

System mapping for UK infrastructure systems decision making

Tom Hughes
Senior Policy Adviser

IPPO webinar
1st November 2023

NIC's role: an impartial and expert voice

- Established in 2015 to provide expert advice to government on long term infrastructure challenges
- Remit covers **energy, transport, water and wastewater, waste, flood risk management and digital communications**
- Fiscal remit set by government – can recommend public investment of 1.1-1.3% GDP
- Focused on next thirty years



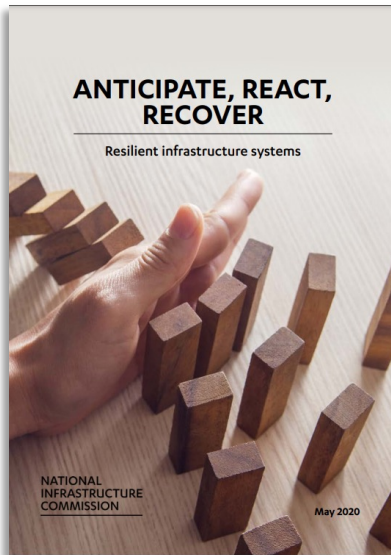
Knowing
what to
build: **NIC**

Funding: HMT



Getting it
built: IPA

Resilience Study



- Reviewed UK and international knowledge and approaches
- Considered public expectations and response to the potential loss of infrastructure services
- **Undertook pilot analysis to better understand systems and identify actions to improve resilience**
- Developed a framework for thinking about resilience
- Made recommendations to government about what we concluded were cross-cutting priorities:
 - resilience standards
 - stress testing
 - development of long-term resilience strategies

Why systems mapping?

Aim: to understand the relationship between different decision-making factors, their relative importance in determining what levels of service are delivered and how they relate to one another.

- What are the relevant decision-making factors within each infrastructure system?
- How do different factors interact?
- How do different systems interact as a system-of-systems level?

The first part of the project focussed on data collection with a mix of desk research, individual expert engagement and a workshop.

Individual sector maps were produced and then edited following feedback, to consolidate into a system-of-systems map. This was then iterated over time.

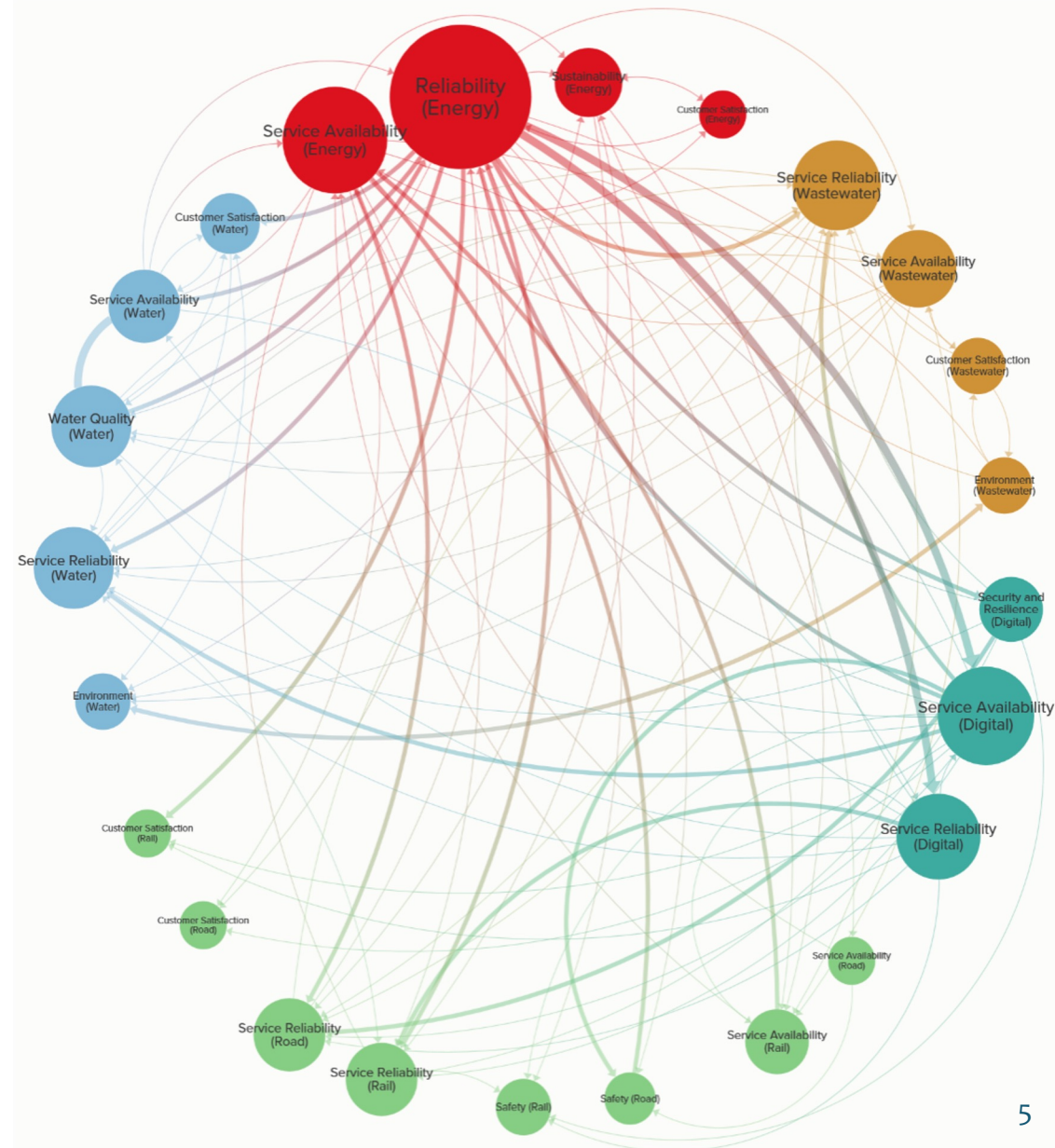
We complemented this with other research, including [technical analysis](#) of functional interdependencies

We started simple ...

The exercise asked participants to identify links between the level of service in different sectors.

The thicker the line, the more connections between nodes.

The bigger the node, the more connections going to/from it.



... lots of feedback and trial and error ...

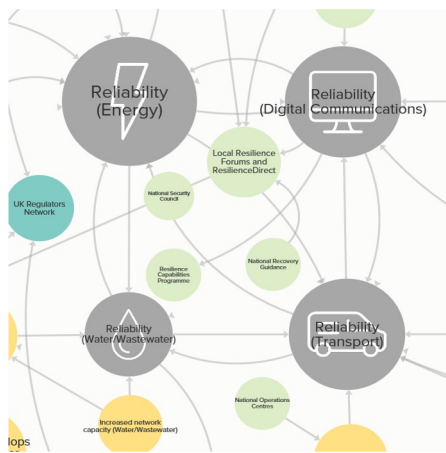
Sectoral experts fed back on each sector map

Then we brought in experts from other sectors to help identify interdependencies with other sectors

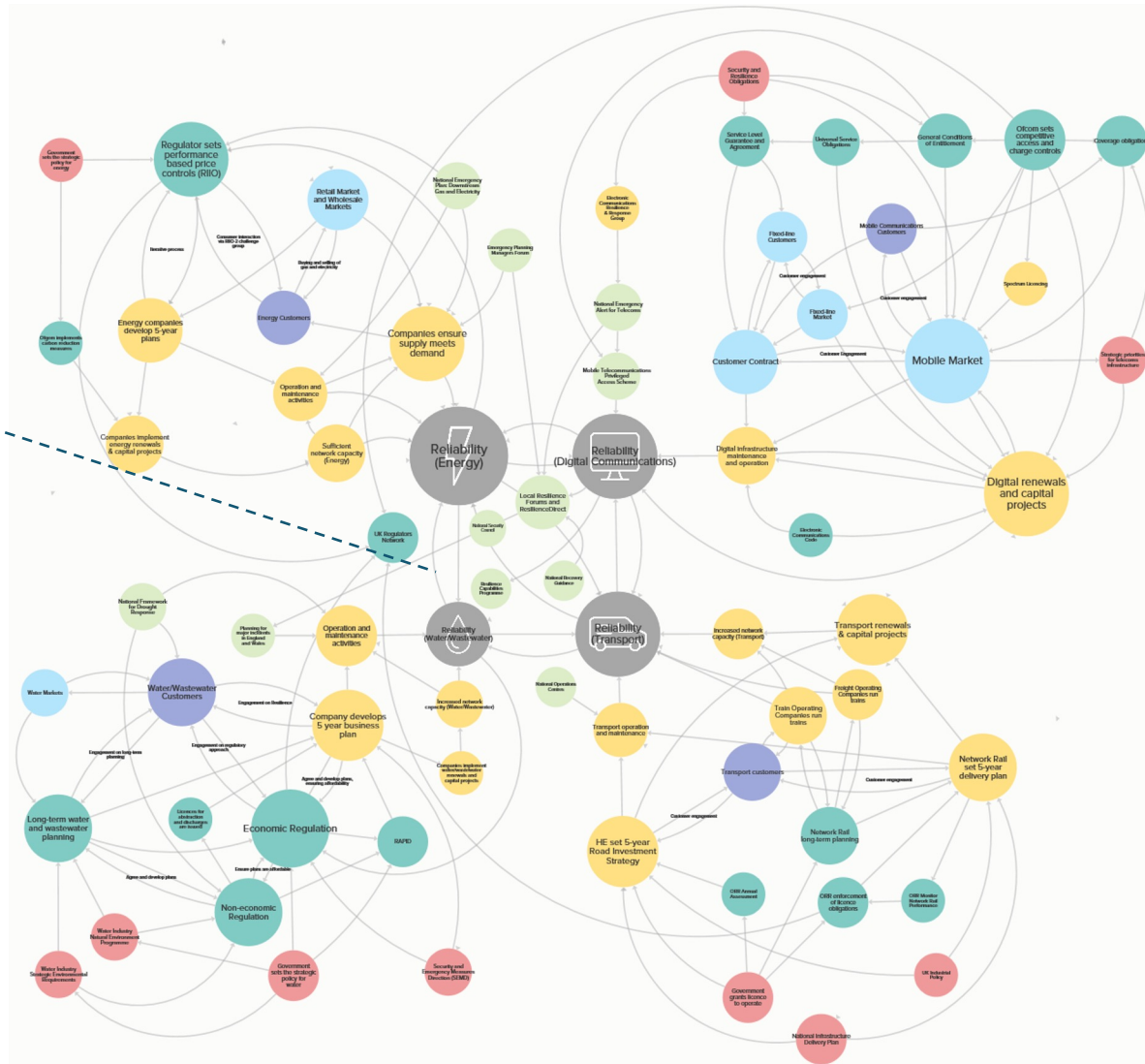


... we iterated the final map

Informed by the earlier work, we built these around the reliability of the level of service in each sector



While we did have a single 'final' map, it was helpful to be able to look at it in different ways



What did we learn?

- **Think illustratively** – there isn't always an objective way to define or show the system, so think about what you want to analyse and communicate
- **Pick the right view** – it's tricky to get the right level of simplification and the right layers of detail while maintaining an overall system view that is intelligible
- **Relationships are tricky** – not just how individual relationships work, but also the interactions between them and their relative importance
- **Value the process** – going through the process to creating a systems map is at least as valuable as the actual map itself
- **Diagnosing not solving** – systems maps will help you identify problems, but they won't tell you how to fix them

Links

Final systems mapping [report](#) from Arup and [interactive presentation](#)

Project maps:

- [Taxonomy of decision making factors](#)
- [Current decision making](#)
- [Future scenario](#)

Resilience study [final report](#)