

# Towards a Route Map for Decarbonising the South West's Infrastructure System



Prepared for the **South West Infrastructure Partnership**

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# Introduction

Infrastructure systems underpin our daily lives. Their assets and services work together to facilitate the flow of people, resources, energy and information. From roads and sewage pipes to fibreoptic cables and wind farms; the quality of our infrastructure affects our quality of life and the strength of our economy. However, in its current form it also poses a threat to the natural environment, and by extension our own wellbeing. HM Treasury's Infrastructure Carbon Review<sup>1</sup> concluded that the infrastructure industry directly controlled 16% of the UK's total carbon emissions and had an indirect influence over a further 37%. It predicted that the total impact (direct and indirect) would grow to 90% by 2050, largely due to the projected decarbonisation of other sectors. In turn, the resultant changes to our climate can impact the quality of our infrastructure.



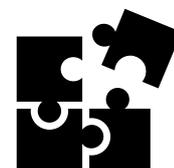
*There is a moral imperative to go beyond adaptation and redesign the infrastructure system-of-systems to become more sustainable and ensure the activities it facilitates can do the same.*

The South West has distinct infrastructure challenges, not least the vulnerability of many communities to rising sea levels and flooding. Engineers have a crucial role to play in adapting our infrastructure to cope with the

impacts of climate change. Furthermore, there is a moral imperative to go beyond adaptation and redesign infrastructure, whether that's power or transport, to become sustainable and to support the activities it facilitates to do the same. One critical aspect of this is the transition to low carbon technologies.

Long-term South West infrastructure challenges hinge around fragmented governance and oversight. It is fragmented across geographic boundaries and political boundaries. Even looking within these boundaries infrastructure is fragmented by industry. The road and rail networks are managed as largely discrete from the electricity network for example. The result is two-fold. Firstly, the South West does not have a collective powerful voice at national government level and as a result fails to secure as much proportionate infrastructure investment as other regions. For example, it has the second lowest construction spend on highways – around 50% less than the South East<sup>2</sup> despite having urgent strategic highways improvement needs. Secondly, fragmented oversight leads to counter-productive decision making and actions from one sector to another, even though the sector infrastructures are often physically, functionally and operationally interdependent<sup>3</sup> The consequence is ineffective and inefficient infrastructure, which costs more, damages growth and impedes progress towards achieving the Sustainable Development Goals<sup>4</sup>.

*The sustainability challenge is exacerbated by the fragmented nature of infrastructure operation and governance. .*



The South West Infrastructure Partnership (SWIP) has identified the decarbonisation of the South West as a systemic challenge that depends on the effective integration of the region's energy and mobility (of people and goods) systems; there is no regional governance mechanism for driving this integration and, consequently, little technical action to achieve it. The challenge of decarbonisation cannot be addressed through decisions taken in regional or political silos. Decarbonisation cannot be achieved by managing one infrastructure system as if it is

<sup>1</sup> HM Treasury, 2013, Infrastructure Carbon Review, November 2013

<sup>2</sup> Pregolato M, Ford A, Robson C, Glenis V, Barr S, Dawson R. Assessing urban strategies for reducing the impacts of extreme weather on infrastructure networks. R Soc Open Sci 2016. doi:10.1098/rsos.160023.

<sup>3</sup> Institution of Civil Engineers, 2016, State of the Nation Report [Online: <https://www.ice.org.uk/getattachment/media-and-policy/policy/state-of-the-nation-2016-devolution/state-of-the-nation-2016-devolution.pdf.aspx>]

<sup>4</sup> National Infrastructure Commission, 2018, National Infrastructure Assessment [Online: National Infrastructure Assessment 2018. [https://www.nic.org.uk/wp-content/uploads/CCS001\\_CCS0618917350-001\\_NIC-NIA\\_Accessible.pdf](https://www.nic.org.uk/wp-content/uploads/CCS001_CCS0618917350-001_NIC-NIA_Accessible.pdf)]

independent from another. Such fragmented approaches lead to unintended consequences and shifting the burden outside of the largely artificial boundary of analysis. As a trivial example it would be regionally sub-optimal to decarbonise Devon's electricity supply if the consequence was drawing more fossil-fuel based power from Cornwall. Under current metrics carbon emissions associated with the road network could be dramatically reduced through a switch to electric vehicles but this would be at best meaningless and at worst disastrous without consideration of the energy system providing the electricity.



Two workshops were held, bringing together over 100 infrastructure experts from across the region to explore the decarbonisation challenge. These took place on **Wednesday 29 January** in Bristol and on **Thursday 6 February** in Truro. These workshops sought to explore (1) the perceived purpose of infrastructure; (2) the complexity of the overall infrastructure system; (3) the future of infrastructure; (4) the current and required knowledge for decarbonising the sector; (4) the incentives and barriers to effective collaboration; and (5) the critical actions and next steps to achieve decarbonisation.

## The Purpose of Infrastructure

The overarching outcome noted by almost every group across both events was **quality of life**. This is often dependent on reliable public services facilitated by the quality of the infrastructure. Infrastructure also provides connectivity, within the region and beyond. While this is significantly physical in terms of the mobility of people and resources, it is increasingly provided through digital means. The South West has unique challenges emerging from its disperse and transient population. From tourism to agriculture, the environment is a critical factor in its economy.

## The Complexity of Infrastructure

Infrastructure operates as a complex system of systems. Infrastructure services emerge from the interactions of multiple assets. The transport and energy sectors are particularly reliant upon one another. Changes made in one sector can have significant impacts on the operation of other sectors. For example, switching to electrical private vehicles will impact the energy sector, and could even increase use on public transport. Furthermore, sectors critical to the South West, such as agriculture and tourism, can be significantly impacted by and impacted upon built infrastructure. Excluding these from discussions around decarbonisation of infrastructure could result in inefficient or ineffective actions.

## The Future of Infrastructure

The idealised South West of 2050 would have a self-sufficient, sustainable, circular economy based on community supported local services. The key driver would be the attainment of valued social outcomes rather than growth in GDP. Decarbonisation should not require the construction of new roads, focusing instead on maintaining existing networks and solutions that reduce demand (e.g. low-cost public transport and flexible working locations). The energy system in this ideal scenario would include more solar, wind, marine and geothermal sources, together with the utilisation of improved battery technology. Such a mix would present

new challenges in terms of the economics of some sources and the management of grid stability. Fast and reliable digital connectivity would be critical component of the transition to an idealised, low-carbon 2050.

In the worst-case scenario a rise in private vehicles would cause congestion while petrol still dominates. The switch to renewable energy sources would have stalled to such a degree that supply could not meet demand. Energy poverty would increase. Climate change would lead to advanced warming, a retreat from coastal regions and an acceptance of greater flood risks. General health and well-being would decline as a result.

## Knowledge

There was disagreement at the workshops as to whether there was sufficient information available to get a complete picture of the South West infrastructure sector's contribution to carbon emissions or not. Even where data exists there may be questions over its trustworthiness, accuracy, visibility and consistency. Obtaining a data baseline is essential to delivering a strategy for decarbonisation. Information is required that allows for an agreed and complete measure of embedded and operational carbon through the entire infrastructure supply chain and across the life cycle. Real-time performance data for both lagging and leading indicators would be useful, together with a broader set of metrics that ensures a focus on the ultimate outcomes and not just carbon.

## Collaboration

Collaboration is essential to decarbonising the complex interdependent infrastructure system. It requires open channels of communication and can be driven by a clear vision and unified objectives. Collaboration is hindered by a silo-mentality, outsourcing, fragmentation, focus on capital expenditure and related contracting issues. Clear leadership and a change in culture can overcome these barriers. The system needs to appropriately value the environment and involve all stakeholders and delivery partners from the earliest project stages. Intellectual property rights and the distribution of reward and risk can be detrimental. New methods of contracting that avoid short-term individual incentives and provide equality are required.

## Actions & Next Steps

It was clear from the two events that there is a realisation of the complexity of the decarbonisation challenge and a great deal of appetite for collaborative action across the South West's infrastructure sector to address that complexity.

**The South West's infrastructure sector requires a shared vision and a co-created route map guiding the way towards decarbonisation. This should be supported by a framework for consistently measuring progress. While this is all based upon a fundamental change in mindset from business as usual, it also requires leadership and a convenor to facilitate collaboration and influence national policy.**



A full report of the workshop findings is available at <https://www.southwestinfrastructurepartnership.co.uk/knowledge/>