

## Case Study title: Developing a cloud-based version of the National Highways Carbon Calculator

Scheme name: A47 – DIP Schemes

Project stage: Stage 3 Date Case Study submitted: 01/02/2022

Environmental

### Scheme context:

The National Highways Carbon Calculator is used to report carbon emissions through construction each quarter. It is also used during design to help quantify estimated emissions. At present, there is no quick and easy way to compare projects, either on a quarter-by-quarter basis or through different design stages. This project sought to develop a cloud-based version of the tool which was capable of comparing projects.

### Case study details:

Despite a growing awareness of climate change and the need to reduce our GHG (or 'carbon') emissions, there is still a lack of understanding to what carbon is and what can be done to reduce this. Carbon is often linked to cost which can provide some understanding (e.g. 'reduce carbon, reduce cost'), but by visualising carbon emissions we can start to educate designers and contractors on where hotspots are to stimulate discussion and enable carbon reduction.

Sweco developed the Carbon Portal which has been designed to collate data from the National Highways Carbon Calculator and to quickly provide visuals to help identify carbon hotspots. This provides a good breakdown of the carbon on a project, but the value from the Carbon Portal is being able to review multiple projects at once. This can support project teams in meaningfully managing carbon on projects with the aim to minimise emissions.

The Carbon portal developed by Sweco is built as a cloud-based SaaS (Software as a Service), based on MS SharePoint, MS Azure and MS Power BI. By using MS SharePoint as portal solution many functions come with the platform. It is easy to manage user access to the portal and share information within groups and organisations. It is also easy to define privileges and level of access.

Visualisation of carbon footprint is made with Power BI technology. Power BI offers data preparation and discovery, interactive dashboards, and rich visualisations in one solution.

The integration between the Carbon Calculator which is an Excel based tool developed and maintained by National Highways and the Carbon Portal is handled by an Azure web job. The web job is a JavaScript application deployed as a repeating job that is scanning the SharePoint portal looking for new files (Carbon Calculator). To view a project on the Carbon Portal the excel file is uploaded to the SharePoint portal. When a file is detected, the web job will extract the data in the Carbon Calculator excel file and move it in to a SQL database. The Power BI will then use SQL database as data source to visualise project carbon data.

### What are the benefits?

During design, a side-by-side comparison of designs at PCF Stage 3 and 5 is possible. This allows designers to see how carbon is being managed. If used multiple times throughout design (e.g. in value engineering) it will be possible to see how the carbon emissions fall from the initial design baseline.

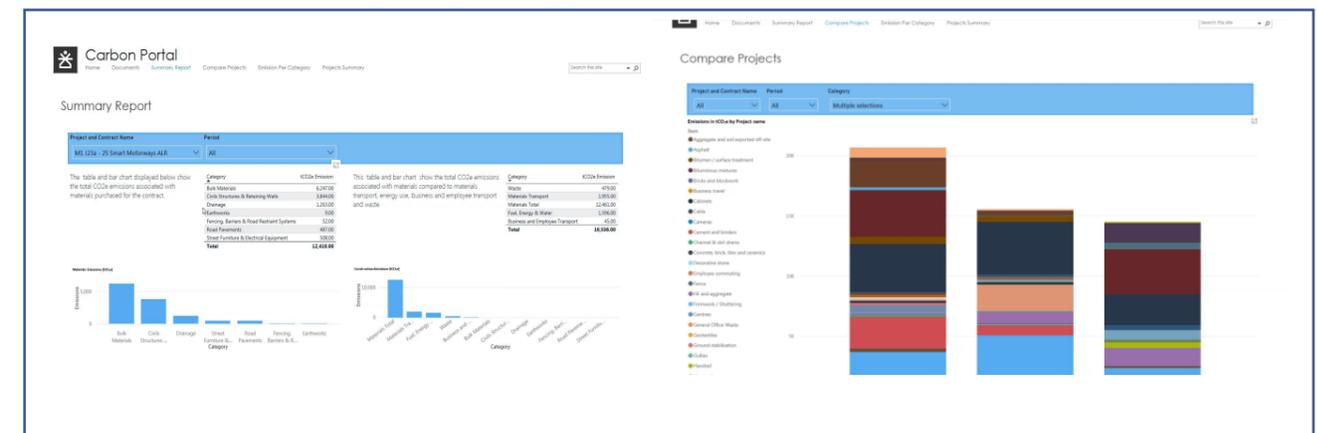
As part of the CPF reporting each quarter, it is possible to see how emissions have changed on a project. Through a project it is easy to put the total carbon side-by-side. It is also possible to assess how Project A is performing compared to Project B from a similar time.

### How can others apply your learning?

The Carbon Portal solution is easy to use and very flexible to extend with further functions and visualisation. However, during development of the Portal, we have seen that there is a problem with non-stable data from the Carbon Calculator. When the Carbon Calculator is updated to a newer version, some fields and values are not the same as in previous version, which means that the data schema doesn't match the expected data schema. This is a common problem in all IT solutions with integrations or when applications are relying on external data sources.

In order to build applications that are relying on the Carbon Calculator excel file it is important that the application schema in the excel is stable. The Carbon Calculator needs to be handled as an IT application. If any changes are made between two versions those changes need to be announced to anyone building applications relying on the tool.

### Visual materials that explain your approach / outcome



Contact for more details: David Jackson – [David.jackson@sweco.co.uk](mailto:David.jackson@sweco.co.uk)

### Further information:

For more information on this project, please get in touch with Sweco using the contact details above.

## Summary Report

Project and Contract Name:  Period:

The table and bar chart displayed below show the total CO2e emissions associated with materials purchased for the contract.

Category	tCO2e Emission
Bulk Materials	6,247.00
Civils Structures & Retaining Walls	3,844.00
Drainage	1,263.00
Earthworks	9.00
Fencing, Barriers & Road Restraint Systems	52.00
Road Pavements	487.00
Street Furniture & Electrical Equipment	508.00
<b>Total</b>	<b>12,410.00</b>

Materials Emissions (tCO2e)



This table and bar chart show the total CO2e emissions associated with materials compared to materials transport, energy use, business and employee transport and waste

Category	tCO2e Emission
Waste	479.00
Materials Transport	1,955.00
Materials Total	12,461.00
Fuel, Energy & Water	1,596.00
Business and Employee Transport	45.00
<b>Total</b>	<b>16,536.00</b>

Construction Emissions (tCO2e)





# Compare Projects

Project and Contract Name: All | Period: All | Category: Multiple selections

Emissions in tCO<sub>2</sub>e by Project name

