

# Mapping complex policy landscapes: the example of 'Mobility as a Service'

A CECAN case study Evaluation Policy and Practice Note for policy makers and analysts



**T**his EPPN presents work done as part of a CECAN case study with the UK government's Centre for Connected and Autonomous Vehicles (CCAV), a cross-department unit set up by the Department for Transport and the Department for Business, Energy and Industrial Strategy.

## What is Mobility as a Service?

The UK Industrial Strategy established Grand Challenges to "put the UK at the forefront of the industries of the future". 'Future of Mobility' is one of these Grand Challenges, with the aim of the UK becoming a world leader in the way people, goods and services move. Four early priorities have been identified for Future of Mobility: (i) Establish a flexible regulatory framework to encourage new modes of transport and new business models; (ii) Prepare for a future of new mobility services, increased autonomy, journey-sharing and a blurring of the distinctions between private and public transport; (iii) Explore ways to use data to accelerate development of new mobility services and enable the more effective operation of the transport system; and (iv) Seize the opportunities and address the challenges of moving from hydrocarbon to zero emission vehicles.

We are beginning to see new mobility models emerge, such as 'Mobility as a Service'. We define Mobility as a Service (or MaaS) as the integration of various modes of transport along with information and payment functions into a single mobility service.

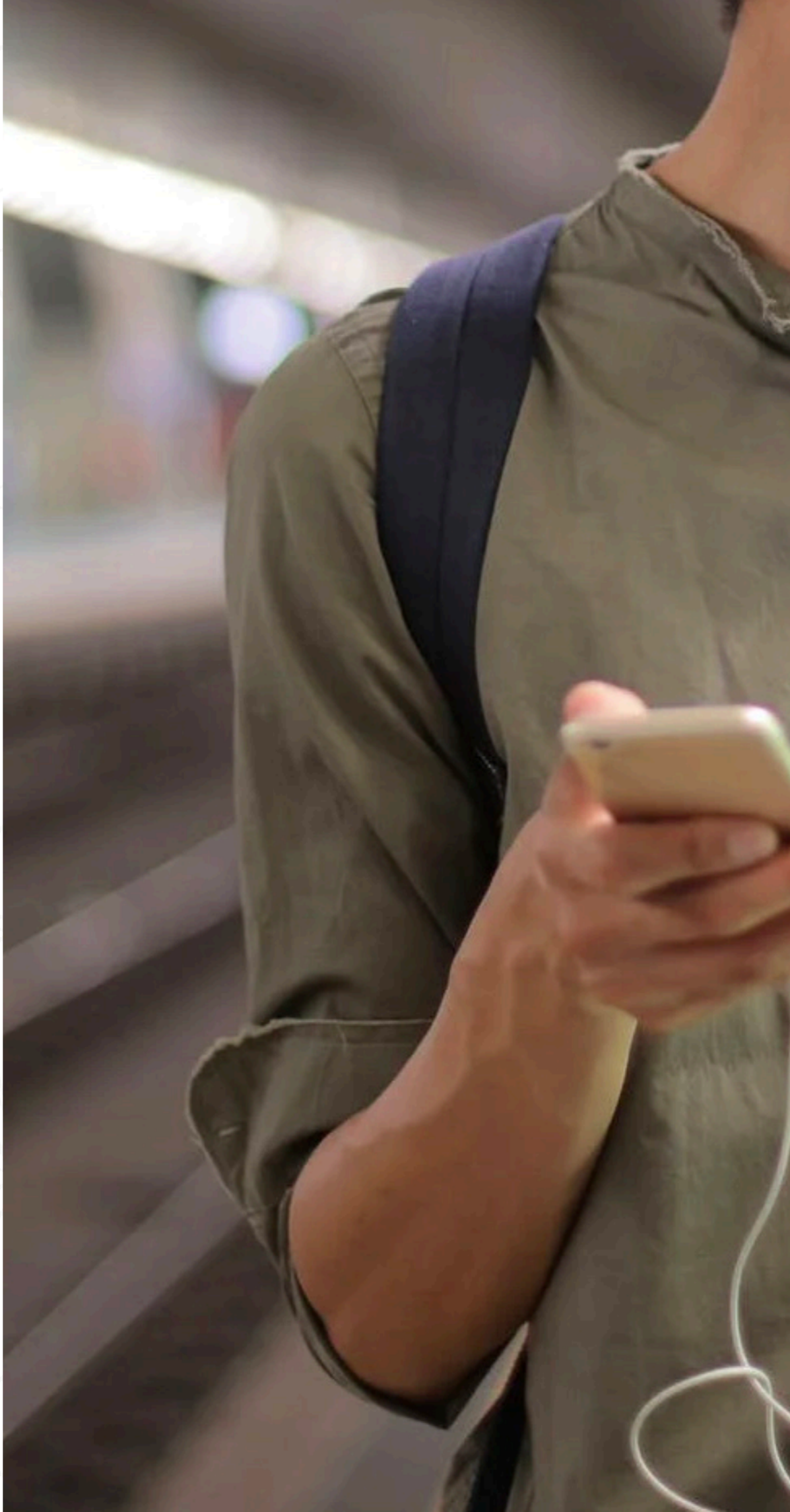
## What were the aims of this CECAN case study?

The aim of the case study was to understand the links and interdependencies between the structural requirements for a MaaS platform with the wider impacts of these business models on consumers, mobility providers, local authorities and businesses. We aimed to develop this understanding using the approach to Participatory Systems Mapping that CECAN has been developing. This understanding is complementing and feeding into a range of activities CCAV is working on in this area, including a regulatory review and a consultation.

## What is Participatory Systems Mapping?

Our systems mapping approach involves a variety of stakeholders collaboratively constructing a complex causal map of their system. The process of map construction has value in building consensus and shared learning, as well as delivering a map of the system which can be used as a general purpose resource and analysed in a variety of ways. The approach is particularly useful in this context as MaaS spans across both traditional and new transport modes, with a wide range of impacts, from air quality to physical infrastructure to consumer protection.

A practical introduction to the method is presented in Penn and Barbrook-Johnson (2019), and two examples of its use in energy policy are presented in Barbrook-Johnson and Penn (2021) and Barbrook-Johnson (2019; 2020).



## What did we do?

The mapping process was run across two workshops in early 2020. In the first workshop, the map was started by a group of transport and MaaS stakeholders. The aim was to discuss the system definition, agree on some key focal factors to start with, and then begin building the map. In the second workshop, the map was refined and extended by a group of Department for Transport and CCAV staff. There was also a discussion on what a map like this might be useful for. After the workshops the map was further refined and extended by CCAV and CECAN through a series of meetings in mid 2020. In total, the case study was live for around 12 months and used an estimated three 'person months' of effort. Each stage of the mapping process is described in Table 1.



Stage	Purpose and points of interest
Planning	<ul style="list-style-type: none"><li>• Agree mapping aims and process</li><li>• Begin defining the map boundaries and scope</li><li>• Decide who should be invited to workshops</li></ul>
Workshop 1	<ul style="list-style-type: none"><li>• Begin the mapping</li><li>• Bring in a wide set of viewpoints</li><li>• Finalise map definition and boundaries</li></ul>
Workshop 2	<ul style="list-style-type: none"><li>• Refine and extend the map</li><li>• Bring in views from teams likely to use the map</li><li>• Consider in more detail how the map could be used</li></ul>
Small group refinement of the map	<ul style="list-style-type: none"><li>• Finalise the map</li><li>• Generate ideas for initial analysis of the map</li></ul>
Analysis	<ul style="list-style-type: none"><li>• Generate narratives and new questions from the map</li><li>• Give users a 'way-in' to the full map</li></ul>

## The Map

The full map can be seen in Figure 1 below.  
Put precisely, this is a Participatory Systems Map of the Mobility as a Service system in the UK. It is intended to represent the system as it stands now but also highlight things which might change in the next five years.

## Legend

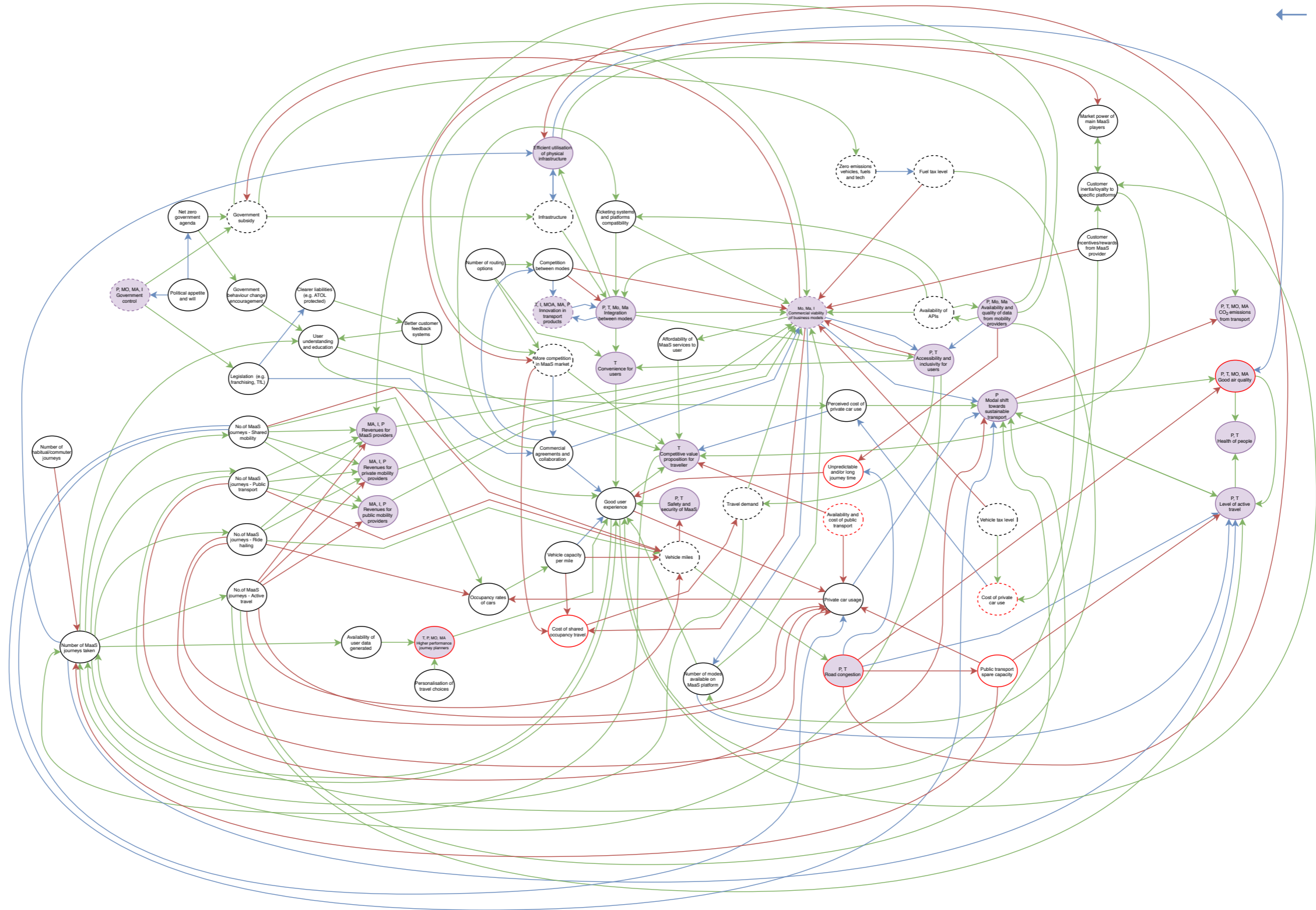
- Key function or outcome
- Factor
- Factor which may change in five years' time
- Factor which plays a key role in wider modal choice

- Positive causal connection
- Negative causal connection
- Complex or unclear causal connection

### Which actors care most about this outcome?

Travellers = T, Public Sector = P, Mobility operators = Mo, MaaS operators = Ma, and Investors = I

**Figure 1**  
Participatory Systems Map of the Mobility as a Service system in the UK



## Looking at the full map

It can be difficult to know where to start when looking at the full map: it has 63 factors and 160 connections. The top left shows a cluster of factors concerned with government policy. The bottom left shows a cluster detailing the number of MaaS journeys in total and broken down by particular modes. Both these feed into the centre of the map. In the top centre we see a collection of factors concerning wider sector issues such as infrastructure, integration between modes, and innovation. There are also some related structural market factors at the top right. Bottom centre and spreading to bottom right we have a collection of factors centred around good user experience of MaaS. Top-right-centre we have one of the key hubs of the map - Commercial Viability of MaaS business models. Just to the right of this are two key outcomes, availability of data, and inclusivity of MaaS for users. Moving to the right we have some key outcomes such as a modal shift towards sustainable transport, CO2 emissions, air quality, health, and active travel.

## Reflections on the full map

In developing the map, we noted the following interesting issues.

**Dealing with modes:** the incorporation of modal split and processes of modal shift (i.e. capturing differences between different modes of transport and shifts between them) into the map generated extensive discussion. The factors affecting modal choice and shift could have formed a separate standalone map. However, many of the issues it raises are highly dependent on which mode of transport we are considering. This can cause difficulties in constructing the map if it leads us to want to break out many factors in their multiple modal equivalents. This would create a very large and complex map - every factor affecting one mode has a knock on effect on all other modes. Here, instead, we chose a few key factors which we felt needed to have their modal types included (number of journeys, revenues), but others are kept at an aggregate level. The decision to deal with modes in this way creates some strong simplifications in the model. We encourage readers to consider differences between modes as they interrogate the map.

We gave some thought to the points of interaction between the transport network as traditionally conceived - users making decisions and journeys in a transport network unmediated by a MaaS - and a MaaS system. Information is the key difference. A MaaS system is capable of providing better and more easily accessible information on travel options for a user before, during and after a journey. This may make users aware of new options they were previously unaware of, allow response to network issues in realtime and allow users to optimise their journey according to their priorities - costs, speed, convenience etc.

**Connecting to the wider transport system:** our system definition focuses purely on the MaaS system, and does not include the wider transport system. As the MaaS system is layered on top of the transport system, this creates some tension and potentially important omissions from the map. For example, and in relation to the point above on modes, we have highlighted some factors which we felt are important for modal shift in the wider transport system, but a more complete model would include the dynamics between these and other relevant non-MaaS factors. We would encourage readers to consider carefully which factors or outcomes are affected significantly by wider transport issues not captured in the current map.

**Centrality of commercial viability when transport is a subsidised system:** several of the stakeholders involved in developing the map remarked on their surprise at the centrality of the Commercial Viability of MaaS in the map, particularly in the face of the fact that the transport system is heavily subsidised. Commercial viability whether now or in the longer term is a critical factor for those considering investing or developing a MaaS system. It raises the issues of who pays and who benefits from MaaS. Would MaaS divert existing revenues and/or create new revenue streams? These additional revenue streams could be based on delivery of better transport options that users are willing to pay a premium for; optimisation of the transport network and possible avoidance or postponement of new infrastructure and associated costs; collection and selling of data on transport use and desires or other potential commercial offerings.



Image CC.0 Max Whitehead / unsplash.com

**Context matters - business models and cities:** stakeholders also felt that two key issues influence almost every relationship in the map:

- Which business model of MaaS are we talking about (i.e. a city-run platform, a commercial platform dependent on transport revenue streams, or a commercial platform dependent on non-transport revenue streams).
- The nature of the city (size, infrastructure, travel patterns) in which the MaaS may be operating.

These are not included as factors in the map, but rather should be thought of as scenarios. As you walk through the full map, or consider the analysis sub-maps below, it may be helpful to think through how connections may be different or how other factors may come into play depending on the type of business model and the context of different cities.

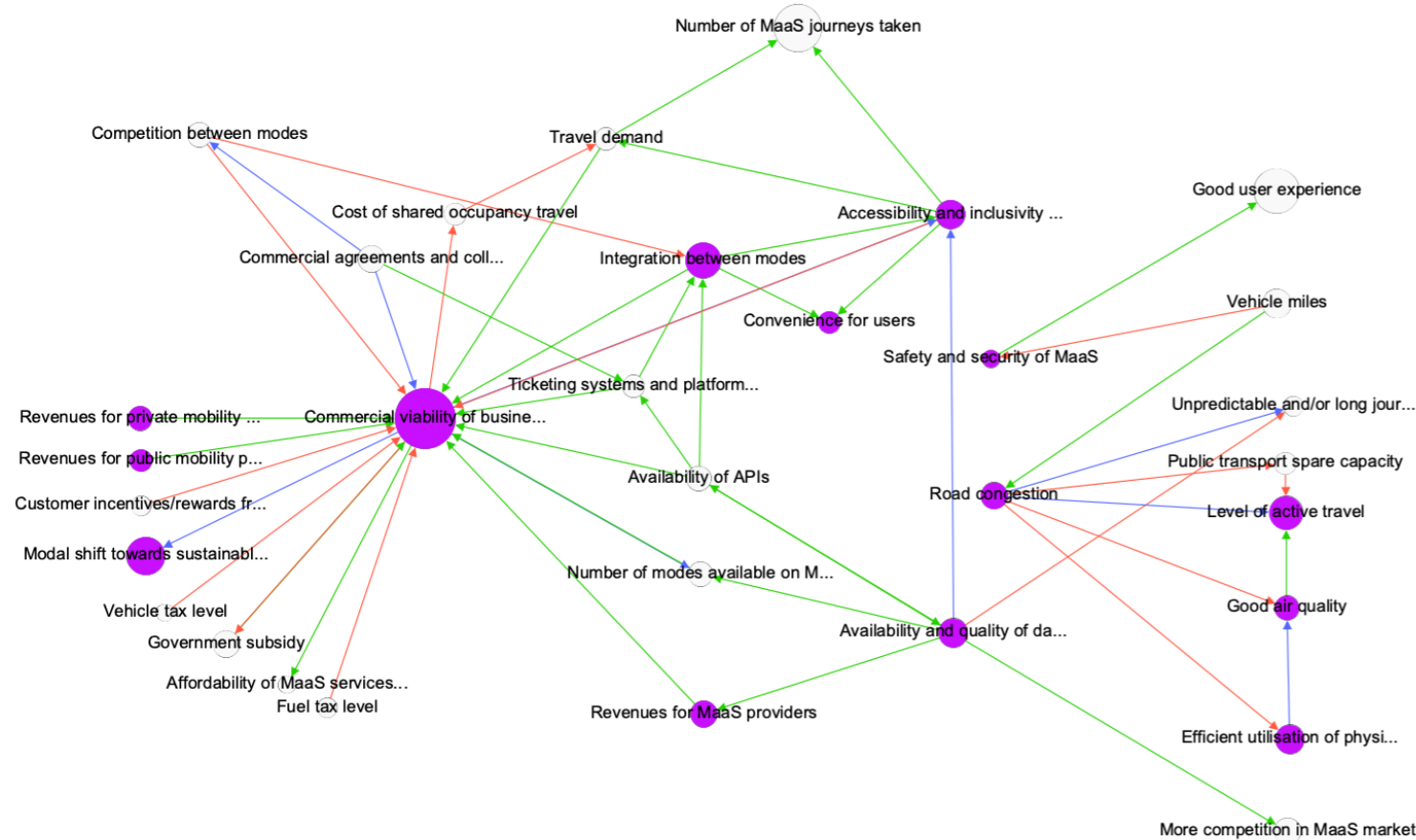
## Sub-map analysis: trade-offs between commercial and public objectives

One area of interest to CCAV was the trade-offs and interactions between commercial and public objectives; we use this here to demonstrate the type of analysis we did on the map. To explore this example we chose five factors to focus on. For commercial objectives we chose Commercial Viability of Business Models, and for public objectives we chose four factors which relate to four of the most important Future of Mobility principles: (i) Accessibility and Inclusivity for Users, (ii) Safety and Security of MaaS, (iii) Road Congestion, and (iv) Availability and Quality of Data from Mobility Providers.

Figure 2 shows a sub-map generated by combining the one-step ego networks of these five factors (ego networks show all the connections in and out of the factors focussed on). Commercial Viability is positioned in the centre left, the four public objectives are positioned vertically in the centre right. Other factors which are only connected to one 'side' are positioned on the far left or far right, factors which are connected to both 'sides' are positioned in the middle.

**Figure 2**

Sub-map exploring trade-offs between commercial and public objectives



The sub-map shows:

- Safety and Security of MaaS and Road Congestion are not closely connected to Commercial Viability
- Availability and quality of data and Accessibility and Inclusivity of MaaS are, however, well connected.
- Integration between modes is a key hub between the two halves
- There are more arrows going into Commercial Viability than into the principles.
- Most of the influences close to the principles and Commercial Viability are 'good' in a normative sense, improving the principles or increasing viability,
  - » However, the relationship between Accessibility and Inclusivity of MaaS and Commercial Viability does not fit this pattern. It appears as the only immediate trade-off between these objectives.
  - » Not all of these connections actually show a causal connection between the principles and/or Commercial Viability, i.e. there is not always a chain of arrows from one to another, rather they are made up of a third factor that is affected by a principle and Commercial Viability (e.g. Number of MaaS journeys), or a third factor which affects a principle and Commercial Viability (e.g. Integration between modes).
- Number of modes available on MaaS platform is pushed in potentially different directions by each side of the sub-map.

## What did we learn?

Some of the cross-cutting themes, key messages, and questions we believe this work uncovered include:

- 1. This is not a system which appears easy to optimise and is unlikely to self-organise because:**
  - The public sector objectives and principles, and commercial objectives are entangled in complex ways and may not always be aligned.
  - The different types of MaaS business models are a key issue in the system. They will prioritise and affect different factors. The importance of business models is heightened and demonstrated by the overriding centrality of Commercial Viability of MaaS business models in the map.
  - Different contexts will change what makes sense in each city and hence which factors should be prioritised or may be driven in different ways.
  - There is no clear system 'leader', 'steerer', or 'steward', but there are many actors in the system, each with significant control/power.
- 2. The map orbits around Commercial Viability of MaaS business models.** What does this tell us? Is this a reflection of reality or the outcome of an incomplete map? Stakeholders had differing views on this factor, some feeling that it was central and connected it to many factors, while others were surprised at its importance in a transport system which is heavily subsidised. If Commercial Viability really is crucial, but also vulnerable to change as suggested by analysis on Travel Demand, what does this imply for the resilience of MaaS systems which rely on commercial viability?
- 3. It is difficult to consider MaaS without considering the complexity of the wider transport system and modal shift dynamics.** This map and analysis attempted to simplify-away the wider transport system and modal shift dynamics. While this made sense for our purpose here, it does create a false boundary which may undermine further analysis along these lines.
- 4. Areas for further research to better understand MaaS in the UK.** Commercial Viability of business models and wider transport and modal shift issues are obvious things suggested by this map. We believe questions around system 'control' and leadership are highlighted by the map - who is going to steer this system and to what end? If the system appears genuinely complex and unlikely to self-organise - who is the 'system steward' (Hallsworth, 2011)? Do we want there to be such a role? How do the goals and interests of public and private sector actors currently interact in different MaaS contexts and scenarios? How can they be aligned? The challenges will only grow and this EPPN has shown how even in a small project the public policy implications of the growth of digital economy and society can be usefully explored and analysed using Participatory Systems Mapping.



## References and further information

- Penn, A. & Barbrook-Johnson (2019) Participatory Systems Mapping: a practical guide. CECAN report available at [www.cecan.ac.uk/resources](http://www.cecan.ac.uk/resources)
- Barbrook-Johnson, P. & Penn, A. (2021) Participatory systems mapping for complex energy policy evaluation. *Evaluation* 27(1), 57-79. <https://doi.org/10.1177/1356389020976153>
- Wilkinson, H. et al. (2021) Building a systems-based Theory of Change using Participatory Systems Mapping. *Evaluation* 27(1), 80-101. <https://doi.org/10.1177/1356389020980493>
- Barbrook-Johnson, P. & Penn, AS. (2018) A participatory systems map of the Energy Trilemma. CECAN report. Available at: <https://www.cecan.ac.uk/projectreports>
- Barbrook-Johnson, P. (2019) Negotiating complexity in evaluation planning: A participatory systems map of the energy trilemma. CECAN EPPN No. 12. Available at: <https://www.cecan.ac.uk/resources>
- Barbrook-Johnson, P. (2020) Participatory Systems Mapping in action - supporting the evaluation of the Renewable Heat Incentive. CECAN EPPN No. 17. Available at: <https://www.cecan.ac.uk/resources>
- Hallsworth, M. (2011) System stewardship: the future of policy making? Institute for Government. Available at <https://www.instituteforgovernment.org.uk/publications/system-stewardship>



[www.cecan.ac.uk](http://www.cecan.ac.uk) / [cecan@surrey.ac.uk](mailto:cecan@surrey.ac.uk) / +44 (0) 1483 682769

The Centre for the Evaluation of Complexity Across the Nexus (CECAN) is a £3m national research centre hosted by the University of Surrey, which brings together a unique coalition of experts to address some of the greatest issues in policy making and evaluation.

**This Evaluation Case Study Policy and Practice Note was written by Pete Barbrook-Johnson, Alex Penn, and Ben Shaw. We thank Francine Gilmore and Claire Gregory at CCAV for their input and collaboration on the case study.**

CECAN has developed a set of co-produced case studies, working with government departments and agencies to tackle their intractable evaluation challenges in complex policy area. These case studies have involved sustained dialogue and an orchestrated succession of activities and relationship building. They are providing experiments in bringing together the expertise of evaluation practitioners, methods and domain specialists, social and natural scientists and policy analysts to develop shared understandings of evaluation challenges and to identify evaluation needs and solutions.

CECAN receives funding from the  
Economic and Social Research Council

