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## **Governance impact on CO2 emission in the infrastructure sector**

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### **Executive summary**

- This article is written evidence aiming to provide a deeper understanding of good governance and carbon dioxide emission within the UK and the infrastructure construction sector. This evidence will provide support and confirmation on how that introducing a rule of law within sectors can positively impact CO2 emission. The evidence provides methods used within the infrastructure sector to enable the reduction of CO2 which can be implemented in future.
- To gather evidence for this article, five semi-structured interviews were undertaken from employees within the infrastructure sector, the responses were then analysed and a conclusion was drawn allowing for future recommendations.
- CO2 emissions are one of the main aspect the infrastructure sector aim to cut in the hopes of becoming green. The infrastructure sector has a CO2 emissions specification for construction and operation which was released in 2013 (PAS 2080) which was released as a guidance document for all industries. There is a lot of conversation that have opened up on targeting net-zero CO2 emissions however there is a lack of governance and enforcement to push the net-zero challenge.

### **Introduction and reasoning for evidence submission**

This evidence is provided by the University of Wolverhampton research team. The evidence is currently under investigation to examine CO2 emissions within the infrastructure sector during construction and operation and maintenance. There are many factors to consider in terms of CO2 emission in the infrastructure sector as from the construction stage, CO2 emissions are already quite high due to machinery and vehicles used at this stage to operation and maintenance as the transport infrastructure sector has CO2 emissions with cars, trains, water, etc during the operation of the asset.

### **Written evidence**

1. Carbon footprint is a major topic across industries as there is a current threat of climate change which has been noticeable across the globe. Global temperatures have

risen below 2 degrees Celsius, the change of rain patterns and rise in sea levels are also being witnessed globally which is increasing the frequency of floods, heatwaves, and fires. Climate change can introduce major dangers to the environment, economy, world's population and health, and infrastructure taking a major part in the UK's greenhouse gas emission. Industries have taken measures to reduce greenhouse gas emission and have made good progress, however, more is required to create a better impact as there is a need for a thorough plan to enable industries to adopt and implement the right mitigation approach. Transforming the infrastructure sector to a net-zero greenhouse gas emission industry can allow workers and staff members to achieve the skills to transform the industry to net-zero at least. This article aims to investigate how good governance can enable the reduction of CO<sub>2</sub> and greenhouse gasses emission within the infrastructure sector during all stages of the asset lifecycle from construction of the asset to operation and maintenance.

2. An ongoing project participated in this study who have three organisations working as a Joint Venture to complete the project. This project was taken as a case study for the provision of this evidence, to ensure the case study is relevant to this submission of evidence, an infrastructure project that has undertaken measures to reduce CO<sub>2</sub> emissions was selected. In this evaluation, this study aims to highlight how the infrastructure sector has enables cutting CO<sub>2</sub> emissions during construction and what is the planned measures for cutting CO<sub>2</sub> emissions during the operation and maintenance stage of the asset.
3. The case study project had the benefit of having early engagement with the contractors during its tender stage. This allowed the contractors to introduce new ideas and get involved early, leading to new tools being used to increase efficiency from the pre-construction stage. This project has implemented many digital tools from the start including the Building Information Model (BIM) and a 5D plus tool. In addition to calculating CO<sub>2</sub> emissions, the tool also calculated cost estimates. With these digital tools the project has highlight a total savings of over £2 million by incorporating the benefits from the tool within their main works. Not only was cost savings noted, but also time reduction was calculated and with the tool automating manual calculations, this led to a reduction in required staff to conduct the task.
4. The tool being used within this project is the first of its occurrence, the tool namely 5D Plus is a combination of a cost estimating tool which has been integrated with a carbon estimating tool. As the project has implemented and adopted the full use of the BIM, the project has 3D models of all assets that are to be constructed. These models were inserted into the tool which allowed quantities to be calculated with the use of the details such as labour rate, production and materials which are embedded into the 3D models due to this innovation, the project cut staff members that would have been required to undertake this task by 83%. In addition to the cost saving in terms of staff, this has also impacted time as having an automated process with easy access to designs saved the time it would take to undertake manual tasks.

5. The tool adopted provided cost and time savings as mentioned, however, in addition to those benefits gained, carbon emission was also calculated enabling a reduction of CO<sub>2</sub> emissions by having it calculated during the tender stage at the initial stages of the project. This allowed the contractors to analyse a different way of constructing certain elements or replacing with a greener material or construction process. The carbon calculation was conducted using the 3D model where the carbon contents of the various elements within the model that are to be constructed had their carbon footprint incorporated as data. These carbon contents were extracted from a library and in addition to being integrated with the 3D model, the carbon contents were also added to the software itself, this allowed the software to almost assess the carbon impact of the designs instantly. In addition to CO<sub>2</sub> emissions being lowered during the design and construction stage, the asset being constructed aims to run on electricity, this means that the CO<sub>2</sub> emission for the asset will be dependent on the energy supply being more decarbonised to achieve the goal of being a low carbon emission asset during its operational stage leading to a more sustainable asset overall.
6. Governance as a process can encourage organisations within the infrastructure sector to apply methods and processes that can reduce the carbon emission being produced before, during and after construction. Having a formal or informal guide and process can guide and motivate organisations in the infrastructure sector to become more sustainable and greener. The case study project was asked by their client to reduce carbon emission by up to 15% during the initial stages of the project. Due to this being part of their scope, this has motivated the organisation to find ways, in this case the BIM tool utilised, to enable the reduction of their carbon footprint. This shows that governance does have a positive impact in CO<sub>2</sub> reduction as good governance from clients within the infrastructure sector can motivate organisation in the industry to practice sustainable and green project construction and operation.
7. In conclusion good governance has proven as witnessed in the case study project to have a massive effect on CO<sub>2</sub> emission reduction within the infrastructure sector. Having clients ask for CO<sub>2</sub> reduction goals as a rule has motivated the organisation to find ways in reducing CO<sub>2</sub> emissions from the tender stage of the project by having the digital tools available to calculate and assess CO<sub>2</sub> emission from the initial stages of the project. This helped the organisation to analyse the carbon impact of building specific elements of the asset and make decision on things such as materials based on its carbon impact.
8. The following recommendations are submitted for the infrastructure sector and the Government to certify that good governance can impact CO<sub>2</sub> emission within the infrastructure sector.
  - The infrastructure sector has always though about reducing CO<sub>2</sub> emission, there are specifications on CO<sub>2</sub> emission released for the infrastructure sector as a guidance however there despite awareness most organisations do not implement ways in which they can fully assess and reduce CO<sub>2</sub> emission during all stages of an asset.

- Technology can play a massive part in assisting with CO2 emission reduction within the infrastructure sector. With BIM being mandated in the UK, using supporting technologies along with the information of assets within the BIM can help organisations to calculate and analyse CO2 emission.
- To follow the above statement, the mandate of the BIM has allowed the infrastructure sector to adopt and implement BIM within projects. With the availability of Governance, organisations are aware to implement the BIM process as it is a mandate. Similar to BIM, CO2 emission reduction can also be mandated as seen in the case study project. As with the governance and goal to reduce at least 15% of CO2 emissions, this has encouraged the organisation to investigate technologies which has allowed this goal to be achieved. If this 15% reduction was made as a rule and mandate in addition with guidance on how to achieve this goal, it would allow infrastructure organisations to adopt methods of which CO2 emission can be calculated and reduced during all stages of the infrastructure construction process.

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