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Supporting decision making for resilient net-zero infrastructure

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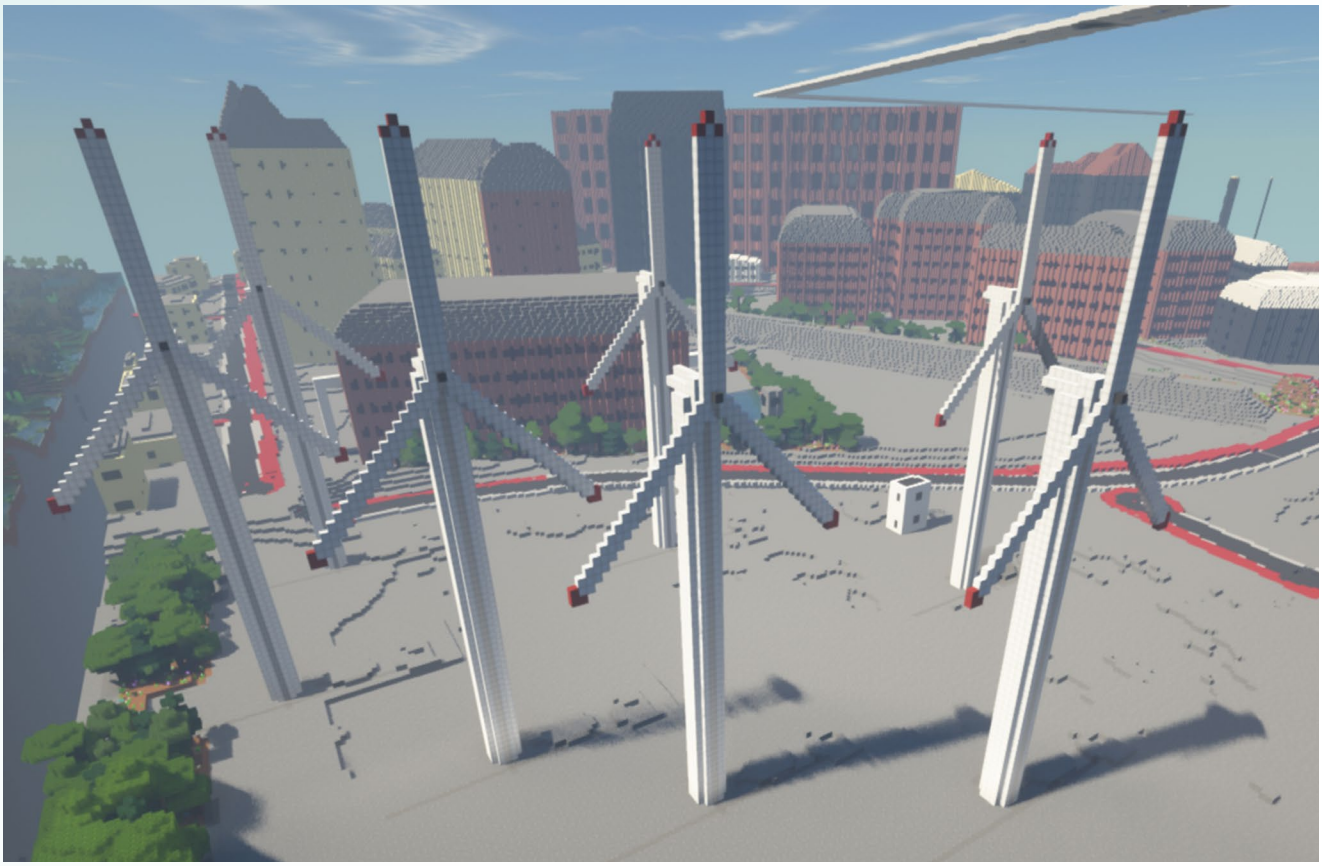
Transforming infrastructure systems is essential to the UK's sustainable development and net-zero commitments. Our research at the **Priestley International Centre for Climate** has shown that current decision making processes are unfit to deal with the multiple crises we face. New decision making approaches must be used that accommodate uncertainty, support collaborative decision making and incorporate the societal value of infrastructure.

Overview

- **Current systems of governance and decision making are not capable of accommodating the uncertainty of challenges like Covid-19 and the climate crisis.**
- **New decision making methods are available and should be adopted by public sector decision makers, which can cope with uncertainty and involve multiple stakeholders.**
- **Collaborative decision making between sectors, departments, organisations, and the public is needed to improve the success and resilience of major infrastructure investments.**
- **Infrastructure needs to be considered as a provider of wellbeing, not just assessed in economic terms. Policy changes must enhance wellbeing.**



A city designed on Minecraft by members of the public during deliberative workshops in Leeds.

The Climate Change Committee and the National Infrastructure Commission have identified that transforming infrastructure systems is essential to the UK's sustainable development and 2050 net-zero commitment. In 2020/21 it is estimated that £37.5bn of infrastructure spending will be commissioned with a further £350bn anticipated in the national infrastructure pipeline.

Improving existing infrastructure is challenging and increasingly uncertain. For example, the balance of spending on physical and digital infrastructure could be shifting rapidly following Covid-19 as business, retail and supply chain practices all rapidly evolve. Coupled with this are uncertainties over the nature of climate mitigation and adaptation investments.

Recognising uncertainty is not enough. Decision making processes in national government can be adapted to accommodate uncertainty, so that outcomes are delivered that would work in a variety of future contexts. To improve decision making, we need to recognise that there are often multiple organisations involved in planning for and delivering infrastructure, with shared responsibility but not necessarily a shared vision.

Supporting decision makers

In our research over the last decade, we have been working alongside local and national government to help move towards resilient net-zero infrastructure systems, and most recently to recover from Covid-19. Examples below present work relating predominantly to transport, which is a good example of wider infrastructure issues and the infrastructure system most closely governed by national government. This draws on research conducted with the Department for Transport, Transport for Greater Manchester and the Local Government Association.

Research in Greater Manchester, led by Dr Katy Roelich's **Multi Actor Adaptive Decision Making (MAADM) project**, is aiming to build flexibility into decisions that contribute to achieving a sustainable transport system, aligned with Greater Manchester's goal to become carbon neutral by 2038. The project considers decision making in its broadest sense and is embedding adaptive methods into all processes from strategy development, options assessment to formal appraisal.

The MAADM project also has a key focus on public engagement in decision making and has undertaken a series of deliberative workshops to explore public perceptions of infrastructure. As part of these workshops, participants designed infrastructure for a future city using Minecraft to visualise their proposals. Reducing emissions

and building resilience were key objectives of participants' infrastructure plans.

> "We are developing new adaptive approaches that can allow decision makers to transform infrastructure systems, to tackle social deprivation and the climate crisis, whilst accommodating the deep uncertainty associated with the infrastructure system."
>
> Dr Katy Roelich

Transport is the largest sector in the future infrastructure pipeline for the UK. The Institute for Transport Studies at the University of Leeds is a global top ten ranked research department and offers major opportunities to deploy these new decision making tools. The work is embedded within nationally leading investments in understanding the climate change and transport challenge both at a **national** and **regional** scale. It is an essential part of our work on future infrastructure to understand how we can move towards an ambitious zero carbon pathway and to consider the balance between infrastructure investment, technology change and demand management. This has recently been demonstrated through a high profile set of **briefings for the Local Government Association** on how to decarbonise transport.

The Commission on Travel Demand, funded by the UK Research Council's Energy programme, brought together national and local government stakeholders, industry experts and academics to understand why travel demand trends are changing and could be changed, and what this means for future investment plans in the transport sector. The **first report** addressed the decline in the commute (20% since the 1990s), the rise of on-line shopping (17% of all sales) and reductions in driving (10% per person since 2002), particularly in the under 30s. The **second report** examined how we can increase the efficiency of our infrastructure through increased shared mobility.

Professor Greg Marsden, who leads the Commission, is also leading on a **major behavioural impacts study** about the impacts of Covid-19 on travel behaviour both in the short and long-run. The work is funded by UKRI, Transport Scotland, Transport for the North and Liverpool City Region, and works with the Behavioural Insights team in the Department for Transport. The importance of changes to the commute cannot be underestimated in terms of the need for future 'peak hour' infrastructure investments, the subsidy requirements for public transport and the future mix of office, residential and leisure in and around our cities.

By working in partnership with decision makers, we have been able to:

- Provide place-based insights into the short and long-term behavioural impacts of Covid-19 and the associated restrictions to travel and activities.
- Use these insights to enable governments and businesses to make more informed policy choices to support "building back better".
- Improve the capacity of decision makers to accommodate deep uncertainty in the decision making process during Covid recovery.
- Examine the role of infrastructure in supporting wellbeing and building this into decision making processes.

Key findings

Covid-19 has highlighted the deep uncertainty associated with infrastructure decision making and the need to accommodate this uncertainty. Insights and techniques that we developed and successfully implemented to support Covid recovery can now be used to accommodate other uncertainties, like climate change, in decision making processes.

There are several ways to accommodate uncertainty in all stages of infrastructure decision making – including during strategy development, options analysis and formal appraisal. The 'Robust Decision Making' method can be used quickly and qualitatively by the public sector to build the tolerance of plans to deep uncertainties. Adaptive decision making can build flexibility into key policies whilst directing change towards a particular goal.

Our research has shown how these decision making approaches can be used in the public sector, and that they can be beneficial for national policy makers working across infrastructure.

This research has also shown the importance of infrastructure in providing societal value, as well as economic prosperity. However, some assumptions about infrastructure's impact on economic growth have been overestimated, and the societal value of certain services and modes, such as buses and walking, have been underestimated. Infrastructure's positive impact on wellbeing was especially highlighted during Covid lockdown and recovery but it is not fully accounted for in decision making processes.

Covid has reinforced existing fragmented governance structures and strategies – locking us in to certain types of sub-optimal response. This has clearly demonstrated the need to utilise new decision making approaches that are more collaborative and better at planning for the long-term – navigating a flexible pathway to achieving climate targets and social needs.

The MAADM project recently reported the results of **deliberative workshops** with members of the public in Leeds, which explored their views on infrastructure systems. The workshops found that explicitly talking about the link between infrastructure and wellbeing, and seeking to engage with the values underpinning perceptions offers more opportunity to find areas of agreement between the public and decision makers. Public awareness of infrastructure and its impact on daily life is increasing and their values should be accounted for in decision making processes.

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National policy makers have a key role to play

Decisions affecting infrastructure transformation take place in myriad organisations across the public and private sector and across organisational processes from strategy development to formal appraisal. National policy makers have a significant influence over how these decisions are made, through regulation, policy setting and formal guidance for appraisal and monitoring of decisions. It is crucial that national government processes are able to accommodate uncertainty and incorporate social value and that its regulation and guidance allows others to address this too.

Our work to date has been related predominantly to transport but these findings are relevant to all infrastructure sectors. In fact, approaches to decision making that accommodate uncertainty and incorporate social value provide a more systemic understanding. This would encourage consideration of the links between infrastructure sectors - for example digital communications can partially substitute for travel and can also help transform transport through smart transport systems, which have both provided more resilience during Covid.

Our recommendations fall into three key areas: adopting new decision making approaches, collaborative decision making, and valuing infrastructure socially, not just economically.

New decision making approaches are needed

New decision making approaches that can incorporate uncertainty are essential in responding to challenges like Covid-19 and the climate crisis. Our current approaches to decision making around infrastructure do not work. However, new decision making methods are available now and can be quickly adapted for use. These robust and adaptive techniques can help policy makers to enable the required transformations to achieve resilient net-zero infrastructure.

Collaborative decision making is key

Coordination between sectors, departments and organisations needs to change to improve alignment on major investments. Policy makers have a key role in facilitating this, both through setting national strategies and by changing policy to make collaboration a requirement. The public should be part of decision making processes to ensure infrastructure addresses their needs, in addition to meeting environmental targets.

Valuing infrastructure socially, not just economically

Infrastructure needs to be considered as a provider of wellbeing, not just assessed in economic terms. The societal value of infrastructure was highlighted during Covid lockdown, and any proposed policy changes to infrastructure must enhance wellbeing. The effect of infrastructure investment on economic growth in an era of growing digitisation needs to be revisited.

About the authors

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Disclosure statement

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Further information

To find out more about Leeds' research helping to drive the transition to net-zero, visit the **Priestley International Centre for Climate website.**

Front cover image: Manchester Victoria Station Metrolink Platforms, credit: David Dixon

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