

# Addressing the Transport Zero Carbon Challenge: Concepts and tools in supporting cities in meeting their targets

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## Introduction

- While the negative externalities associated with urban road traffic have been well documented over many years, the need to decarbonise the transport sector brings new challenges, a greater urgency – and new opportunities
- Finding effective and acceptable solutions is highly dependent on the framing of the problem. As Einstein is credited with saying: ‘we can’t solve problems using the same thinking that created them in the first place’
- This presentation covers five issues:
  - The significance of framing
  - Implications for street design
  - The need to develop credible transition pathways
  - The importance of working with major trip-generating sectors
  - Effective implementation

Drawing on three EU Horizon 2020 projects: CREATE., MORE, SUMP-PLUS

# PROBLEM FRAMING

# Policy perspective shape cities



- Road building
- Car parking
- Lower density
- Dispersion

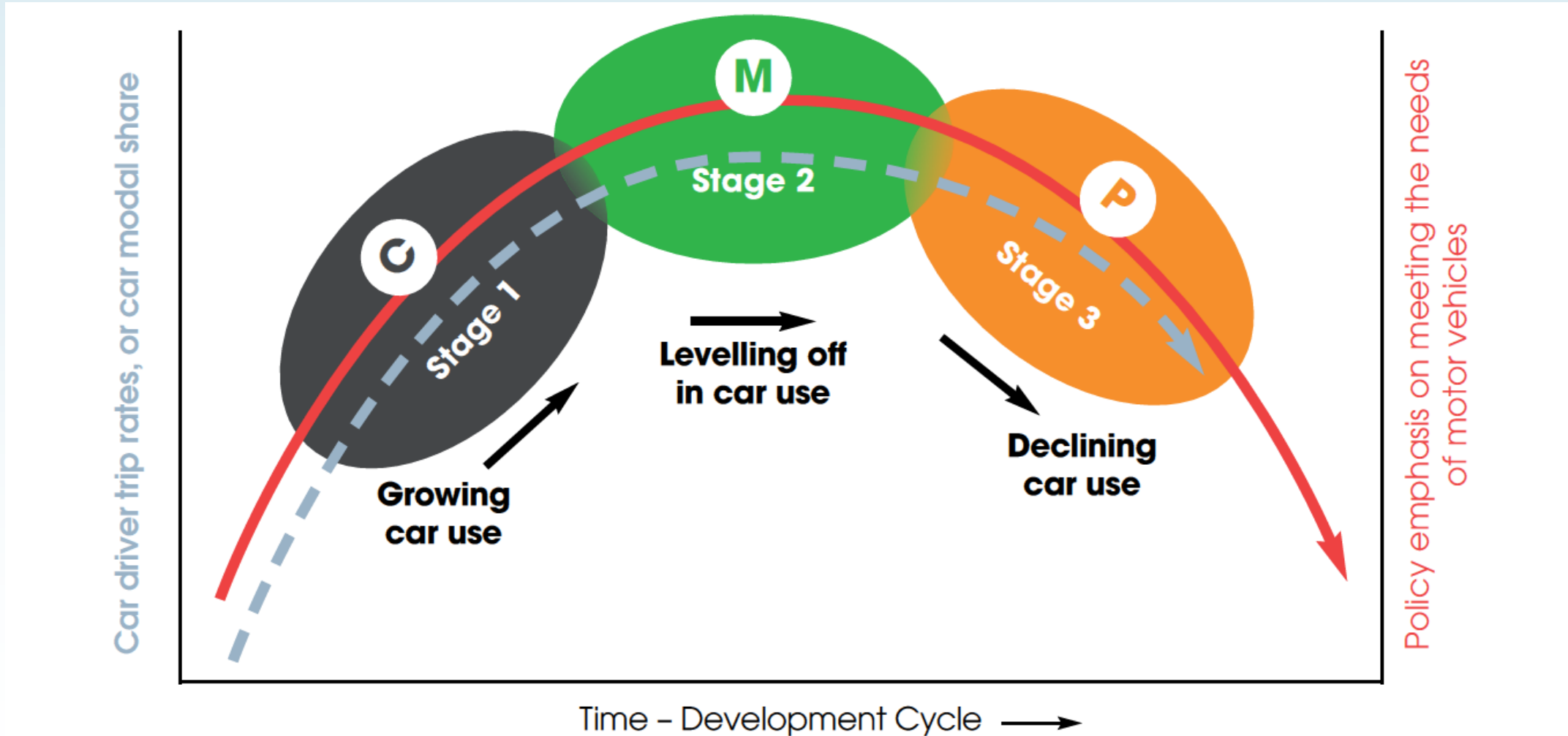


- Public transport
- Cycle networks
- Roadspace reallocation



- Public realm
- Street activities
- Traffic restraint
- ToD/mixed use developments

# And lead to changes in travel behaviour



# IMPLICATIONS FOR STREET DESIGN

## The Role of Street Design in Delivering Objectives



“Street redesign and improved management of public space can reverse induced demand by reallocating public space and investment to low carbon and space efficient modes, and balancing space use between transport and other uses; leading instead to disappearing traffic. Barcelona’s Superblocks are an example of street redesign and reallocation planned to transform the whole of the Barcelona Municipality.”

- In London, all the mayor’s strategies can be supported through street design and management

# Make a real difference, on the ground

London, Aldgate Square:

**C** Put in gyratory to increase road capacity (1960s)



Before

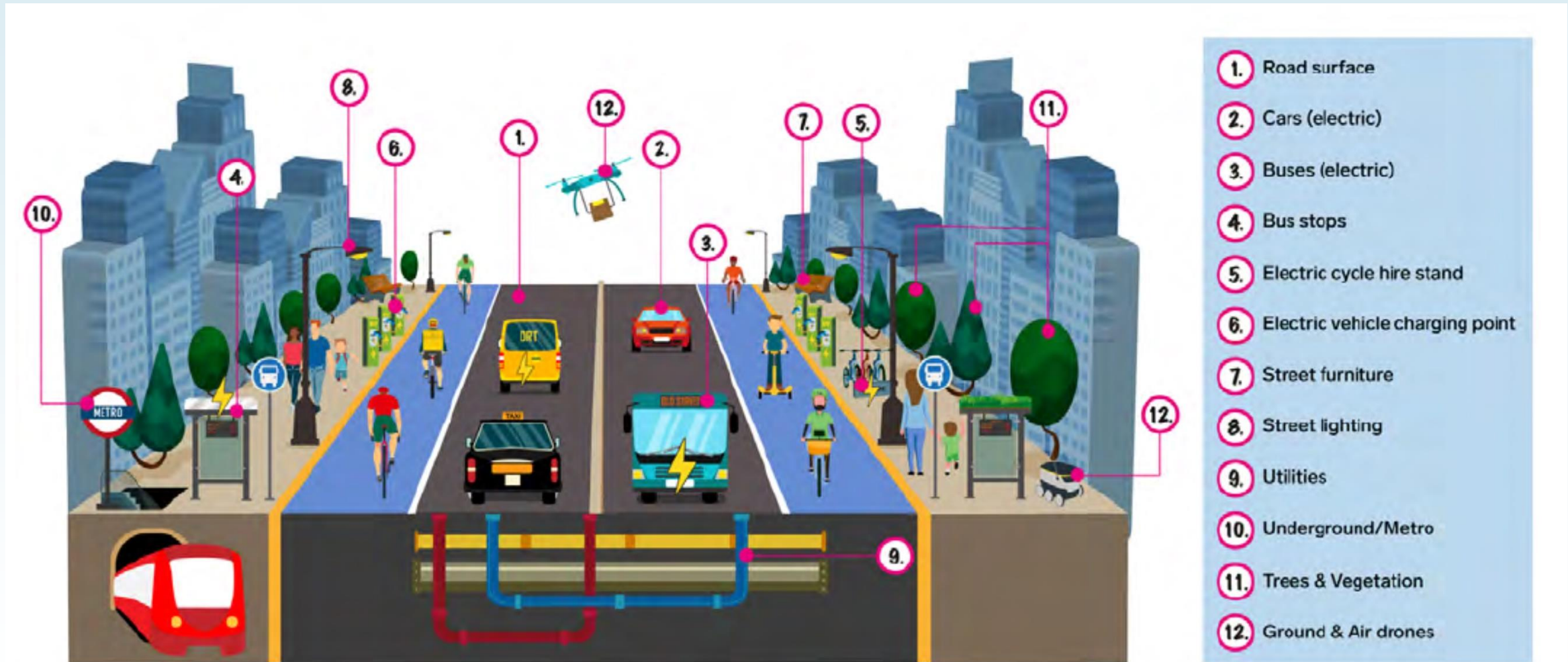
**P** Remove, to enhance place and provide new community heartland (2018)



After



# Replacing carbon emitters in the street



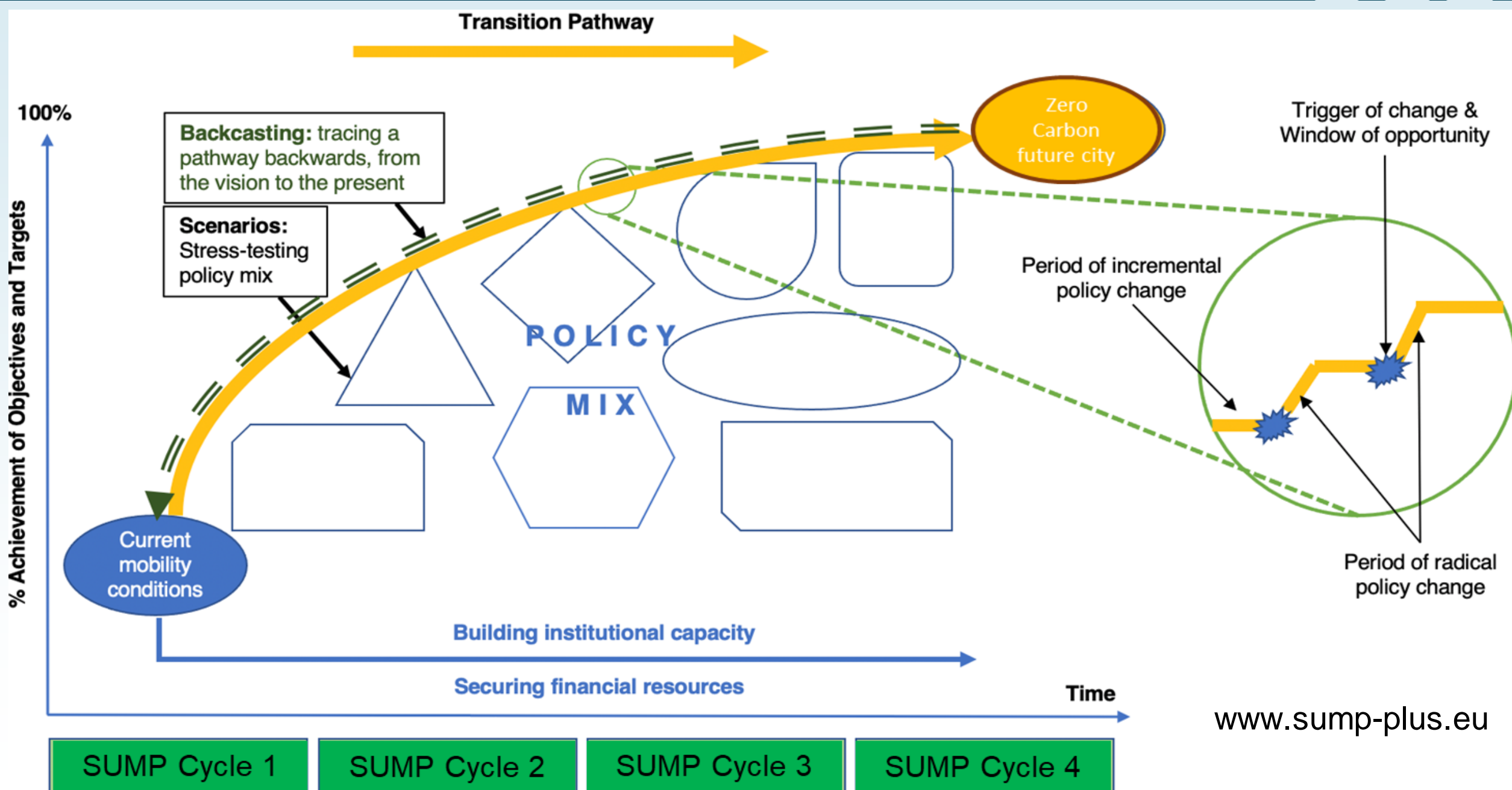
# CARBON TRANSITION PATHWAYS

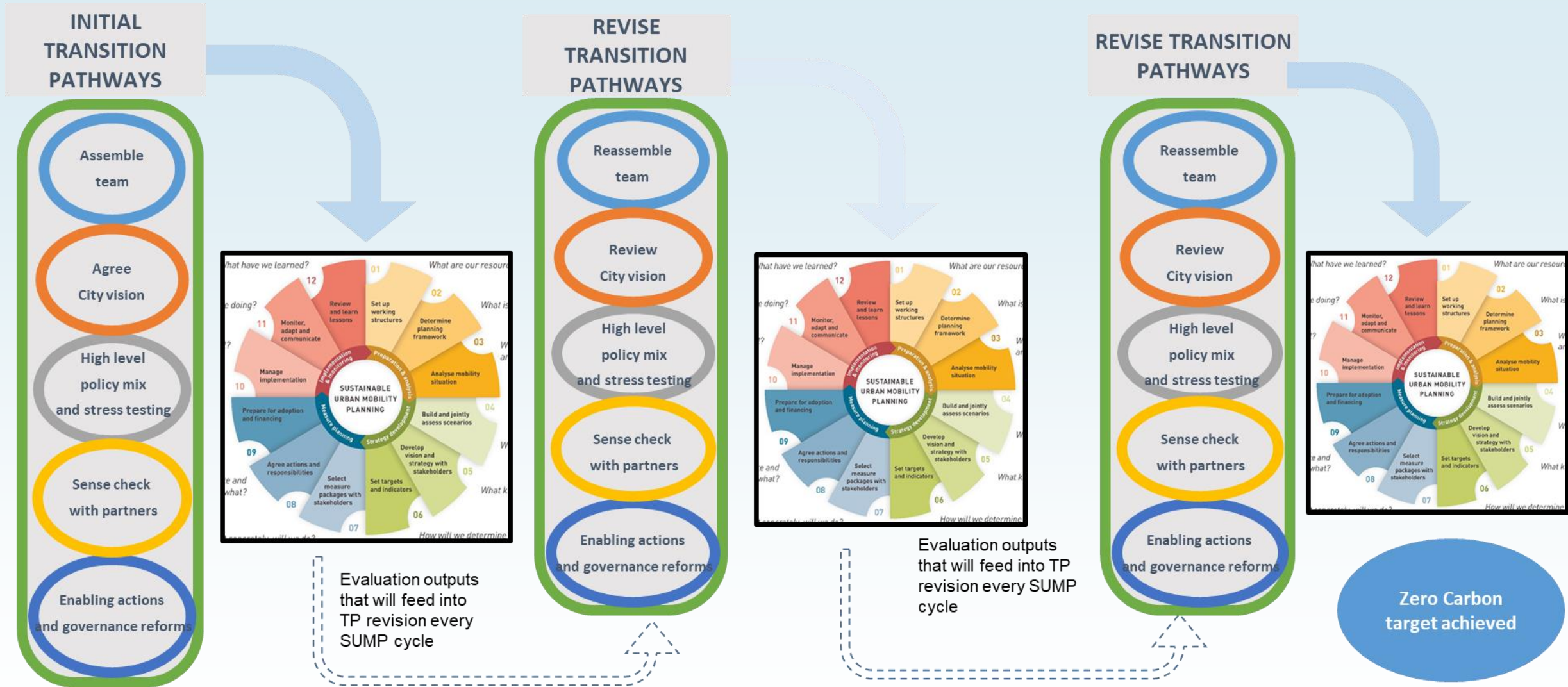
## Key points:

Successful development and implementation of a zero carbon transition pathway depends on:

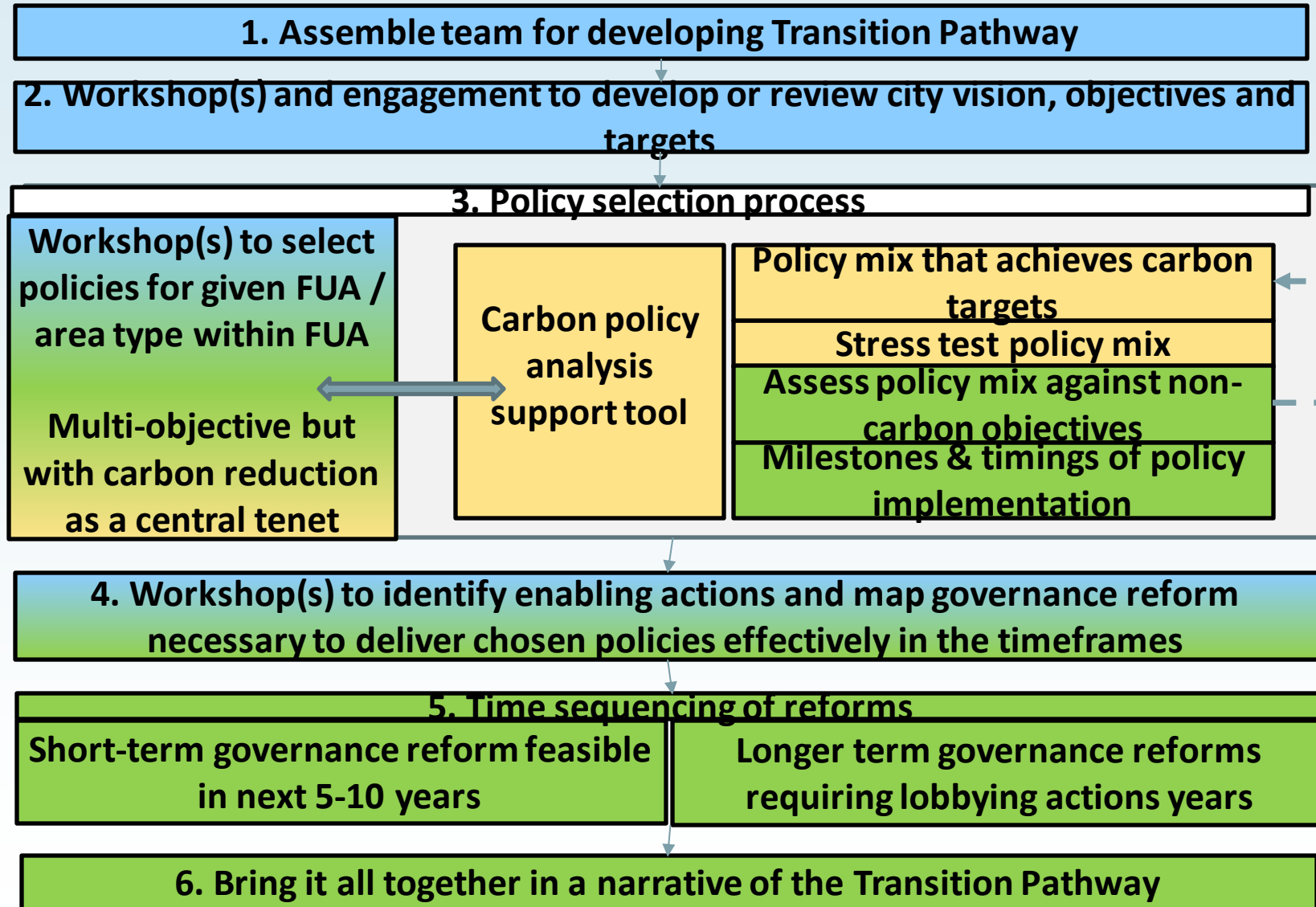
- Developing a long-term vision
- Devising a set of strategies that will collectively deliver the vision – validated through backcasting
- Engaging effectively with a wide range of stakeholders
- Developing a comprehensive implementation strategy, with both spatial and temporal dimensions

*See SUMP Topic Guide on ,Decarbonising Urban Transport*



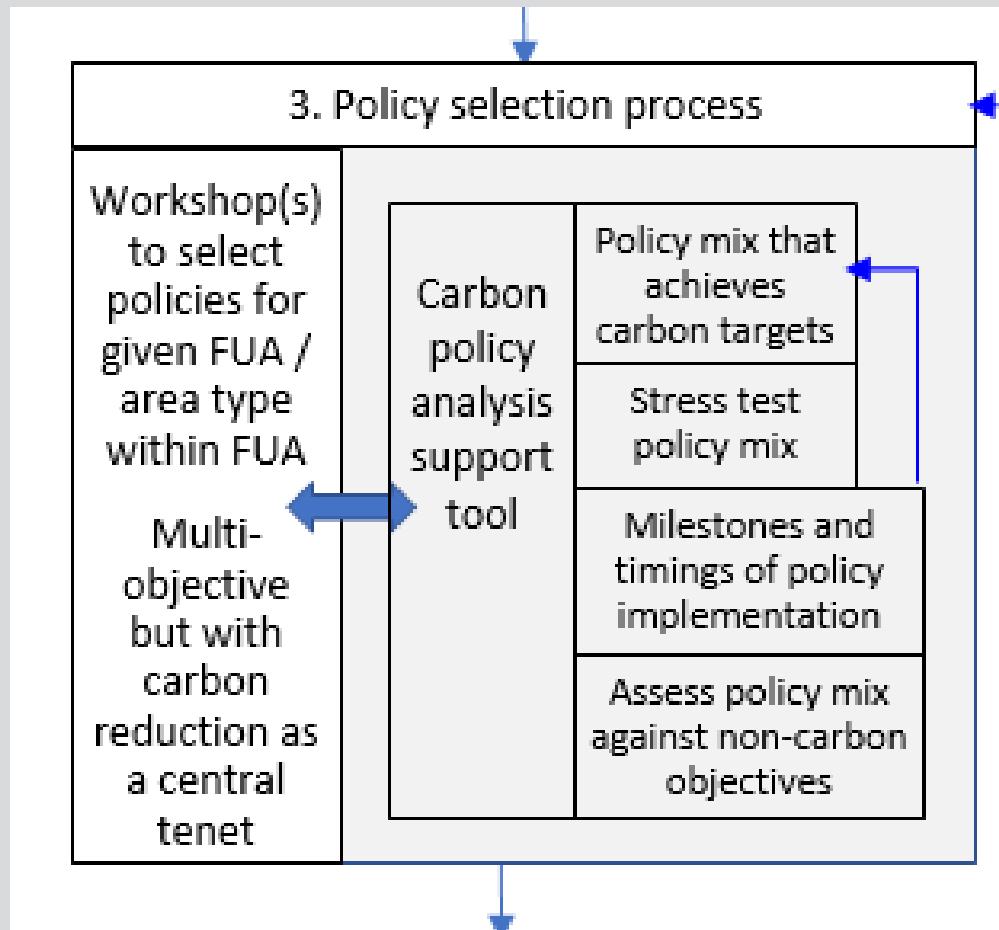


# Process for developing a transition pathway



- Engagement tools (WP4)
- Governance analysis/transition management (WP3)
- High level carbon reduction policy tool (WP1)

## Transition Pathway – Step 3



This comprises of a set of workshops to decide on the mix of policy strategies that are required to meet the long-term city vision objectives related to urban mobility.

Carbon Policy Analysis support tool developed to assist cities identify a suitable mix of policy strategies and their timings, that will achieve carbon targets while also respecting and supporting the other objectives that cities are looking to deliver.

**Policy strategy assessment to establish policy mix that achieves carbon targets**

To enable cities to assess the carbon reduction impact of different policy mix choices, a support tool has been developed that allows the user to vary the scale of input/uptake of a particular policy strategy in order to better understand the impact this has on overall carbon emissions, how it contributes to carbon reduction targets, and its relative significance in comparison to other policy choices.

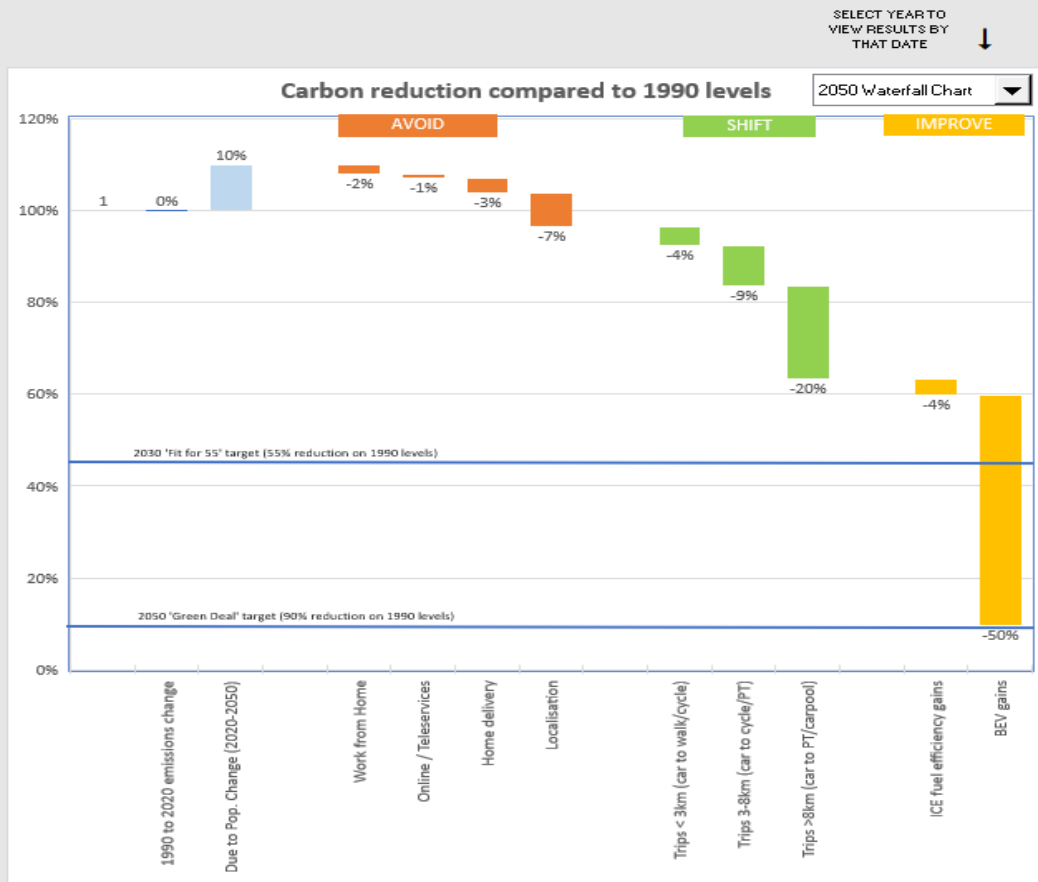
*this tool, funquise calls indicate where user inputs are*

The tool helps users gauge the potential contribution to carbon reduction from different policies related to avoid, shift and improve strategies. This enables more informed choices on the mix of policy strategies, also taking account of effects from the timings of these, that will deliver the carbon reductions required to meet the targets at key points in time up to 2050.

For each policy strategy, the user can select from a range of uptake scenarios (%-point increases) or improvement scenarios (% change) that they wish to explore.

Please provide the year by which the policy strategy will start to take effect and the year by which it will provide its full effect. The growth in take-up is assumed to be linear between the start and full effect years. This information is used to estimate the carbon emissions reduction in each year between 2021 and 2050.

**2050 POLICY MIX impacts**



**INPUT PARAMETERS**

**Background data**

Enter % change in car surface transport carbon emission from 1990 to 2019

Enter forecast % change in population from 2020 to 2050

What type of area best describes your city

What is the % mode share for car driver trips (all trips)

What is the % mode share for car driver trips (commuter trips)

**AVOID policy**

Enter the % point increase in working from home by year of full effect (from 2019 base case)

Enter the % point increase in personal business trips (e.g. banking, health) that are digitised or become telephone consultation by year of full effect (from 2019 base)

Enter the % point increase in shopping delivered to the home by year of full effect (from 2019 base)

Enter the % point increase of trips for shopping, leisure, personal business and education localised within a 15 minute walk from home by year of full effect (from 2019 base)

**SHIFT policy**

Enter the % point shift from car driver mode share to alternative modes by year of full effect (from 2019 base case)

**IMPROVE policy**

Enter the % of electricity generated from renewables (including nuclear) 2019 base

Enter the % of electricity generated from renewables (including nuclear) by year of full effect

Enter the % improvement in ICE fuel efficiency of conventional cars on the road by year of full effect (from 2019 base case) - [expected to be 30%]

Enter the % improvement in electric battery efficiency by year of full effect (from 2019 base case) - [expected to be 40% by 2050]

Electric vehicle takeup by year of full effect

Date by which policy strategy will start to take effect

<input type="text" value="2021"/>	<input type="text" value="2040"/>
<input type="text" value="2023"/>	<input type="text" value="2040"/>
<input type="text" value="2025"/>	<input type="text" value="2040"/>
<input type="text" value="2030"/>	<input type="text" value="2050"/>

<input type="text" value="2021"/>	<input type="text" value="2040"/>
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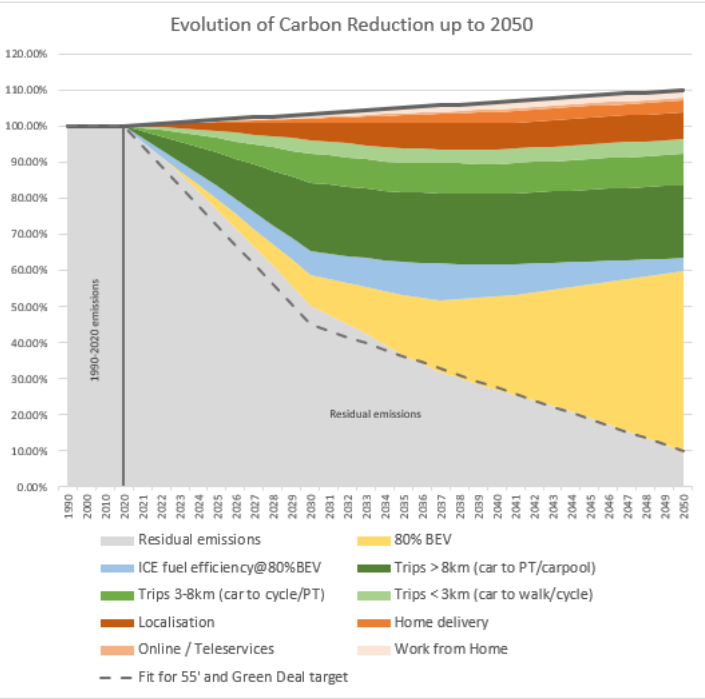
<input type="text" value="2021"/>	<input type="text" value="2050"/>
<input type="text" value="2021"/>	<input type="text" value="2037"/>
<input type="text" value="2025"/>	<input type="text" value="2045"/>
<input type="text" value="2023"/>	<input type="text" value="2050"/>



**Worksheet 3: Adjust Policy Timings**

This worksheet allows the user to visualise the effects of their policy strategy choices (levels of uptake/improvement and timings of implementation) on carbon reduction over time between 2020 and 2050. The two diagrams output in this worksheet, viewed together, can be helpful in ascertaining the optimal timings of policy strategy delivery to check that intermediate targets and milestones are being met and that cumulative emissions are within the prescribed targets needed to limit temperature rises to 1.5 degrees C. The information in these charts can highlight the need to bring forward the commencement of a particular strategy, or the need for it to take full effect sooner. This information helps establish the timings for policy delivery needed to meet the expected targets up to and including 2050.

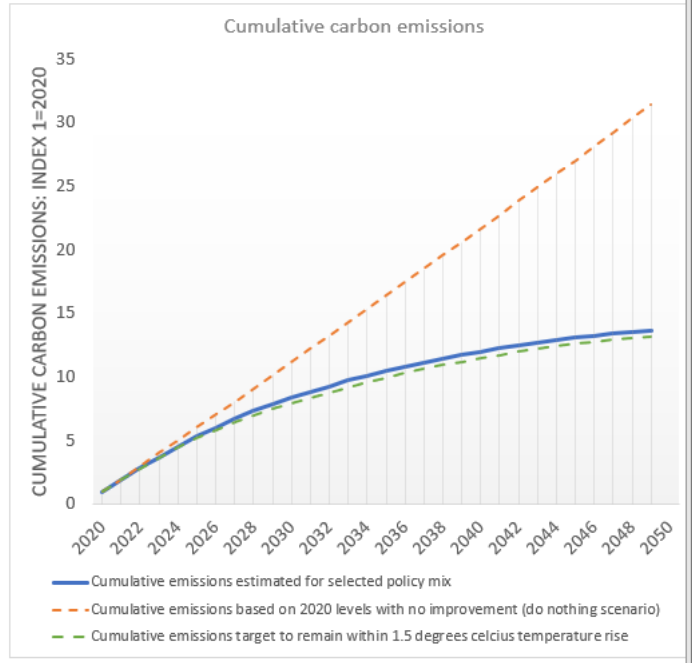
The dashed line in the chart below shows the necessary reduction in carbon for each year to remain on target to achieve the 'Fit for 55' target by 2030 and Green Deal target of 90% reduction in GHG emissions by 2050 compared to 1990 levels. If the dashed line is not reached by the policy strategy selections, then the user is offered the possibility to adjust the implementation timings for the various policy strategies. This allows the user to understand not only the level of uptake/improvement for the policy strategy, but also the timings for when the strategy should commence and when it is required to take full effect.



Policy	Description	% Improvement	Date by which policy strategy will start to take effect	Date by which policy strategy will take full effect	Adjusted date by which policy strategy will start to take effect	Adjusted date by which policy strategy will take full effect
AVOID policy	% point increase in working from home by year of full effect (from 2019 base)	20%	2021	2040		
	% point increase in personal business trips (e.g. banking, health) that are digitised or become telephone consultation by year of full effect (from 2019)	20%	2023	2040		
	% point increase in shopping delivered to the home by year of full effect (from 2019 base)	40%	2025	2040		
	% point increase of trips for shopping, leisure, personal business and education localised within a 15 minute walk from home by year of full effect	30%	2030	2050	2021	2035
SHIFT policy	% point shift from car driver mode share to alternative modes by year of full effect (from 2019 base case)	15%	2021	2040		2030
IMPROVE policy	% of electricity generated from renewables (including nuclear) 2019 base	30%				
	% of electricity generated from renewables (including nuclear) by year of full effect	100%	2021	2050		
	% improvement in ICE fuel efficiency of conventional cars on the road by year of full effect (from 2019 base case) - [expected to be 30%]	30%	2021	2037		
	% improvement in electric battery efficiency by year of full effect (from 2019 base case) - [expected to be 40% by 2050]	20%	2025	2045		
	Electric vehicle uptake by year of full effect	80%	2023	2050		

If the carbon reduction impacts do not occur soon enough to meet the target lines, then there is the need to bring forward the policy strategy implementation. This can be done by adjusting the start or full effect timings in the cells below.

The blue line on the chart below represents the cumulative emissions estimated for the selected policy mix inputs. The red dashed line reflects the do-nothing scenario and shows cumulative emissions if no improvements were made compared to 2020 rates of emissions (i.e., emissions remain at 2020 levels until 2050 and are only affected by changes in population). The green dashed line reflects the cumulative emissions limit if global temperatures are to remain within a 1.5 degree C temperature rise (i.e., achieving the 'Fit for 55' target by 2030 and Green Deal target of 90% reduction in GHG emissions by 2050 compared to 1990 levels). In this chart the cumulative emissions are indexed to the 2020 values of emissions as a % of 1990 levels.



# **DECARBONISATION STRATEGIES & CROSS-SECTOR COLLABORATION**

## Strategies to reduce carbon emissions

### **AVOID:**

- Substitute digital for physical meetings
- Provide equipment in-home
- Localise facility provision (shorter trips)

### **SHIFT:**

- Support/encourage shift to sustainable modes
- Consolidation of freight

### **IMPROVE:**

- Decarbonisation of vehicle fleet
- Increase energy efficiency

## Collaborations with other sectors

### **AVOID:**

- Substitute digital for physical meetings
- Provide equipment in-home
- Localise facility provision (shorter trips)

} Trip-generating sectors: education, health, leisure, retail..

### **SHIFT:**

- Support/encourage shift to sustainable modes
- Consolidation of freight

} Governments, transport providers and major trip attractors

### **IMPROVE:**

- Decarbonisation of vehicle fleet
- Increase energy efficiency

} Industry, utilities and transport providers

## Collaborations – weak links

### AVOID:

- Substitute digital for physical meetings
- Provide equipment in-home
- Localise facility provision (shorter trips)

} Trip-generating sectors: education, health, leisure, retail..

### SHIFT:

- Support/encourage shift to sustainable modes
- Consolidation of freight

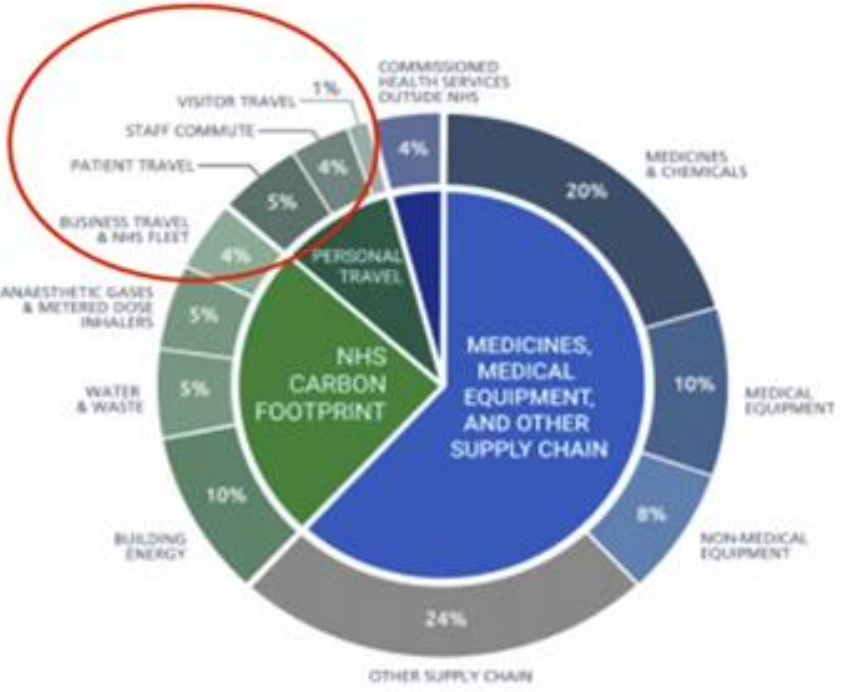
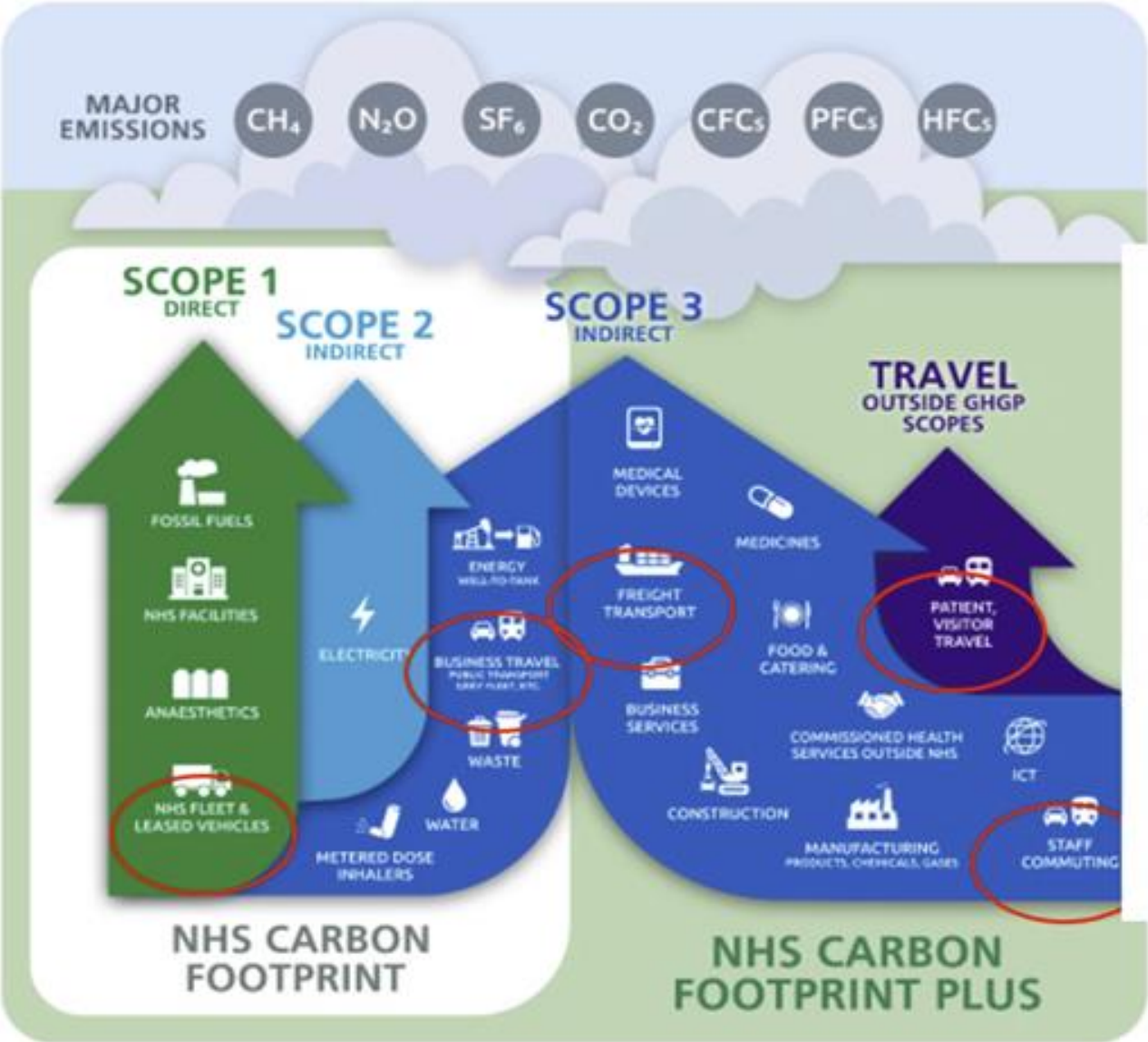
} Governments, transport providers and major trip attractors

### IMPROVE:

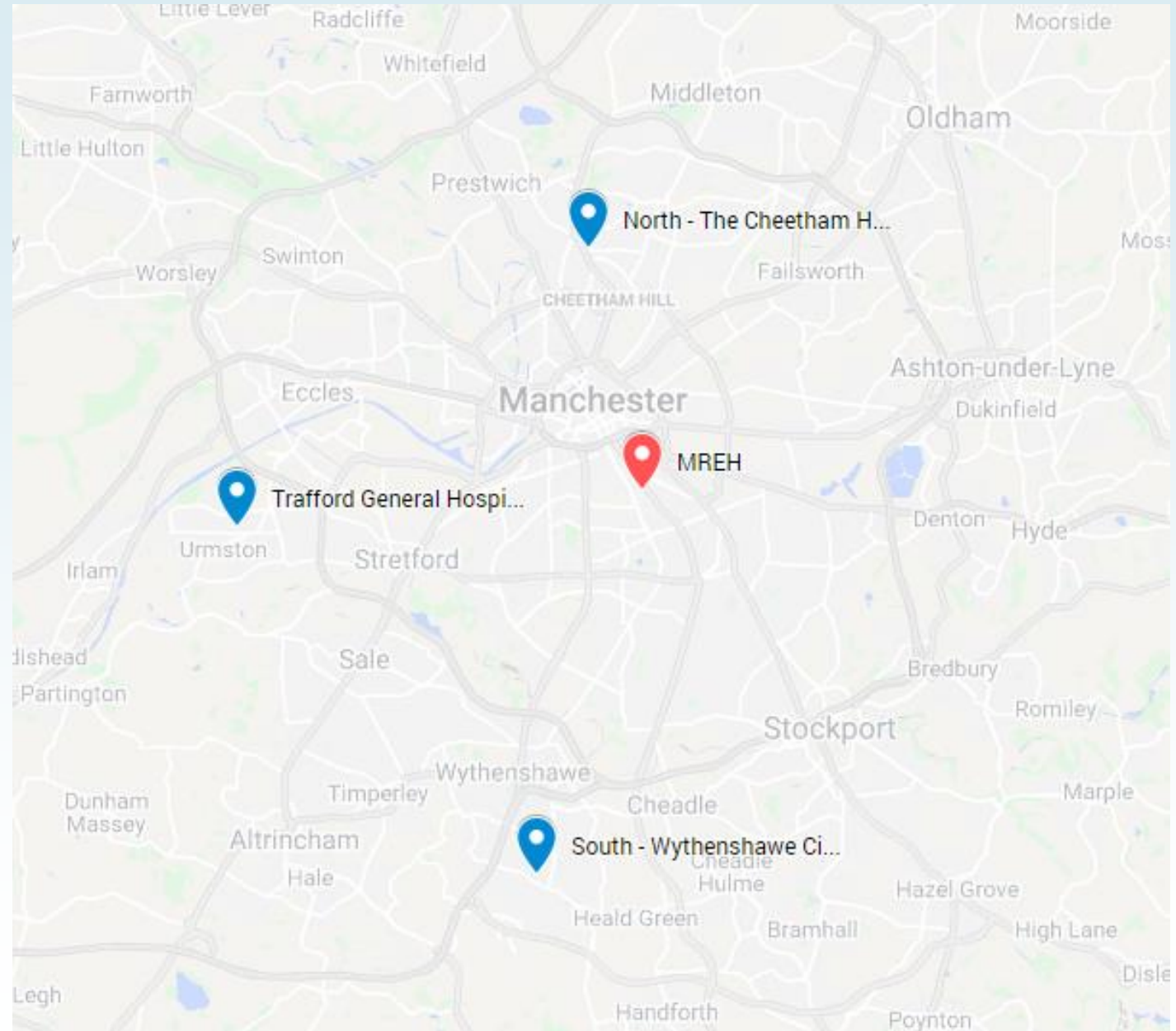
- Decarbonisation of vehicle fleet
- Increase energy efficiency

} Industry, utilities and transport providers

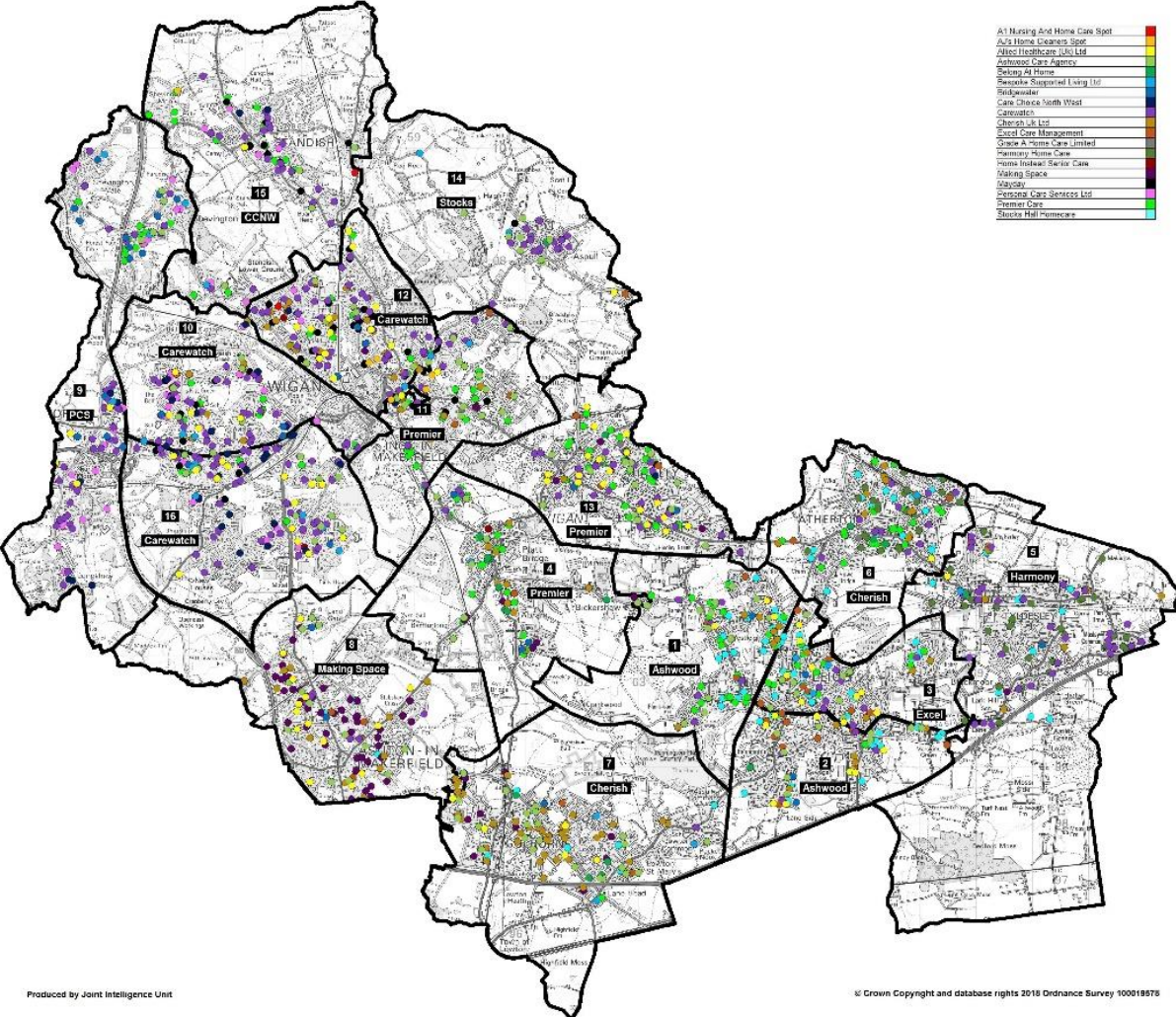
# Contributors to NHS travel and transport carbon footprint



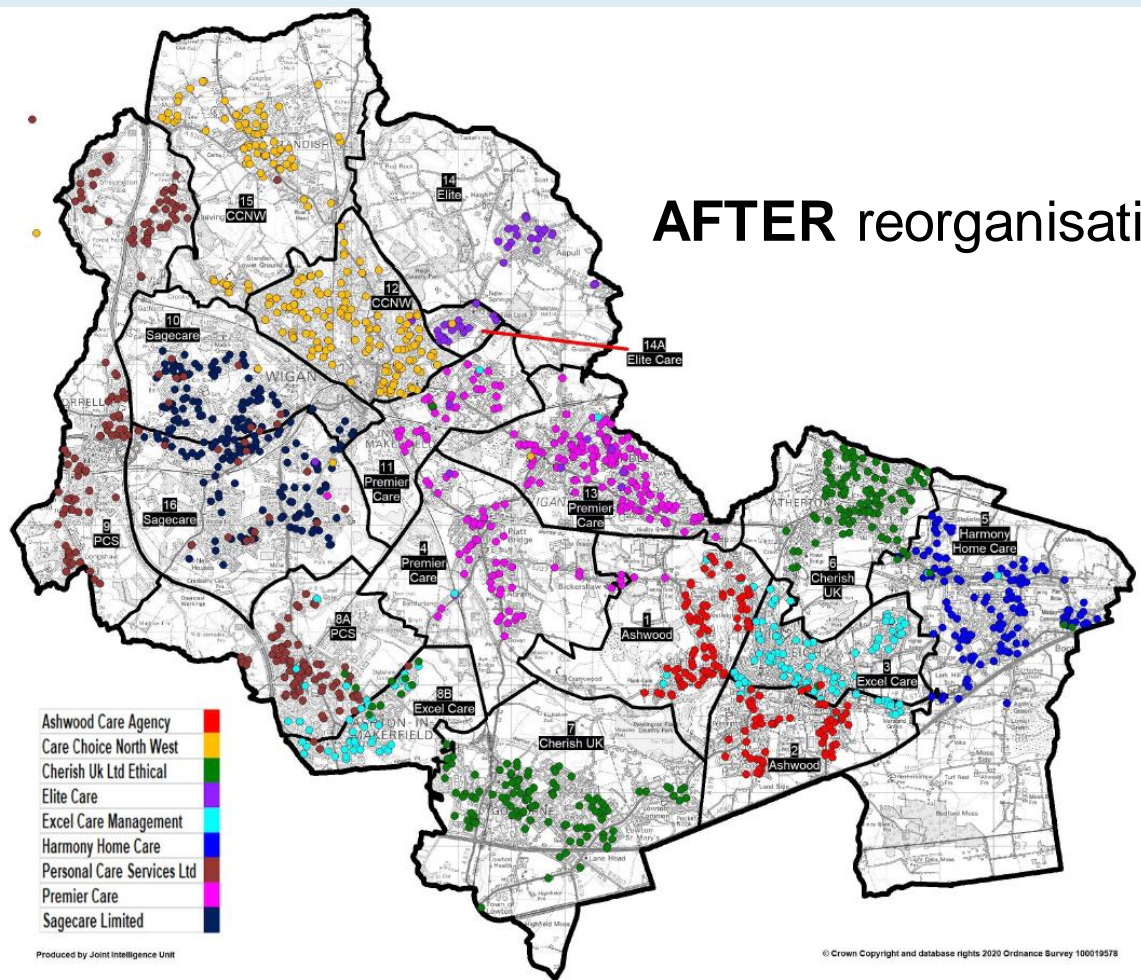
## Greater Manchester: Macular Degeneration Pilot in 3 local stations



# Home care: customer locations served by different providers



**BEFORE reorganisation**



**AFTER reorganisation**



## Generic service delivery options


Form of delivery	Details	Consequences
<b>Fixed Physical Facilities</b>	Trade-offs: Numbers vs Size	Varying size of catchment areas (trip lengths) and modal options
<b>Mobile</b>	Neighbourhood provision	Access on foot, but limited temporal availability
<b>Provision to people's homes</b>	Goods deliveries	Ordered by occupier or professional agency
	Personal services	Providing forms of care
<b>Provision in-home</b>	Physically	Purchase of equipment
	Digitally	Internet + receiver


# **PRACTICALITIES OF IMPLEMENTATION: MAXIMISING EFFICIENCY & EFFECTIVENESS**


## Core measure: Bus with High Level of Service

## Potential 'supporting' measures

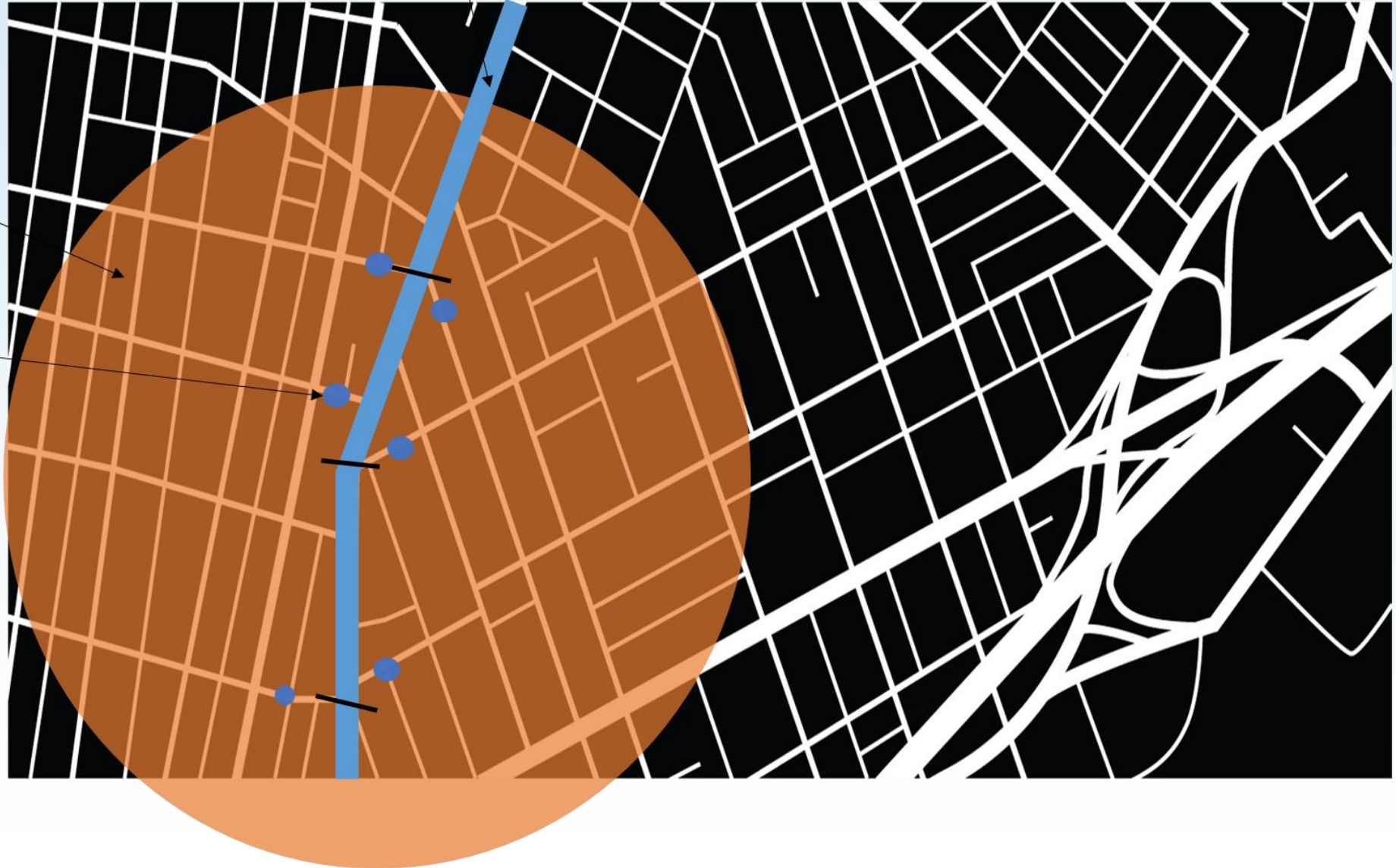
TYPE OF MEASURE	CORE MEASURE	SUPPORTING MEASURES				
	Public/ Collective transport	Walking/ Cycling/ Micro-mobility	Private vehicle ownership/use	Urban Freight and Logistics	Traffic/Kerbside Management	Land Use and Public Space
Physical (infrastructure, operations)	<ul style="list-style-type: none"> <li>Bus lanes and signal priority</li> <li>Bus shelters and seating</li> <li>CCTV to improve on-board safety</li> </ul>	<ul style="list-style-type: none"> <li>Improved infrastructure in bus stop catchment area;</li> <li>Safer crossings to stops</li> </ul>	<ul style="list-style-type: none"> <li>Park &amp; Ride provision at key stops/interchanges</li> </ul>	<ul style="list-style-type: none"> <li>E- lockers at major bus interchange</li> </ul>	<ul style="list-style-type: none"> <li>Kerb build-outs and raised platforms at bus stops to enhance boarding</li> </ul>	<ul style="list-style-type: none"> <li>Concentrate development around major interchanges</li> <li>New public spaces</li> </ul>
Pricing (fares, charges, incentives)	<ul style="list-style-type: none"> <li>Payment system with pre-boarding or quick on-board payment</li> </ul>				<ul style="list-style-type: none"> <li>Higher parking charges in the city centre</li> </ul>	
Regulation (space, time, type)	<ul style="list-style-type: none"> <li>Electric vehicles</li> <li>Low-floor buses</li> </ul>	<ul style="list-style-type: none"> <li>Designate cycle and e-scooter parking spaces close to bus stops</li> </ul>	<ul style="list-style-type: none"> <li>Designate city centre as ultra-low emission zone</li> </ul>	<ul style="list-style-type: none"> <li>Time windows for kerbside goods deliveries along routes</li> </ul>	<ul style="list-style-type: none"> <li>Camera-based enforcement of bus lanes</li> <li>Restrict parking along bus corridors</li> </ul>	<ul style="list-style-type: none"> <li>Planning for provision of health and library services close to bus interchanges</li> </ul>
Information (ICT-enabled, marketing)	<ul style="list-style-type: none"> <li>Dedicated website</li> <li>Real-time information displays at bus stops</li> </ul>	<ul style="list-style-type: none"> <li>On-street signage to bus stops</li> </ul>	<ul style="list-style-type: none"> <li>Campaign targeting car commuters to switch to bus</li> </ul>	<ul style="list-style-type: none"> <li>Awareness campaign about bus lane rules</li> </ul>	<a href="http://www.sump-plus.eu">www.sump-plus.eu</a>	

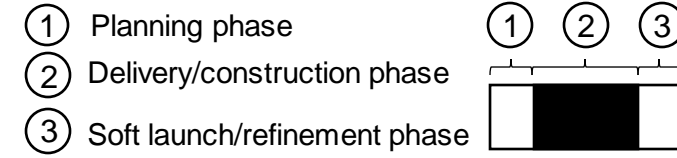
 Core measure:  
BRT corridor

 Supporting measure I:  
Improved pedestrian  
facilities in catchment  
area

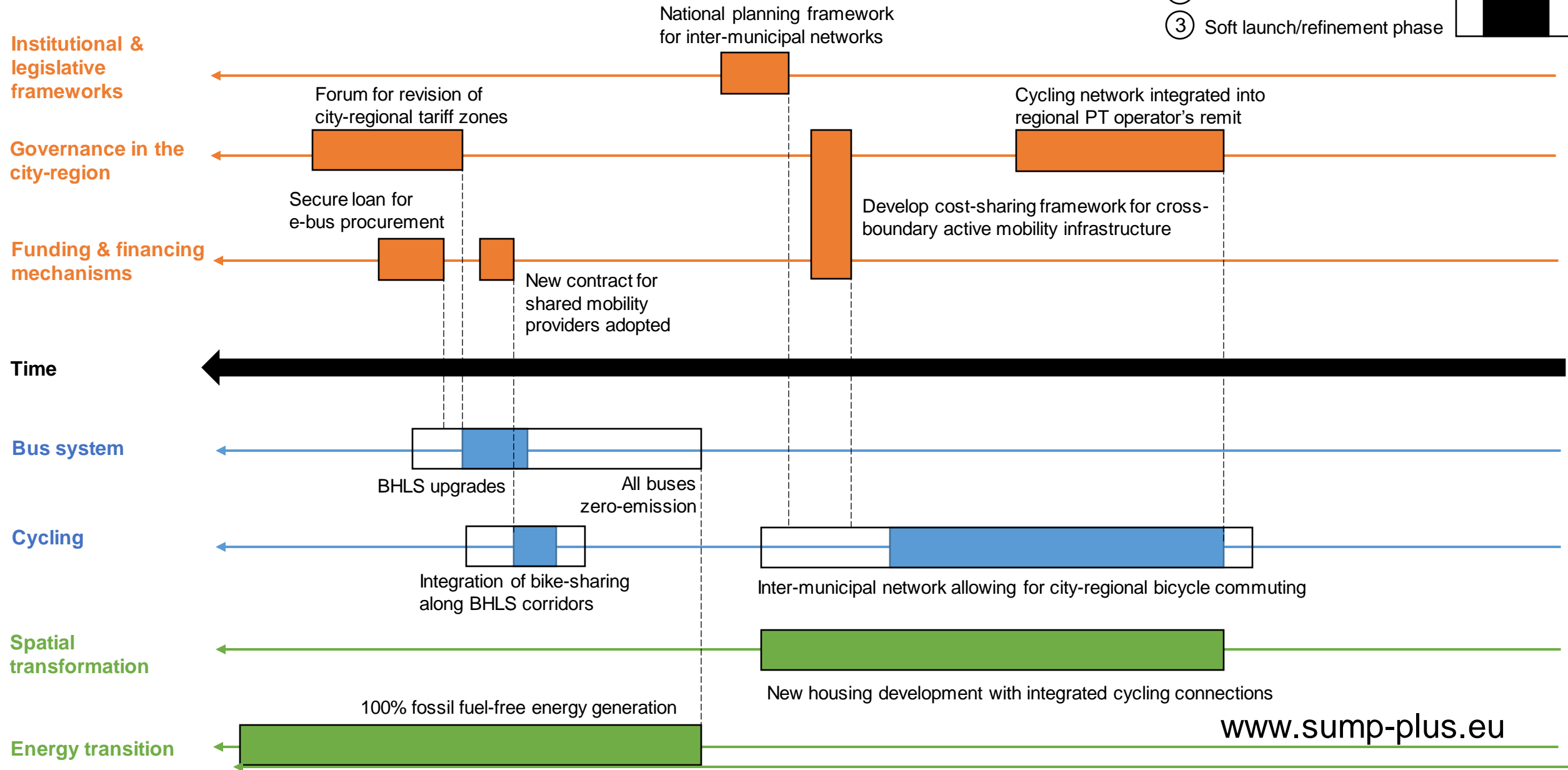
 Supporting measure II:  
high-quality cycle  
parking

## Spatial grouping of policy measures





# Temporal sequencing & interdependencies



# Conclusions

- Achieving transport decarbonisation is a major challenge
- But, progress is possible, through a combination of:
  - Clear, phased targets
  - A suitable policy framing and a clear transition pathway
  - A mix of Avoid-Shift-Improve strategies
  - Cross-sector collaboration
  - Supporting streetspace allocation
  - A comprehensive Implementation Strategy
- Many opportunities for advanced research, especially in investigating behavioural impacts and public acceptability