TRANSITION
CLEAN AIR NETWORK

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Taking a whole systems approach to transport decarbonisation

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The Policy Challenge – Anticipating potential consequences of transport decarbonization policy

- Transport systems are embedded in, and interact with social, economic, political, environmental and physical systems composed of multiple interacting factors – complex systems
- Must deliver multiple outcomes: reduced carbon emissions; improved air quality; equitable access to services and liveable places
- Unexpected indirect effects and trade-offs between outcomes often seen
- Need to understand probable causal connections between ‘system factors’ as a complete picture of the system complexity is not typically brought to bear on decision making processes
- Participatory Systems Mapping (PSM) allows us to capture and integrate diverse types of systems knowledge to stress test policy and design better interventions

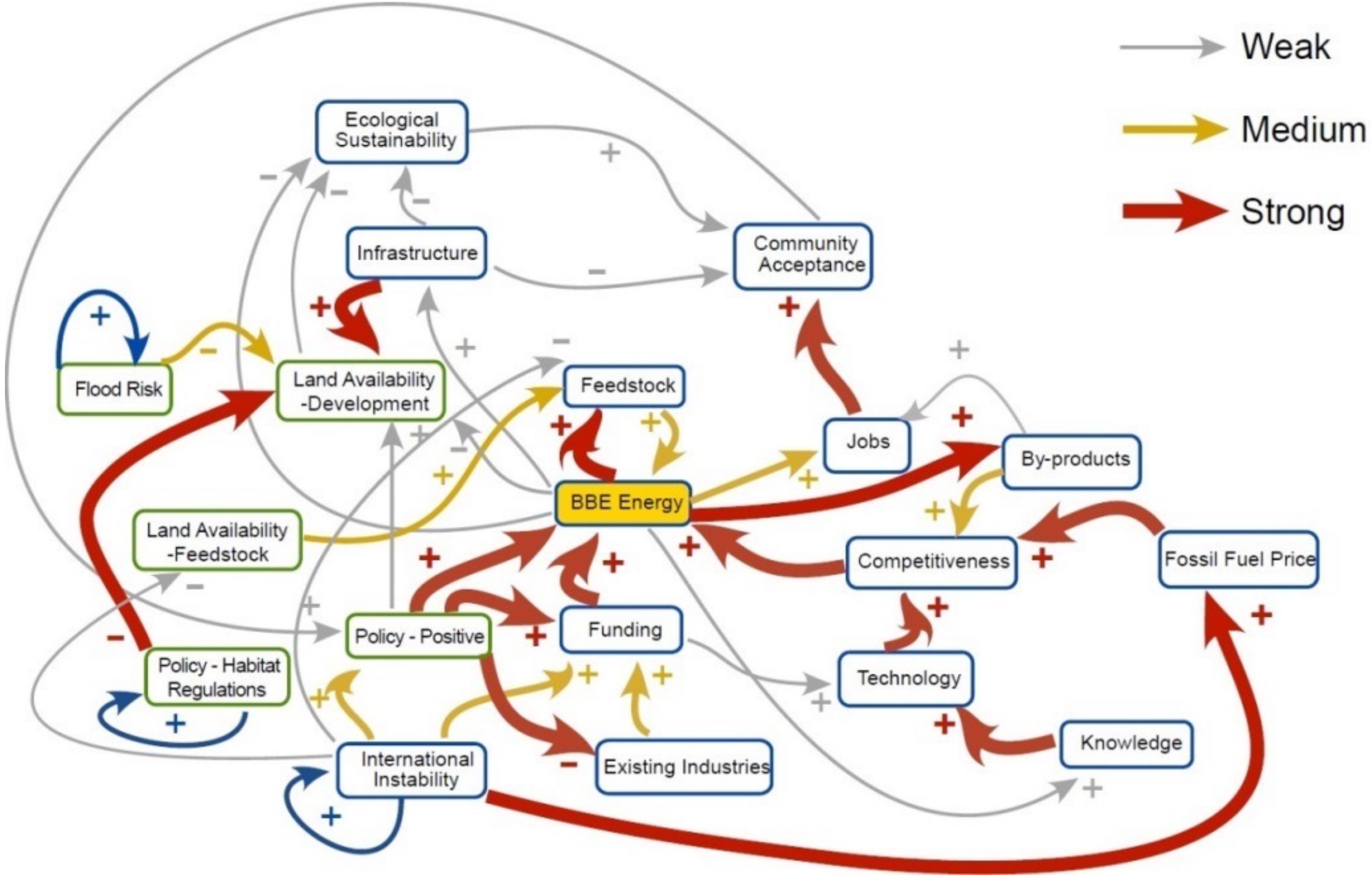
Participatory Systems Mapping

Invited participants collaboratively construct a simple causal model of their system, its components and drivers and their interdependencies

- Overview of *whole system*, emphasizes *interactions*
- Built together, discussion tool
- Diverse knowledge & perspectives
- Captures qualitative & quantified-what matters
- Bespoke analysis-usable insights

Successfully used in the U.K. government in a number of policy domains, which share similar properties of complexity:

- Multiple interconnected domains
- Lack of empirical data or focus on important parts of the system
- Trade-offs between different outcomes or stakeholder interests may need to be negotiated


Weak
Medium
Strong
Ecological Sustainability
Infrastructure
Community Acceptance
Flood Risk
Land Availability -Development
Feedstock
Jobs
By-products
BBE Energy
Land Availability -Feedstock
Competitiveness
Fossil Fuel Price
Policy - Positive
Funding
Policy - Habitat Regulations
Technology
Knowledge
International Instability
Existing Industries

Analysis Overview

Analysis Type	Analysis question	Measure/ Method	Meaning
System-suggested	What are the most influential factors within the system?	Out-degree	Number of direct outgoing connections
	What are the most important factors?	Degree	Total number of direct connections
	Which factors have many different drivers?	In-degree	Number of direct incoming connections
	Which factors influence many causal paths?	Betweenness Centrality	Number of paths between other factors a given factor lies on
Stakeholder-suggested	What most directly influences given outcome/function?	Upstream analysis	All influences on a factors from a few steps back
	What factors does an intervention/change influence?	Downstream analysis	All factors influenced within a few steps forward
	What is a factor directly related to? Do these act as trade-offs or synergies?	Ego Network	Everything related to a factor within 1 or 2 steps

What kinds of things can we learn?

Bespoke map analysis combines network analysis, causal flow with information from stakeholders –tailored to provided relevant insights

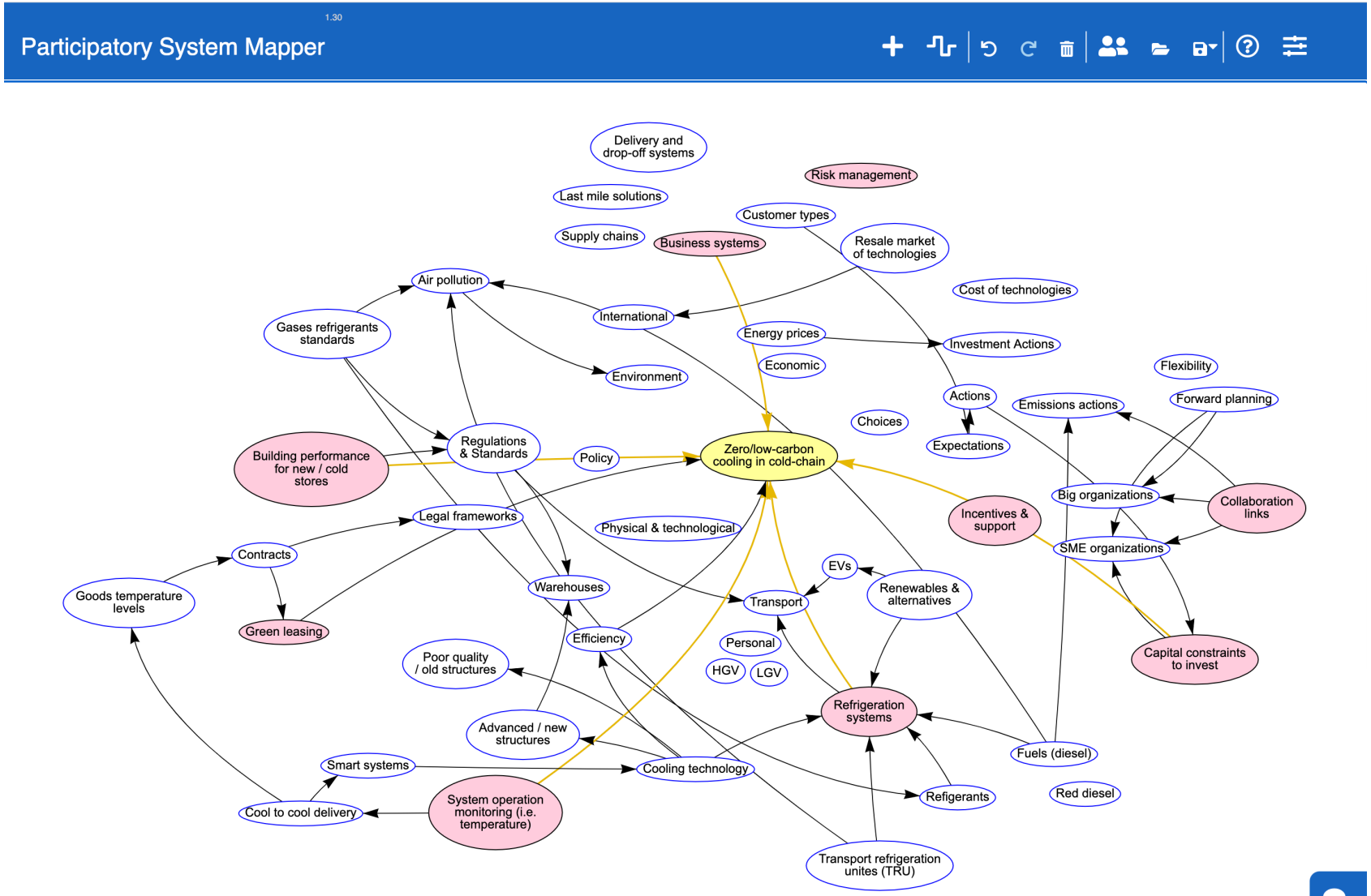
- What are the direct influences on key system functions/outcomes?
- What might be the impacts on the system of changes? Either external or made by those in the system?
- What interactions, trade-offs, or synergies may exist between important functions?
- What might be a vulnerability in the system?
- What might be an opportunity for effective intervention – a ‘lever’?

Mapping the UK personal surface transport system

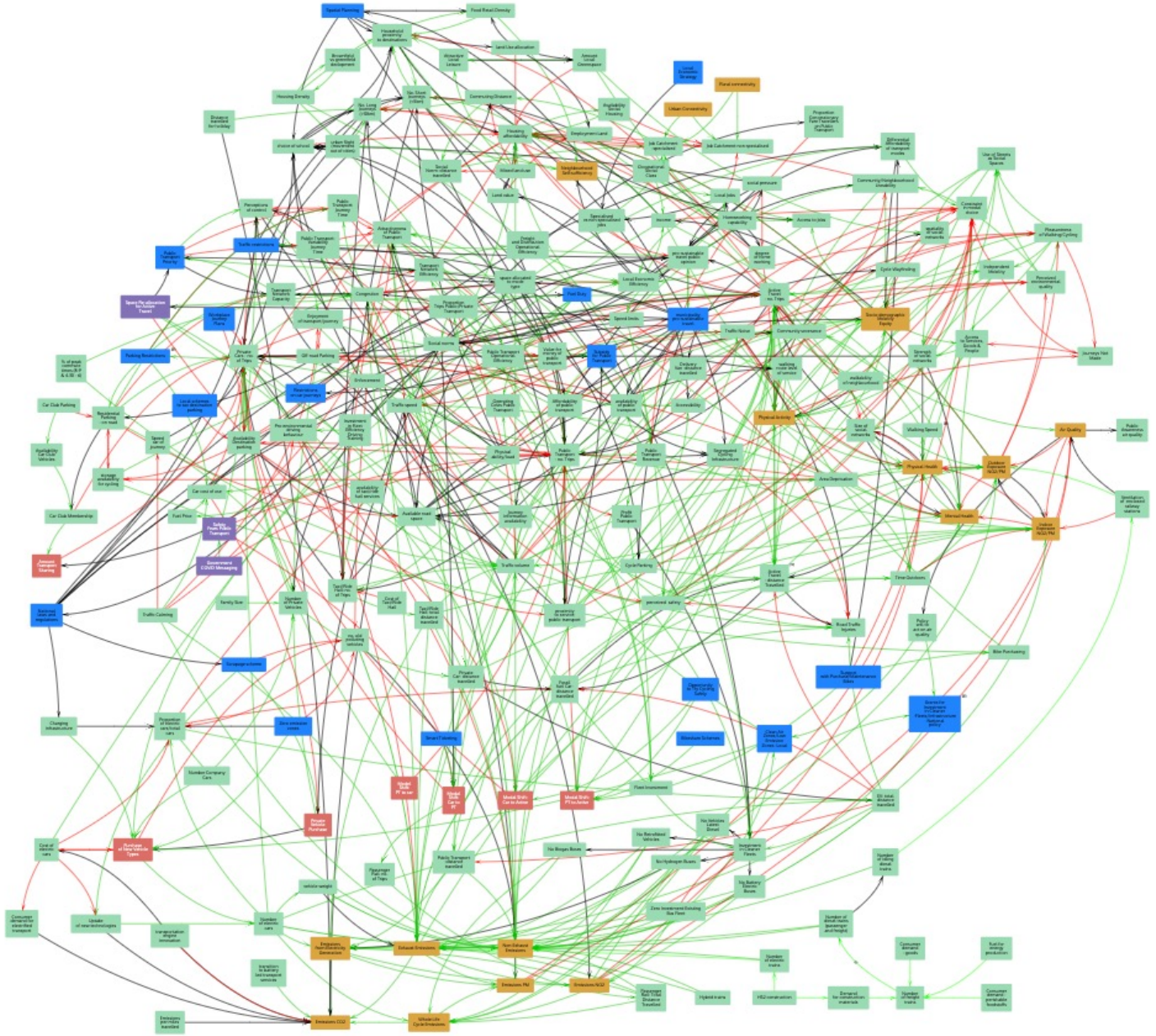
- The personal surface transportation “system” in use: What it is, how it works, how people use it and why?
- Breadth of “outcomes” Carbon, NO2, PM emissions; Mobility Equity; Connectivity; Neighbourhood Self-Sufficiency
- Factors from any domain that impact on or are impacted by these and their causal interconnections
- Created in 2 joint online workshops and multiple 1-2-1 sessions with diverse stakeholders from TRANSITION network: transport providers: local authorities; NGOs; academics

Open Access Paper https://www.mdpi.com/2073-4433/13/3/492/htm

Developing new online tools & collaborative workshop methods- Participatory System Mapper –Experimental!

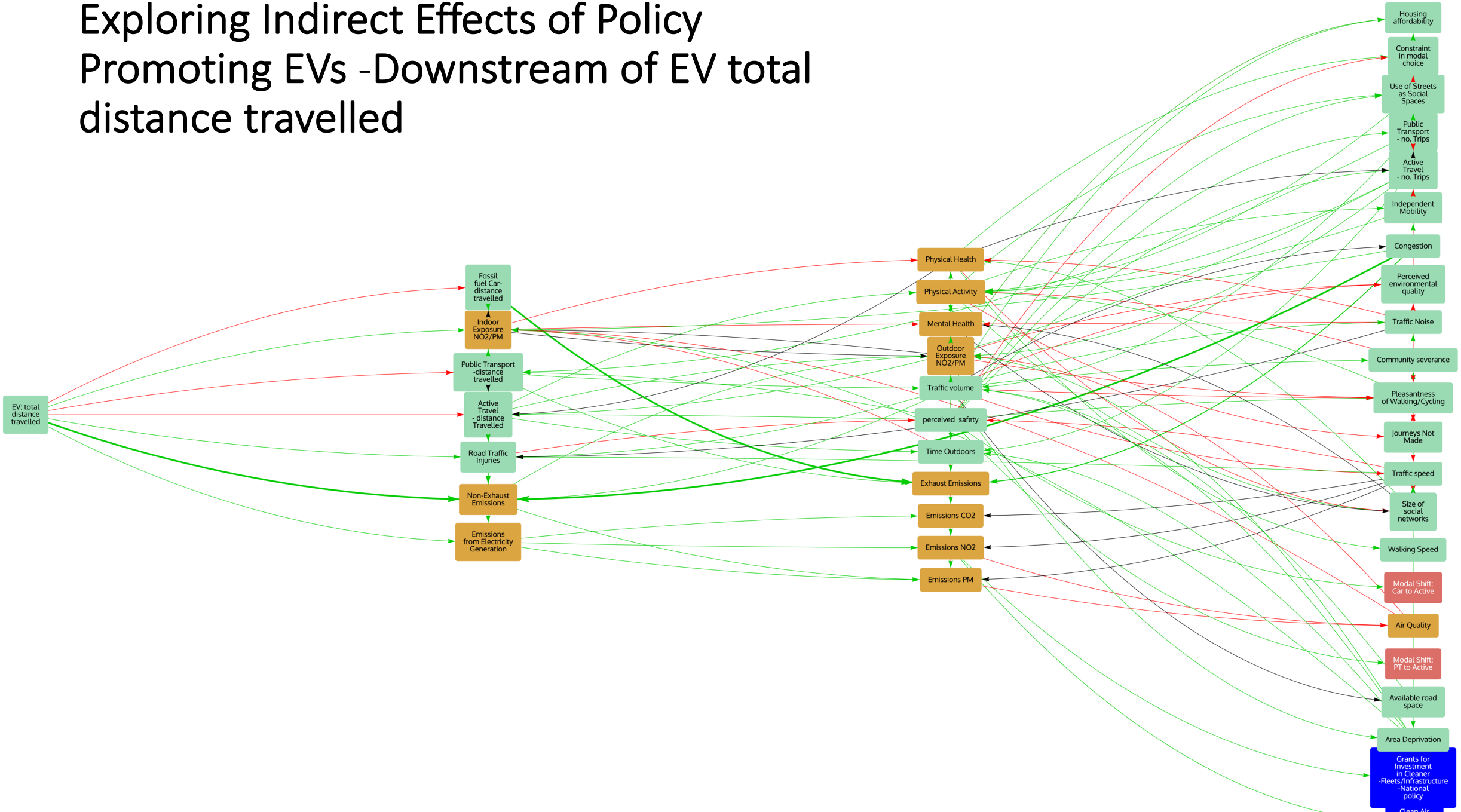


The Map



https://www.prsm.uk/prsm.html?room=OIH-PEX-URN-LFV

Exploring Indirect Effects of Policy Promoting EVs -Downstream of EV total distance travelled

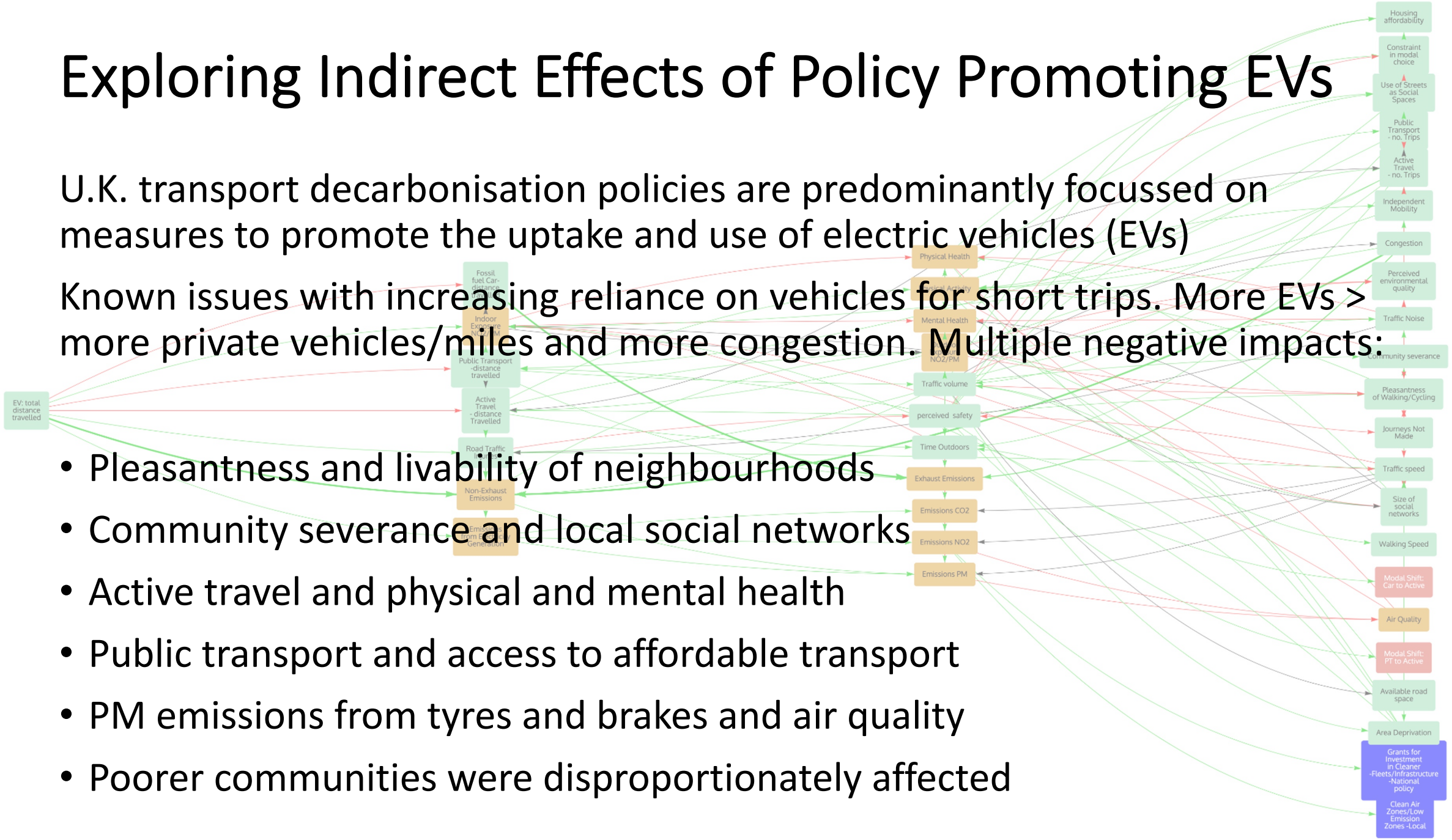


Exploring Indirect Effects of Policy Promoting EVs

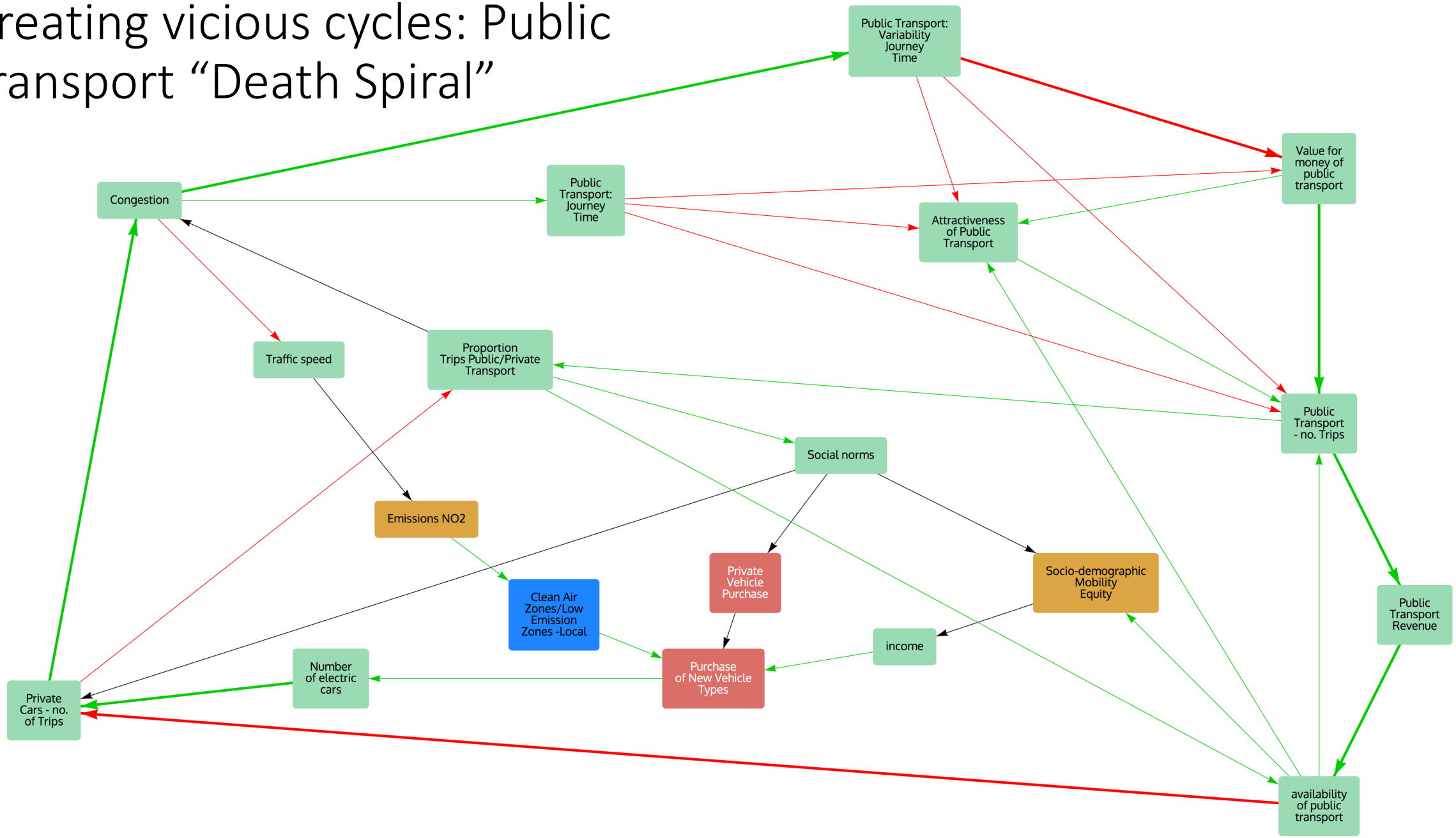
U.K. transport decarbonisation policies are predominantly focussed on measures to promote the uptake and use of electric vehicles (EVs)

Known issues with increasing reliance on vehicles for short trips. More EVs > more private vehicles/miles and more congestion. Multiple negative impacts:

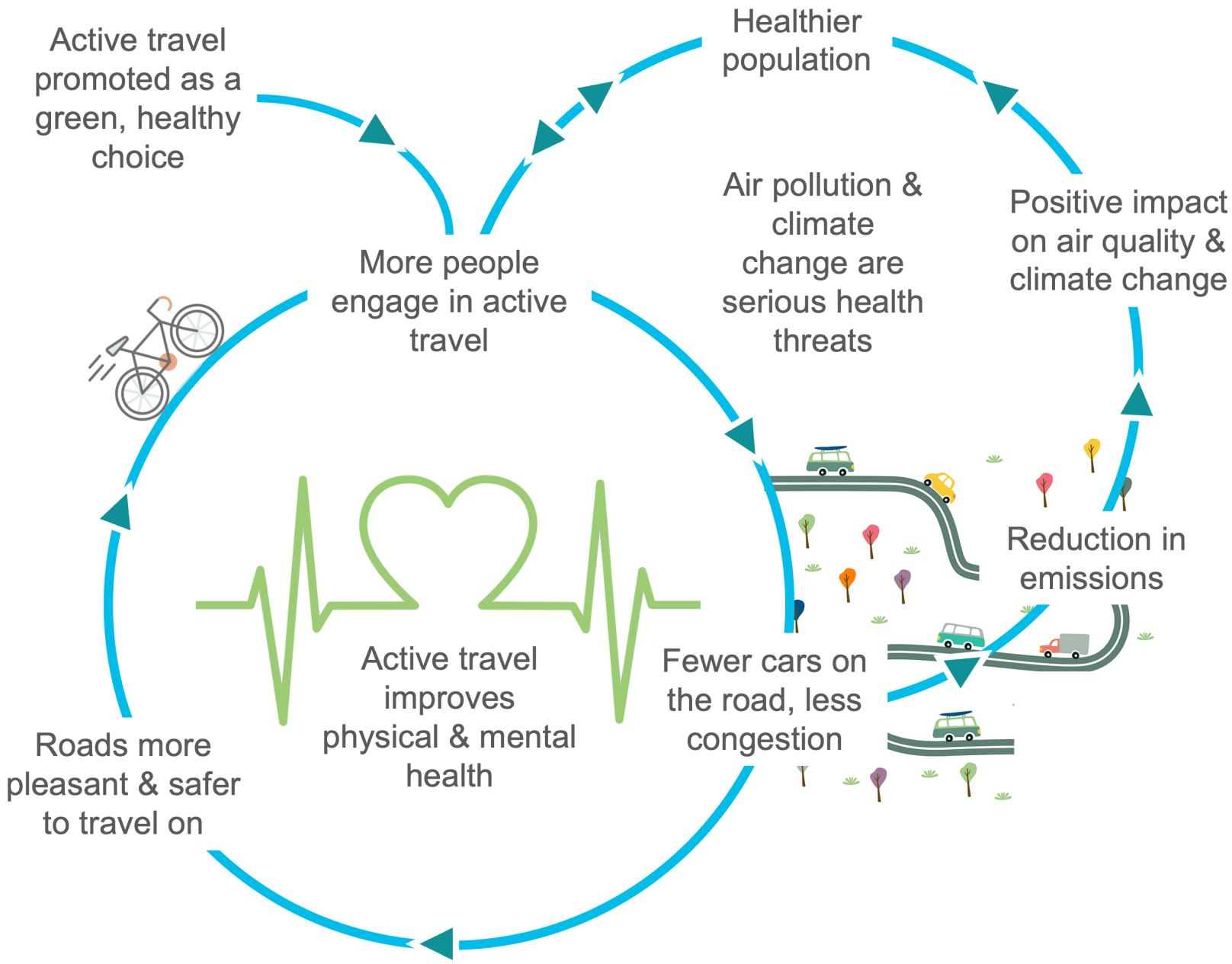
- Pleasantness and livability of neighbourhoods
- Community severance and local social networks
- Active travel and physical and mental health
- Public transport and access to affordable transport
- PM emissions from tyres and brakes and air quality
- Poorer communities were disproportionately affected



Creating vicious cycles: Public Transport “Death Spiral”



Map also allows identification interventions that reduce CO2 with multiple co-benefits or create virtuous cycles



Use in national / local authority policy-making

Makes the complexity of system striking visible-no silver bullets for air quality or decarbonisation

Brings in knowledge of how things work on the ground vital to effective policy

Crucially, shows adaptive approach to policy needed as unexpected indirect effects and behaviours emerge as interventions are put in place.

Tailor Analysis to What is Relevant Producing Actionable Insights:

- What are potential indirect effects of policy interventions/scenarios?
- What influences key policy outcomes?
- What potential trade-offs or synergies between different outcomes exist?
- What might be potential policy levers or risks to policy outcomes?

What can we do?

- How can we mitigate unintended negative effects, trade–offs or risks?
- How can we capitalise on or create potential outcome synergies?
- How can we design interventions to leverage the system structure, disrupt/promote feedback loops
- Adaptive policy making – ongoing monitoring, evaluation and intervention redesign will be needed



Perhaps most importantly, PARTICIPATION!

- Allows people to construct shared understandings of *their* complex systems
- Models and analysis including what matters to them
- Collectively increase understanding of system and others' perspectives
- Accessible exploration of system complexity
- Collaboratively design complexity-appropriate interventions and strategies with multiple co-benefits which work for everyone and for the whole system

Participatory Systems Mapping Resources

Atmosphere Open Access Paper

https://www.mdpi.com/2073-4433/13/3/492/htm

CECAN PSM process guidance and toolkit

https://www.cecan.ac.uk/resources/toolkits/the-participatory-systems-mapping-toolkit/

PRSM software https://prsm.uk/

The transport systems map

https://www.prsm.uk/prsm.html?room=OIH-PEX-URN-LFV

https://www.anticipate.ac.uk/

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anticipateproject

Natural Environment Research Council

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