

## **NWRR**

# **An estimate of the embodied carbon associated with the total life cycle of materials and construction of the NWRR, Shrewsbury, Shropshire**

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1 Embodied emissions are the full supply chain emissions associated with the initial creation of an asset. Typically this includes emissions from: raw material acquisition, transport, processing and manufacturing of building materials; distribution of materials to site and energy used on-site in assembly. In the infrastructure sector these are commonly referred to as capital carbon emissions to accord with the concept of capital cost.

Scott, Gieseckam, Owen and Barrett (2015)

2 Embodied carbon is sometimes referred to as “capital carbon”

“Capital carbon PAS2080 defines capital carbon as GHG emissions that can be associated with the creation, refurbishment and end of life treatment of an asset. This follows for all infrastructure sectors which have similar sources of capital carbon. This includes the emissions associated with the use of materials, such as concrete and steel, the use of construction plant, such as excavators or

tunnel boring machines, and the transport of materials and plant to construction sites. This will occur for all construction activities be they directed to new build, maintenance or refurbishment. Capital carbon emissions also arise at end of life and are associated with demolition, waste processing and any final treatment/disposal. Carbon emissions from transportation which occurs as part of any of these activities is considered to be capital carbon

BSI (2016)

<http://bailey.persona-pi.com/Public-Inquiries/M4%20-%20Revised/8.2.10.pdf>

3 A group of researchers at Leeds University have developed a methodology for the National Committee on Climate Change to provide an estimation tool that can be used to quantify embodied carbon in infrastructure projects (Scott, Giesekam, Owen and Barrett 2015)

4 Embodied emissions do not include operational emissions which in the case of the NWRR will be the greenhouse gas emissions generated by the traffic using the new road and taking into account the evidence around “new roads generate new traffic” (SACTRA, 1994)

5 Embodied greenhouse gases can be estimated by a methodology that is in the public domain and described in the Leeds University report. This is the top-down environmentally-extended input-output analysis (EE-IOA)

“EE-IOA generates an emissions intensity factor for the emissions embodied in UK construction per pound spent on the construction sector’s output (kgCO<sub>2</sub>e/ £), which we take as representative of the emissions intensity of infrastructure. This relates to all the physical goods and services required along the construction sector’s supply chains, whether produced in the UK or abroad

The key findings are summarised in the Leeds University Report

**Table 1: Carbon intensity, spend and embodied emissions of the UK’s infrastructure plans**

|  | 2012 | 2013 | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   |
|--|------|------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>Carbon intensity (kgCO<sub>2</sub>e/ £)</b>   | 1.11 | 1.09 | 1.08   | 1.06   | 1.04   | 1.03   | 1.02   | 1.01   | 0.99   | 0.98   |
| <b>Total NIP expenditure minus wages at 2010 prices (£M)</b>                           |      |      | 27,184 | 28,314 | 24,386 | 24,074 | 25,194 | 19,512 | 19,045 | 71,451 |
| <b>NIP expenditure minus wages at 2010 prices (£M) for projects under construction</b> |      |      | 23,963 | 20,779 | 15,134 | 13,135 | 11,133 | 4,945  | 4,755  | 6,856  |
| <b>Embodied emissions for desired expenditure (Kt CO<sub>2</sub>e)</b>                 |      |      | 29,334 | 30,120 | 25,580 | 24,906 | 25,194 | 19,670 | 18,929 | 70,098 |
| <b>Embodied emissions for projects under construction (Kt CO<sub>2</sub>e)</b>         |      |      | 25,857 | 22,104 | 15,875 | 13,589 | 11,363 | 4,980  | 4,726  | 5,726  |

6 I have assumed that the cost of the NWRR is £95.7 million (Note 1)

7 Referring to the above table from the Leeds University report we can see that the calculation produces an estimate of embodied kgCO<sub>2</sub>eq of 0.98 per £spent, at 2010 prices. The present day estimate of the construction cost of the NWRR is £95.7m, which at 2010 prices would be 0.77 x 95.7 million = £73.689 million. I therefore calculate that the embodied CO<sub>2</sub>e in the NWRR is 73.689 million x 0.98kg = 72,215 tonnes (Note 2)

8 This additional burden of 72,215 tonnes of CO<sub>2</sub> is an avoidable and unacceptable move in the wrong direction. Decarbonisation and dealing with climate change requires a reduction in carbon and not a policy that increases those emissions by 72,215 tonnes of CO<sub>2</sub>eq

9 Shropshire Council should follow the examples of the Welsh Government and its decision to cancel the M4 relief road and adopt non road building measures and interventions that are evidence-based and will deliver the transport, climate and economic policy objectives of the Welsh Government.

## References

BSI (2016) British Standards Institution, PAS 2080, Carbon Management in Infrastructure

<http://bailey.persona-pi.com/Public-Inquiries/M4%20-%20Revised/8.2.10.pdf>

SACTRA (1994) Trunk Roads and the Generation of Traffic, the Standing Advisory Committee on Trunk Road Assessment, Department of Transport

<https://bettertransport.org.uk/sites/default/files/trunk-roads-traffic-report.pdf>

Scott, K., Gieskam, J., Owen, A and Barrett, J (2015) Embodied greenhouse gas emissions of the UK National Infrastructure Pipeline (NIP), University of Leeds

### Note 1

Shropshire Council, Place Overview Scrutiny Committee, 5<sup>th</sup> November 2020

Current total project out-turn cost estimate at 01/06/2020 = £95,705,728

[https://shropshire.gov.uk/committee-services/documents/s25730/NWRR%20Scrutiny%20Report%20Nov%205%202020\\_Final.pdf](https://shropshire.gov.uk/committee-services/documents/s25730/NWRR%20Scrutiny%20Report%20Nov%205%202020_Final.pdf)

### Note 2

This estimate is based on the scientific method produced by Leeds University researchers. It is based on an average value of kgCO<sub>2</sub>eq/£ and it is in the nature of averages that some projects will be above the average and some below. It is a source of concern that Shropshire Council has decided to proceed with the NWRR without calculating the embodied carbon associated with the NWRR and its impact on carbon emissions