.7 | 4765.8 |
| New Orleans | Immingham | 20 | 8 | 20.3 | 1728.3 | 1520.9 | 5577.3 |
| Riga Terminal | Immingham | 4 | 11 | 4.5 | 379.0 | 333.5 | 1222.9 |

These figures only cover direct emissions, and don't include impacts from construction of conveying and storage facilities; construction of ship-unloading equipment; construction of the ships, tugboats and barges used to transport coal down river; fuel production; rail transportation; barge transportation; marine transportation; maintenance of vessels, buildings, and equipment; operation of the storage and conveying systems; impacts from fuel refining e.g. of the heavy fuel oil used in the ships, and both related and other upstream activities.