POLIS
CITIES AND REGIONS FOR TRANSPORT INNOVATION

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#POLIS2022

A Carbon Reduction Strategy Support Tool –

An aid to extend the SUMP planning horizon to meet long-term visions and carbon targets

3H. SUMP innovation for climate mitigation

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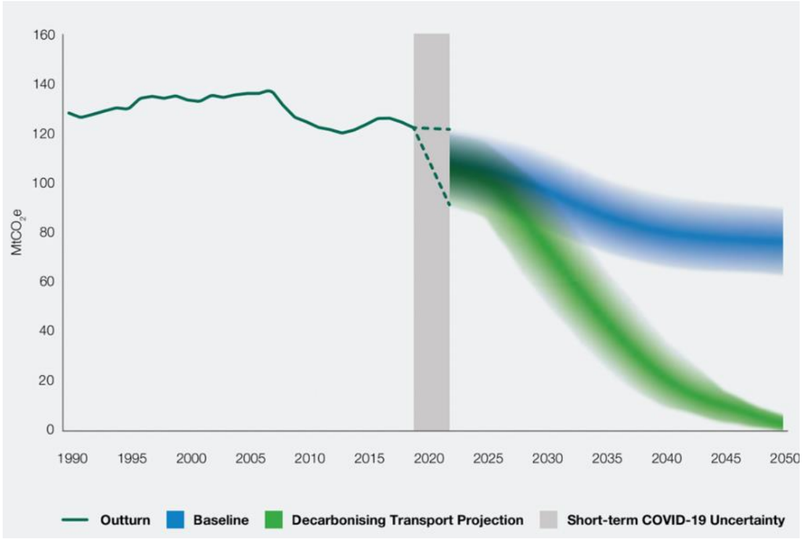
Contents

1. Purpose of the Carbon Reduction Strategy Support Tool
2. Carbon Reduction Strategy Support Tool
   - Theoretical Foundations
   - Using the tool
     - Step1: Background data
     - Step2: Select strategy mix
     - Step3: Review the outputs
     - Step4: Adjust strategy mix
   - Other features of the tool
3. How / where should the Tool be used?
4. Accessing the tool and further information

Purpose of the Carbon Reduction Strategy Support Tool

The transition to achieve net-zero carbon targets by 2050 requires radical and urgent change to existing policies.

– EU targets for transport
  - 55% reduction in CO_2 (vs 1990 levels) by 2030
  - 90% reduction in CO_2 (vs 1990 levels) by 2050



However, cities often lack the knowledge and expertise to understand how different scale and timings of mobility policy strategies impact on carbon emissions, especially when dealing with such long timescales as up to 2050.

Purpose of the Carbon Reduction Strategy Support Tool

The Carbon Reduction Strategy Support Tool has been developed to fill that knowledge gap.

- provides policy strategy decision support within a **backcasting framework**.
- it can help to quantify the relative impacts of one strategy compared to another, and to visualise the combinations required to reach the end goal (net-zero carbon).
- can be used iteratively with groups of stakeholders, trying out different combinations to find the most effective and acceptable mix of strategies.

* the tool deals only with personal travel, not freight

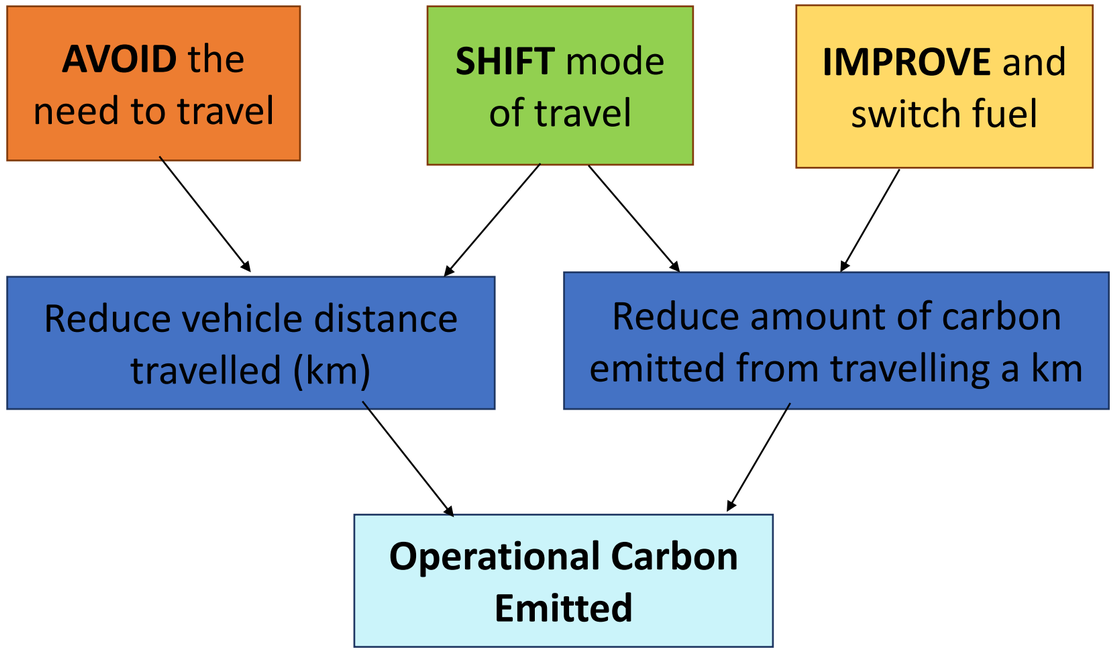
Carbon Reduction Strategy Support Tool - Foundations

Reducing operational carbon requires reducing car distance travelled by

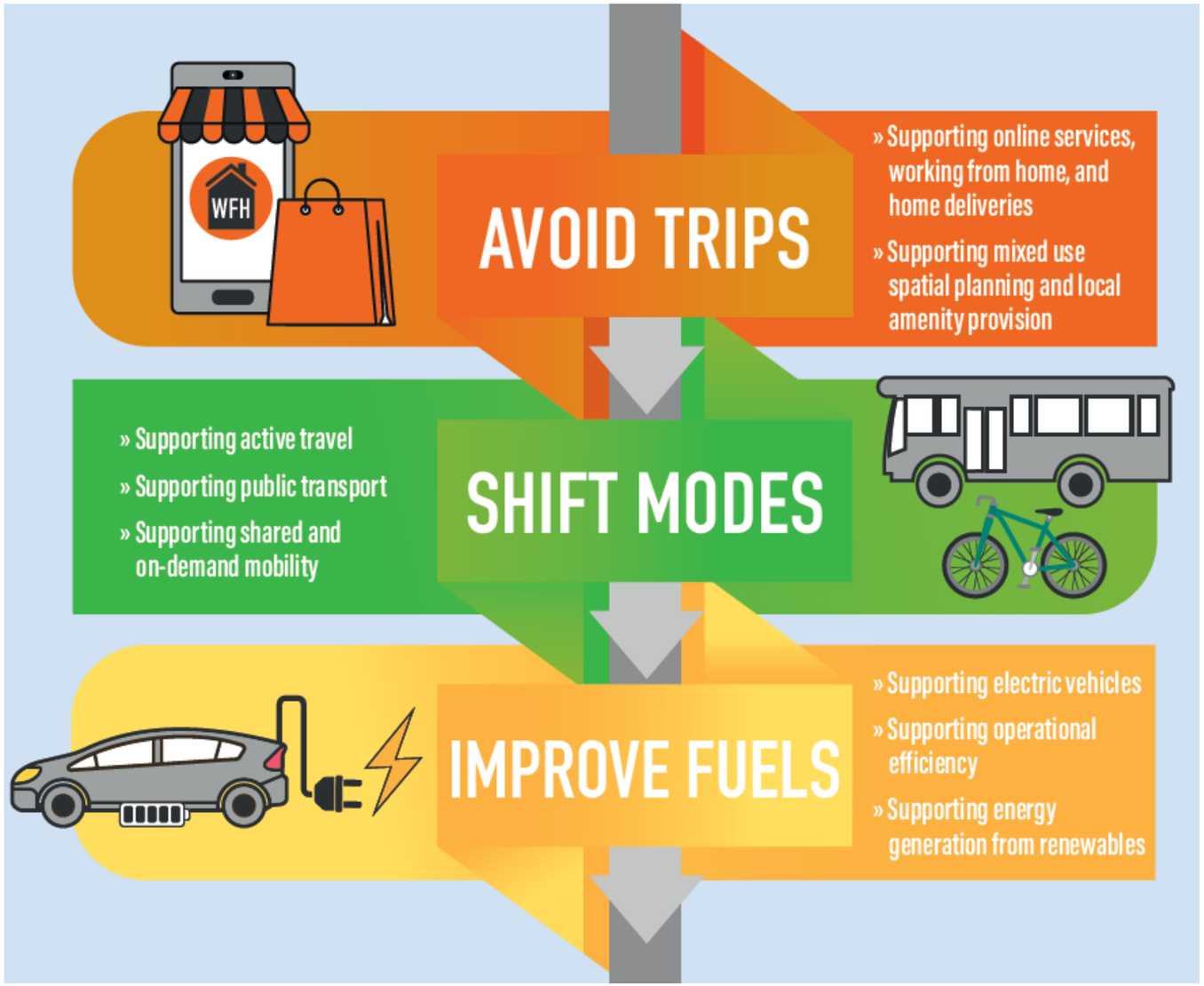
- **Avoiding** the need to travel,
- by **Shifting** mode of travel from car to more sustainable alternatives,

And/or reducing the amount of carbon emitted from travelling a km by

- **Improving** engine efficiency/carbon intensity of fuel for the vehicle used



Carbon Reduction Strategy Support Tool - Foundations



The ASI framework has been central to sustainable, low carbon transport planning for more than a decade.

The **Carbon Reduction Strategy Support Tool** allows cities to explore different options for a number of strategies related to these Avoid/Shift/Improve policy areas to gauge their likely effectiveness.

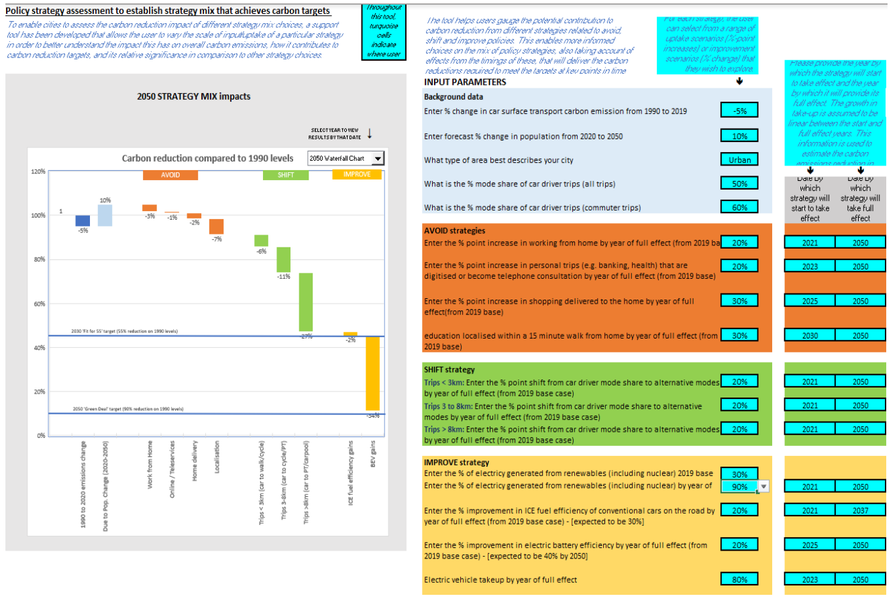
The process of using the tool involves the following steps

1. Specify basic information on current and future conditions in your city

2. For each of the Avoid-Shift-Improve strategies, define scale of uptake, or level of improvement, to be achieved by specified dates (input scenarios).
   - The tool then calculates the carbon emission impacts of the set of input scenarios and presents the results in a series of charts.

3. Review the outputs

4. If the targets are not achieved, review the situation and try a different scenario input mix.



Step1: Background data

Specify basic information on current and future conditions in your city

e.g.

- existing modal shares by purpose,
- existing trip distance by purpose as % of total distance for all purposes,
- expected population growth, to 2030 and to 2050
- average fuel efficiency of ICE car fleet
- Average carbon intensity of fossil fuel electricity generation (mix of gas/oil/coal/lignite)

Background data	
Enter % change in car surface transport carbon emission from 1990 to 2019	-5%
Enter forecast % change in population from 2020 to 2050	10%
What type of area best describes your city	Urban
What is the % mode share of car driver trips (all trips)	50%
What is the % mode share of car driver trips (commuter trips)	60%

Step2: Select strategy mix

Specify a set of Avoid-Shift-Improve strategies to be achieved by specified dates (input scenarios)

e.g.

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

- between a pair of 'start' and 'full effect' dates.

		Date by which strategy will start to take effect	Date by which strategy will take full effect
AVOID strategies			
Enter the % point increase in working from home by year of full effect (from 2019 base case)	20%	2021	2050
Enter the % point increase in personal trips (e.g. banking, health) that are digitised or become telephone consultation by year of full effect (from 2019 base)	20%	2023	2050
Enter the % point increase in shopping delivered to the home by year of full effect(from 2019 base)	30%	2025	2050
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)	30%	2030	2050
SHIFT strategy			
Trips < 3km: Enter the % point shift from car driver mode share to alternative modes by year of full effect (from 2019 base case)	20%	2021	2050
Trips 3 to 8km: Enter the % point shift from car driver mode share to alternative modes by year of full effect (from 2019 base case)	20%	2021	2050
Trips > 8km: Enter the % point shift from car driver mode share to alternative modes by year of full effect (from 2019 base case)	20%	2021	2050
IMPROVE strategy			
Enter the % of electricy generated from renewables (including nuclear) 2019 base	30%		
Enter the % of electricy generated from renewables (including nuclear) by year of full effect	90%	2021	2050
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%]	20%	2021	2037
Enter the % improvement in electric battery efficiency by year of full effect (from 2019 base case) - [expected to be 40% by 2050]	20%	2025	2050
Electric vehicle takeup by year of full effect	80%	2023	2050

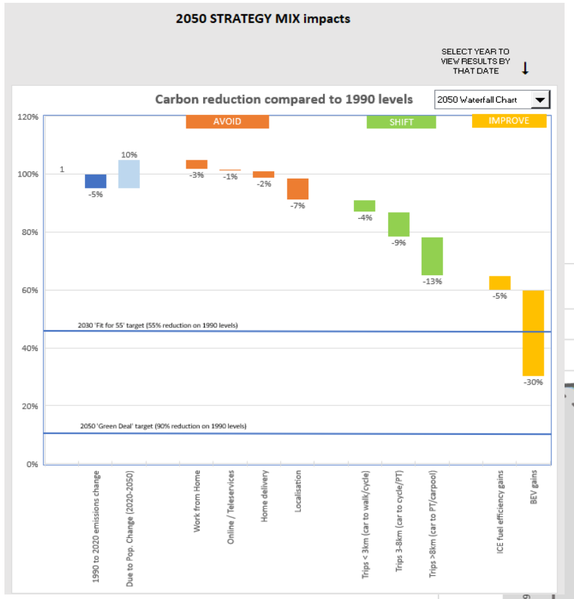
Step3: Review the outputs

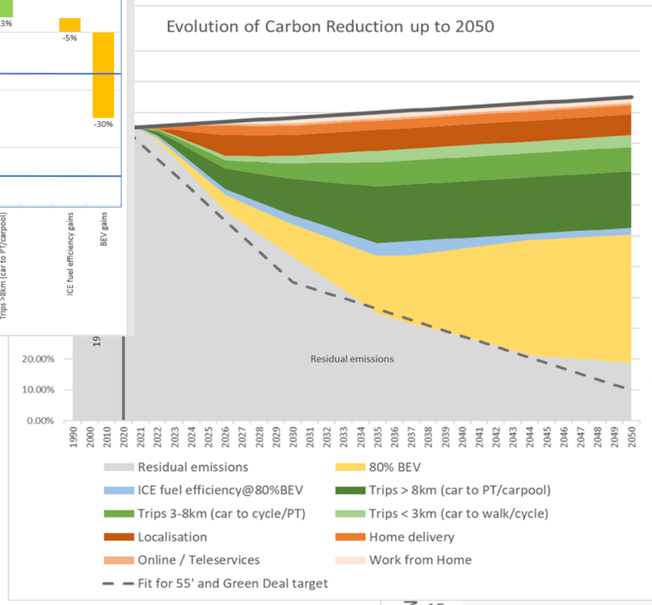
Review the outputs, in the form of:

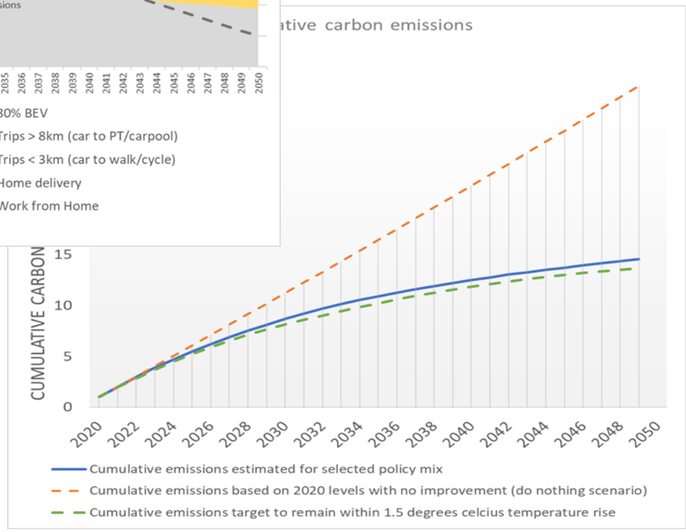
a) A ‘waterfall’ diagram, showing the contribution of each strategy to the overall carbon reduction, at a given target date (e.g. 2050)

b) A ‘fan’ diagram, showing the contributions to carbon reduction, year by year

c) A cumulative distribution diagram, showing cumulative carbon emissions, over time

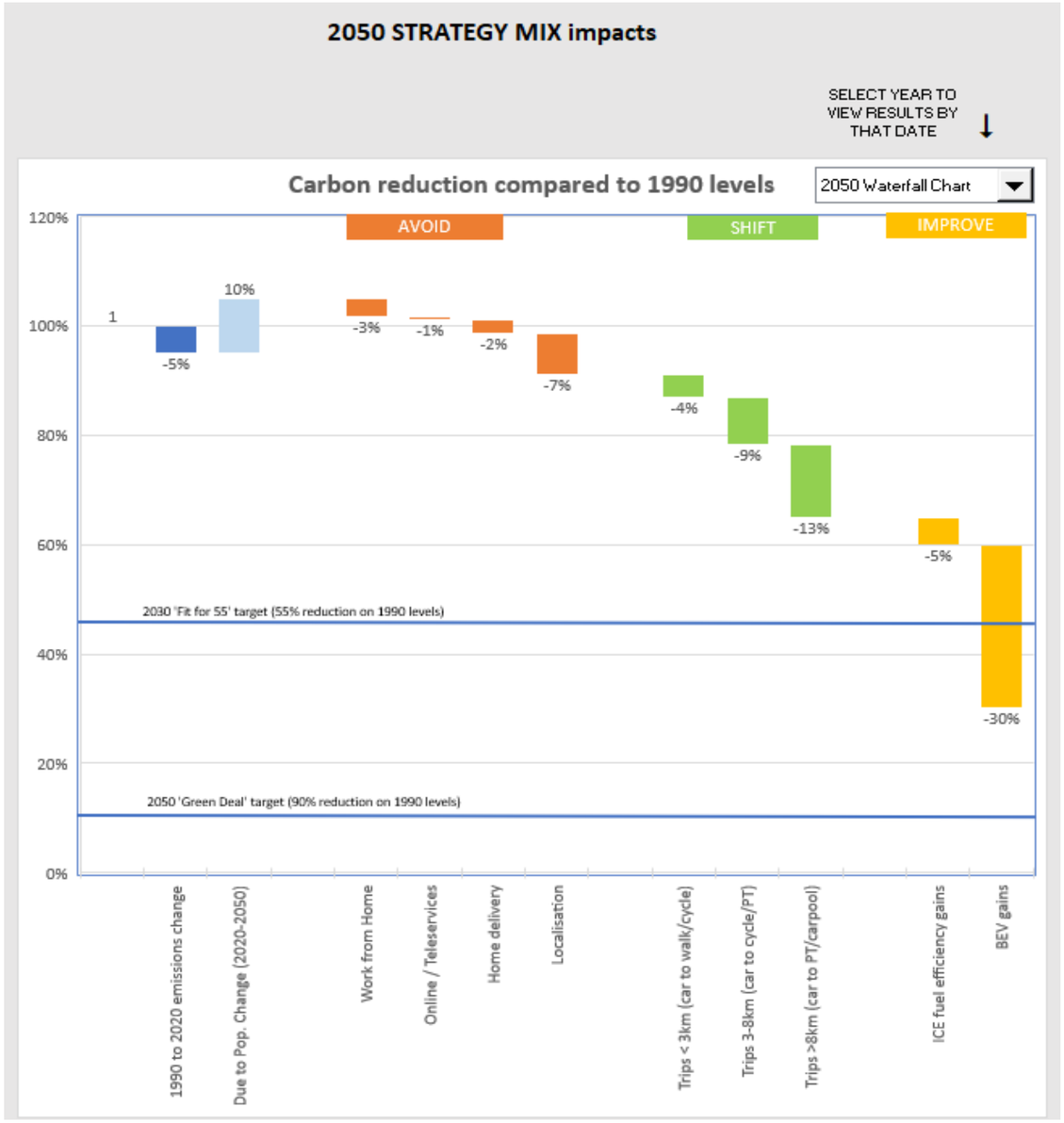






Step3: Review the outputs

Example of a 'waterfall' diagram → output by the tool



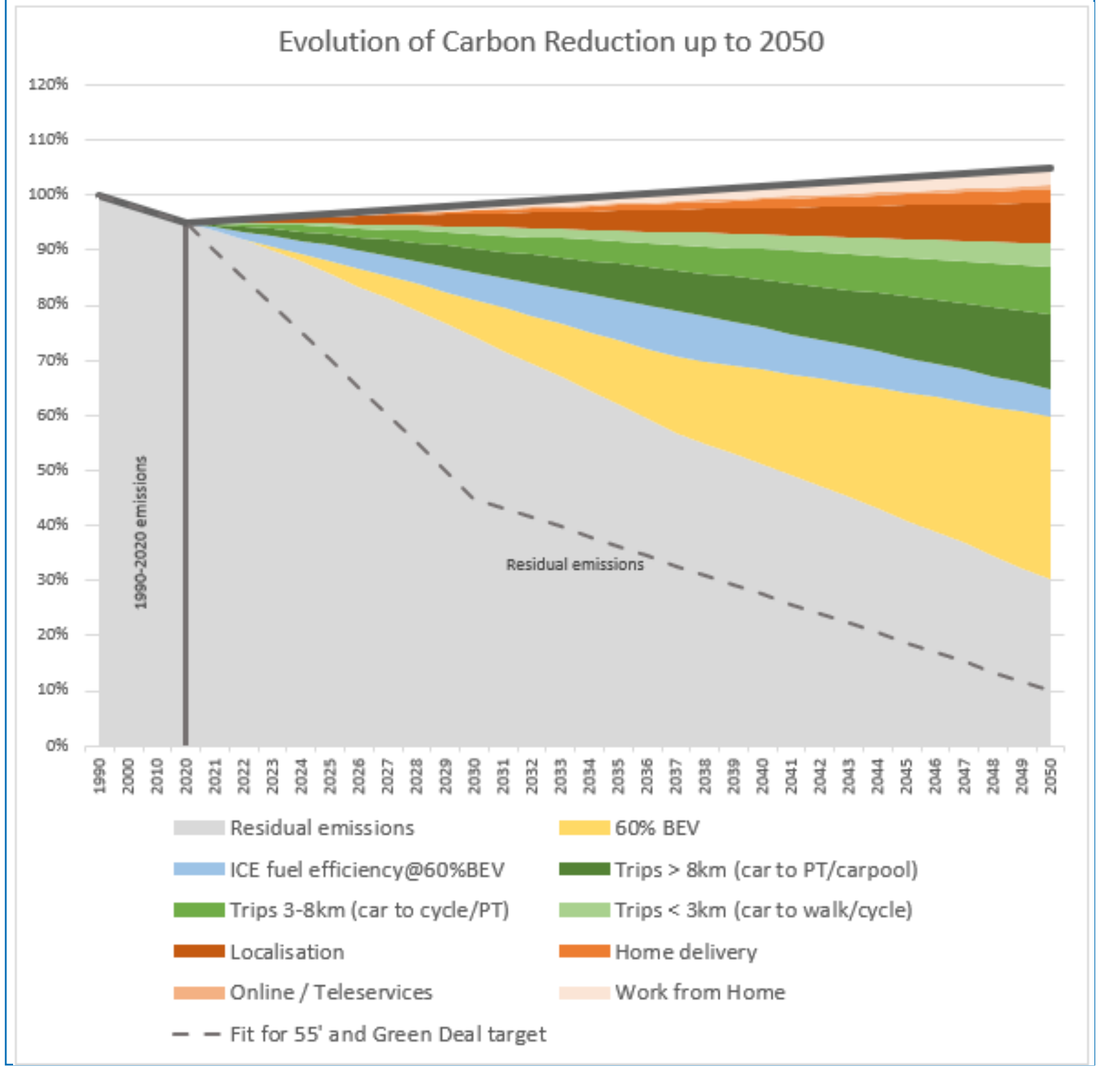
In this example, baseline conditions show carbon emissions to have decreased by 5% from 1990 to 2020, but are expected to increase by 10%, due to population growth by 2050.

Based on the user input scenarios:

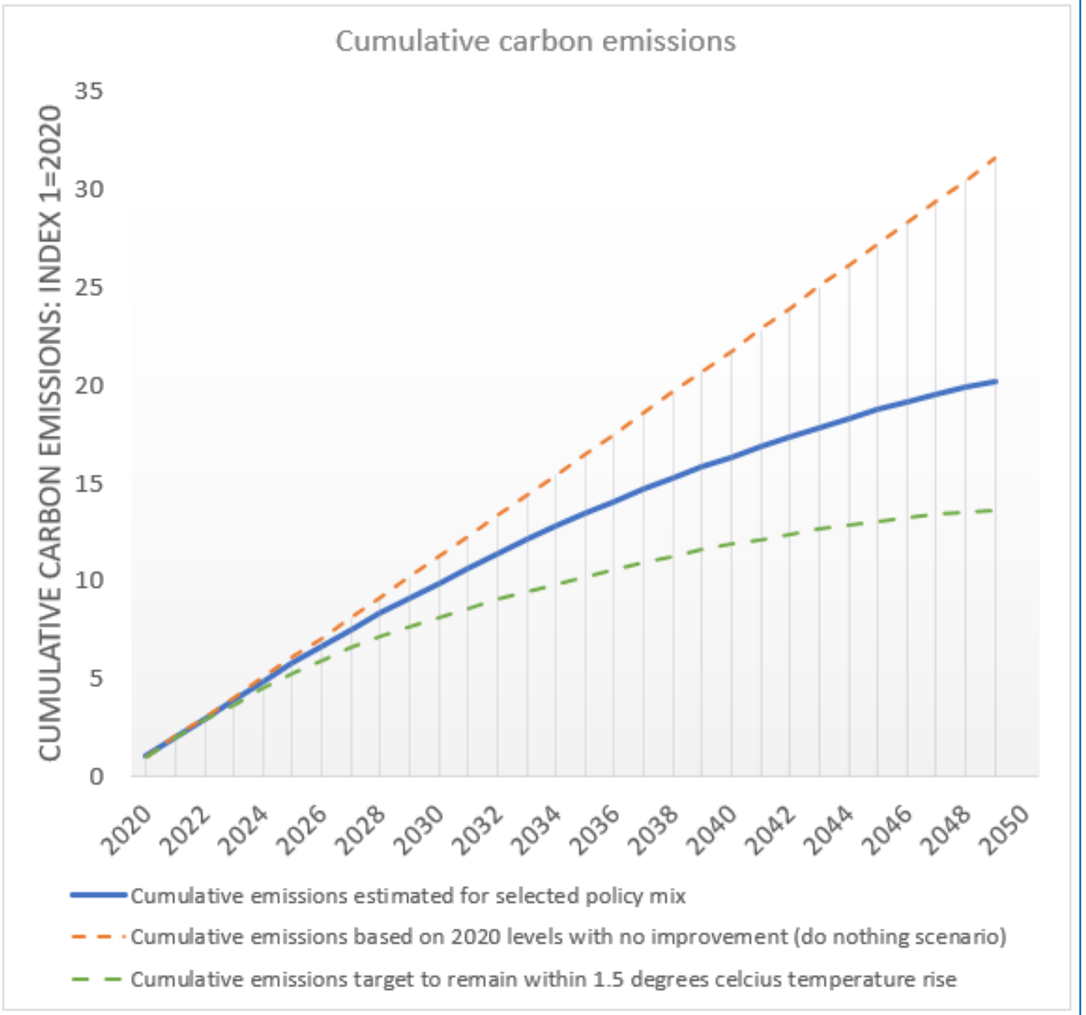
- four chosen 'Avoid' strategies contribute a 13% carbon reduction,
- three 'Shift' strategies a 26% reduction (mainly though a modal shift from car use among trips over 8km), and
- two 'Improve' strategies a 35% reduction

– end result is 70% reduction in CO2 relative to 1990 levels → still short of the 90% target.

The increasing effects of different strategies, over time



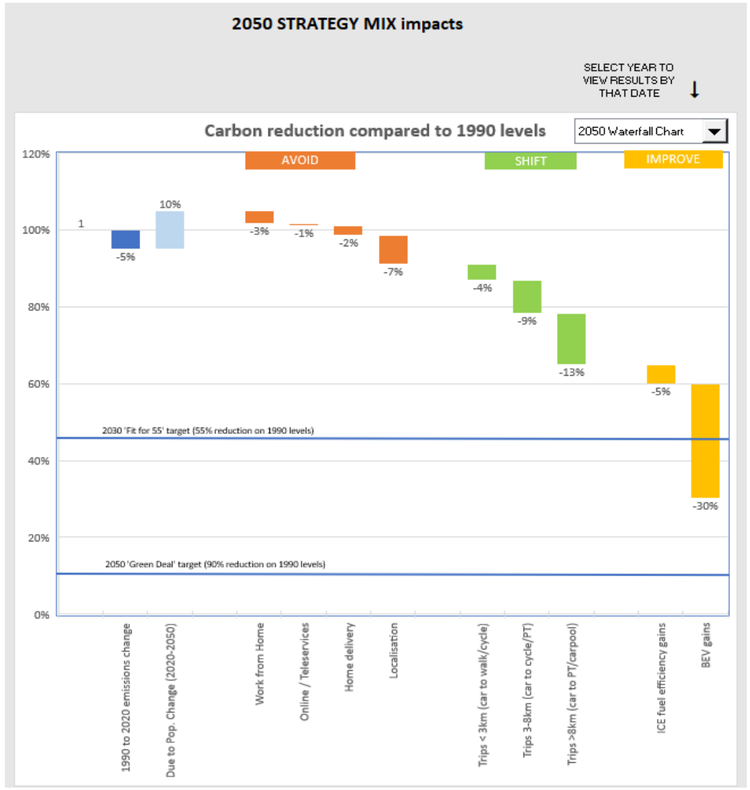
Cumulative carbon emissions, over time



Step4: Adjust strategy mix

If the targets are not achieved, review the situation and try a different strategy mix

- applying some strategies more intensively, or at a faster rate.



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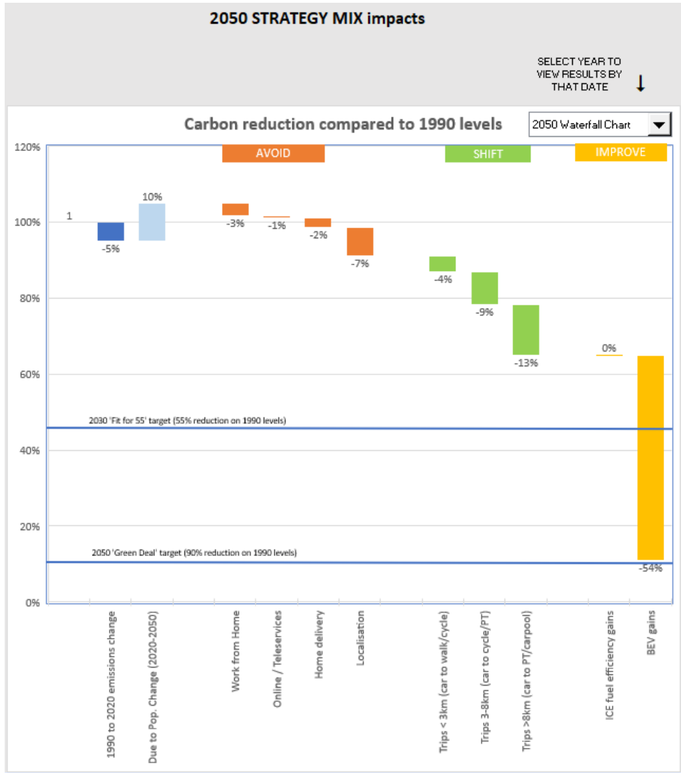
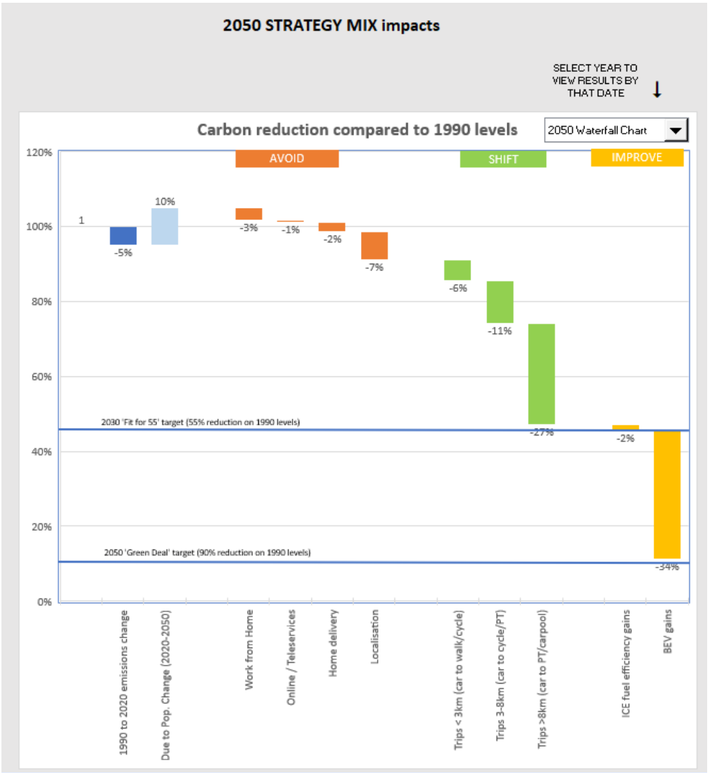
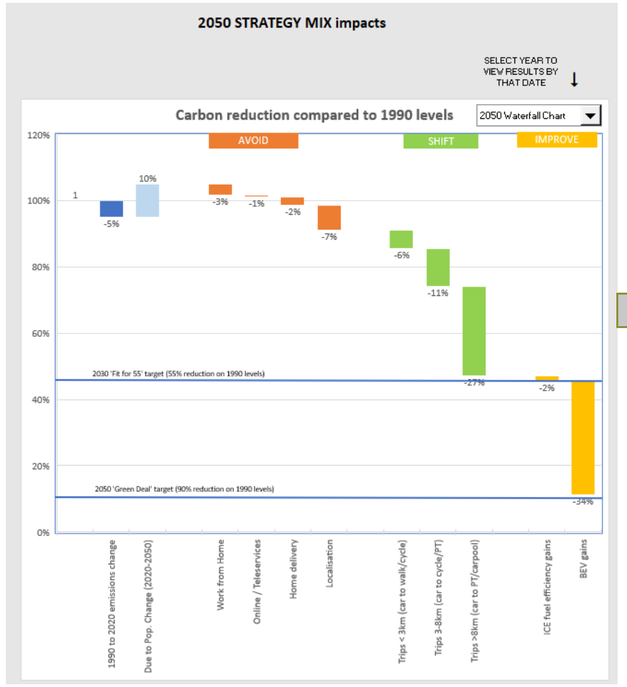
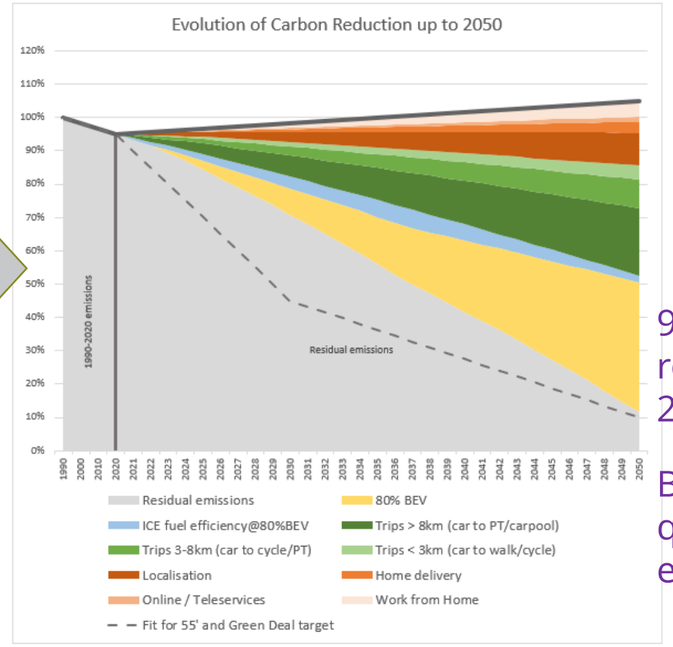


increasing 'electric vehicle take-up' from 60% to 100% by 2050 and increasing the '% electricity generated from renewables by 2050' from 70% to 80%.



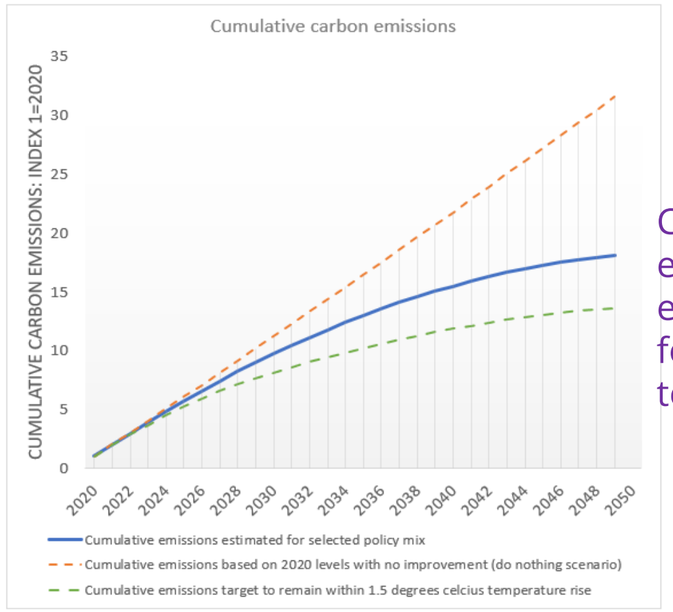
increasing the % point shift from car driver to alternative modes from 10% to 20% combined with increasing '% electricity generated from renewables from 70% to 80%.





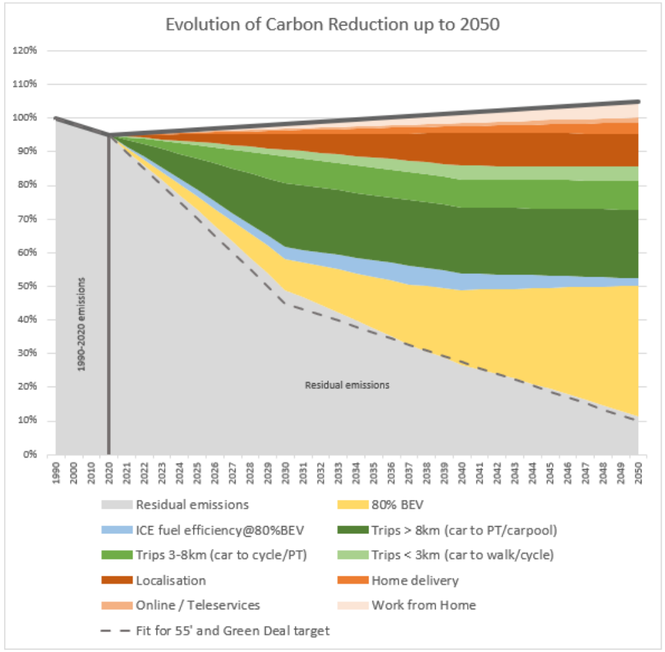
90% reduction by 2050

BUT not quick enough!

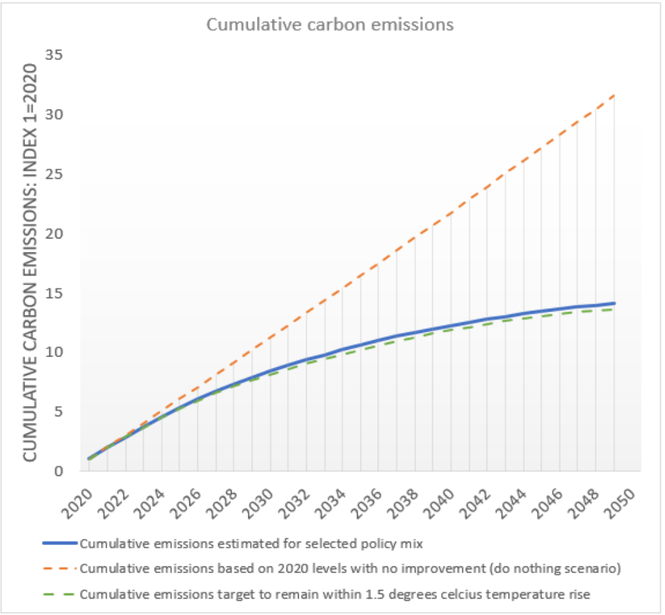


Cumulative emissions exceed limit for 1.5^{0}C temp rise.

→ Speed up delivery of strategies



90% reduction by 2050



Cumulative emissions meet limit for 1.5^{0}C temp rise.

Other features of the tool

Stress testing

User can ‘stress test’ the selected strategy mix to ensure the mix is robust/resilient in the face of alternative futures.

Related to key exogenous factors and trends, e.g.

- cost of fuel / electricity
- speed of societal transition/ adoption

Check impact of strategy selections on other city mobility objectives

A simple assessment framework is provided allowing the user to assess the effect each A-S-I strategy will have (positive, neutral, or negative) on the cities non-carbon objectives.

…..to ensure that the carbon focussed strategies reinforce rather than conflict with other non-carbon objectives that cities have.

Where / how should the Tool be used?

An aid to decision making amongst wide groups of stakeholders

Carbon neutrality represents a fixed end goal……but there are different mixes of policy strategies to achieve that common end goal. Suitability depends on local conditions and capabilities.

The process of establishing the most suitable strategy mix requires extensive stakeholder engagement among many sectors.

→ Tool supports this stakeholder and political engagement, helping inform workshop discussions and decision making when developing long-term policy strategies that align with a transition to net-zero carbon.

Integration with SUMP cycle

Cities can use outputs from the Tool to inform steps 5-7 of subsequent 5-10 year SUMP cycles: i.e.

- identifying priorities for policy strategies for next 10 years,
- set targets and indicators for each policy strategy,
- translate these strategies into packages of measures.

Where to access the tool

Developed by Vectos (part of SLR) within the CIVITAS SUMP-PLUS Project

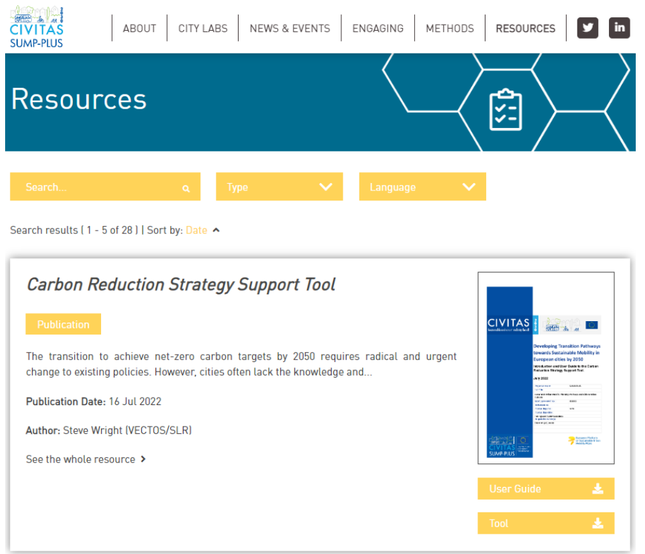
(funded from the European Union's Horizon 2020 Research and Innovation programme, under grant agreement no 814881)

https://sump-plus.eu/

The Carbon Reduction Strategy Support Tool is available free to use by any city.

- **https://sump-plus.eu/resources**

- A more detailed description of the tool and user guide is also provided.



Further queries: steve.wright@vectos.eu

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