Authors

LEVITATE – Passenger car use case

Event: Mobilising Mobility: Impact assessment of automated vehicles
Location: Online
Date: 15th October 2020

LEVITATE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824361.

LEVITATE

Societal Level Impact of Connected and Automated Vehicles

€ 6,4 million project funded by the European Commission under the Horizon 2020 research framework programme

Project coordinator:	Loughborough University
Start date:	1st of December, 2018 – 3 years
Partners:	12 – from 10 countries

levitate

Project partners

Loughborough University

Institute of Transport Economics
Norwegian Centre for Transport Research

POLIS
CITIES AND REGIONS FOR TRANSPORT INNOVATION

National Technical University of Athens

Transport for Greater Manchester

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

SWOV
INSTITUTE FOR ROAD SAFETY RESEARCH

CARRS

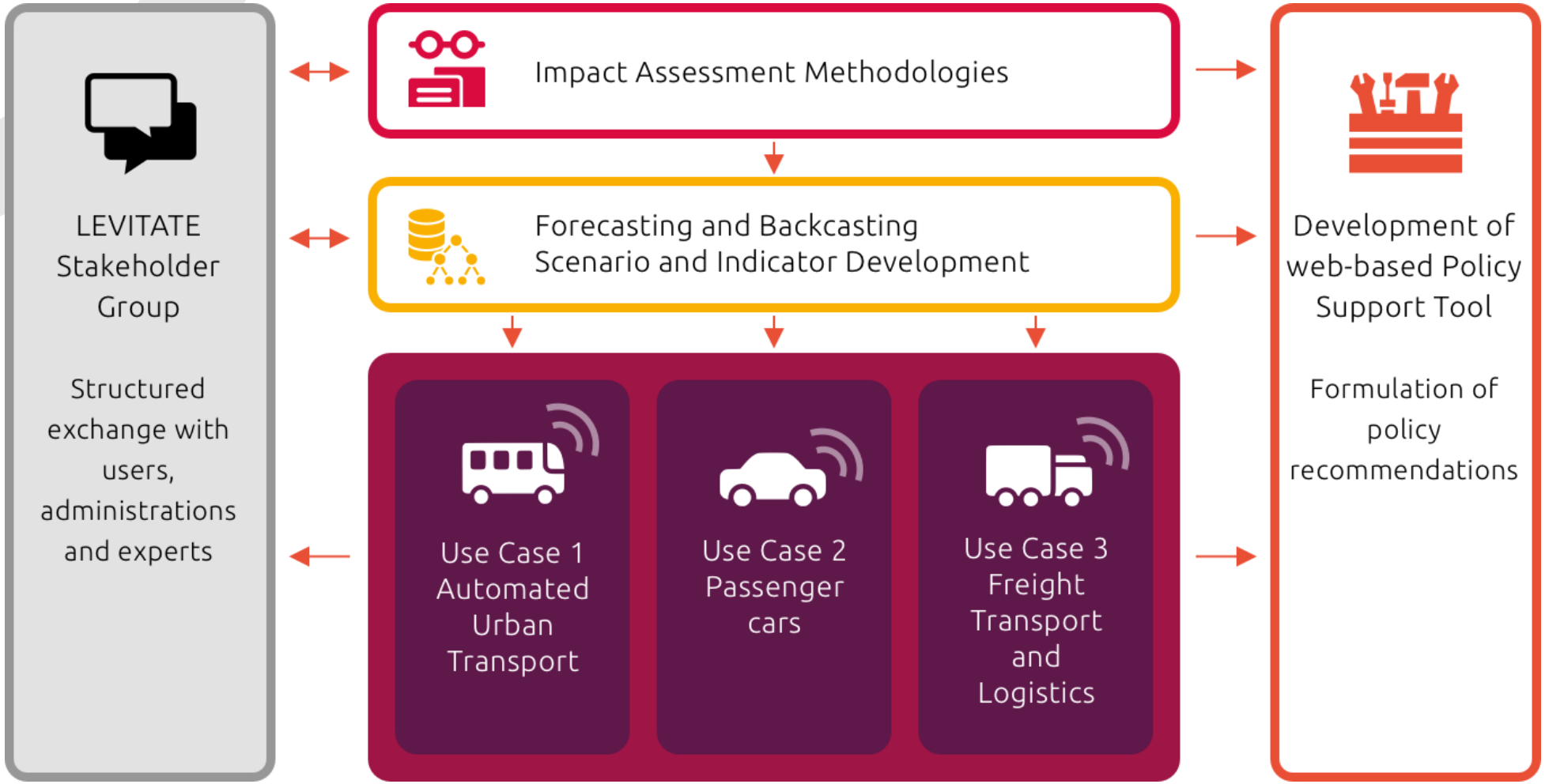
aimsun.

UMTRI

City of Vienna

levitate

Work plan overview

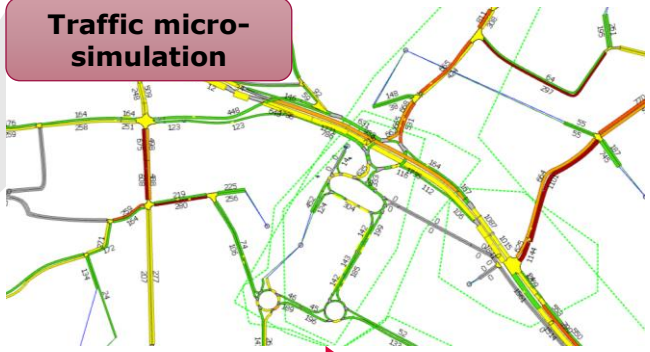


levitate

Progress and Main Findings

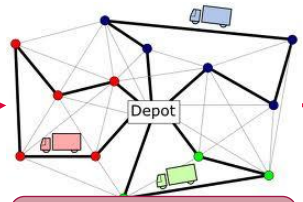
Travel time
Congestion
Conflicts
Emissions
Amount of travel

Traffic micro-simulation



Driving simulator

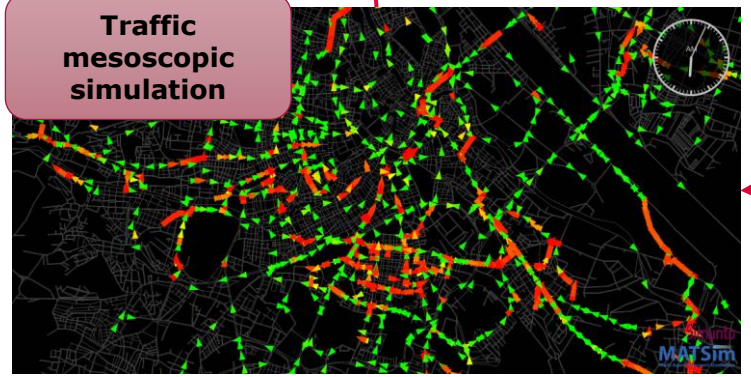
Changes in driving behaviour



Operations research

Fleet size
Total driven km
Vehicle operating costs

Traffic mesoscopic simulation



Sub-use Case

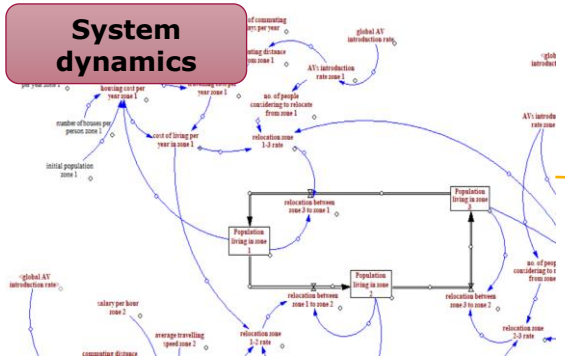
Safety (multiple methods)

No. of injury accidents
Changes in crashes and casualties

Delphi

Access to travel
Vehicle occupancy
Energy efficiency
Vehicle operating cost
Shared mobility rate
Vehicle utilisation rate
Inequality in transport

System dynamics



Public health
Demand for Parking space
Commuting distance
Modal split

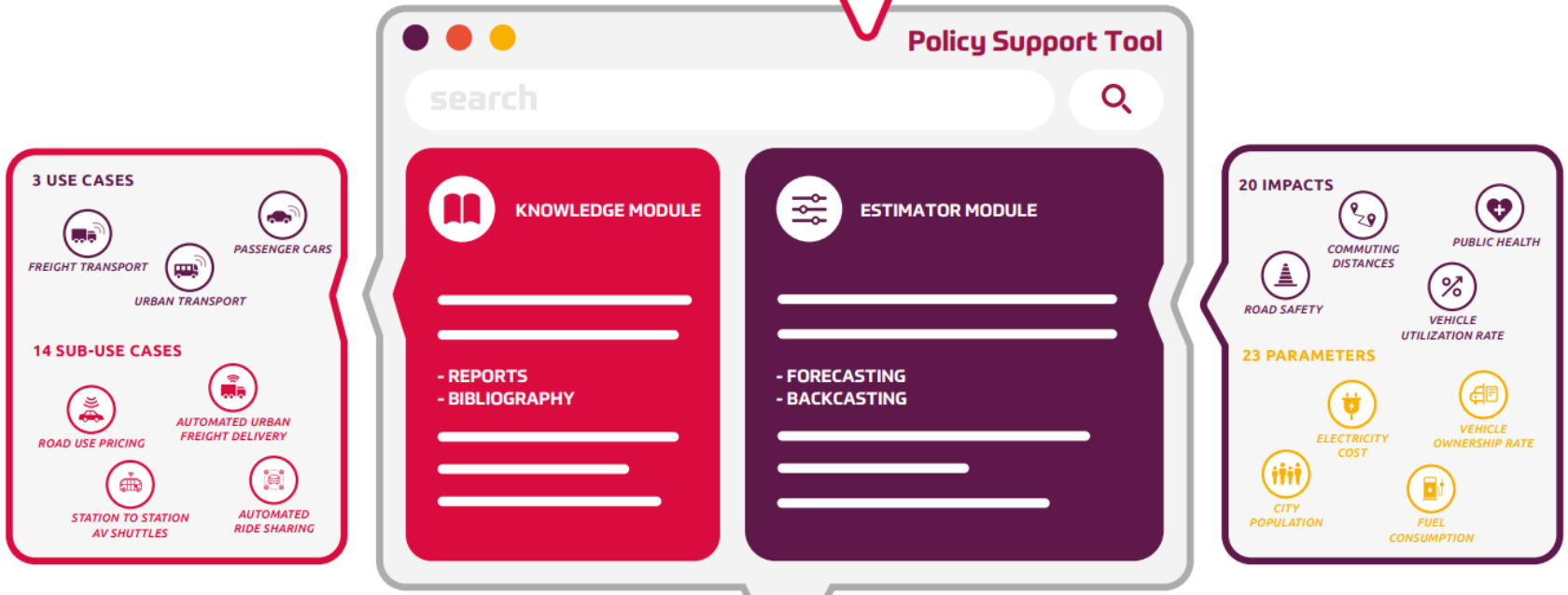
levitate

levitate

What the user gives:

1. Selection of automation use case (e.g. Park pricing)
2. Definition of initial parameter values (e.g. GDP per capita, inflation, city population)
3. Definition of scenario of automation penetration (neutral, pessimistic, optimistic)
4. Selection of sub-use case (e.g. parking ban, park outside, return to origin)
5. Selection of policy implementation year (from 2020 to 2050)

What policies can provide positive impacts from CATs?



What the user gets:

Prediction of impacts based on your selection

A) Systemic impacts, such as:
   1. Amount of travel
   2. Congestion

B) Wider impacts, such as:
   1. Road safety
   2. Pollutant levels due to vehicles (NOx, CO2, PM10)
   3. Commuting distances

levitate

WP Aims and Objectives

Aim

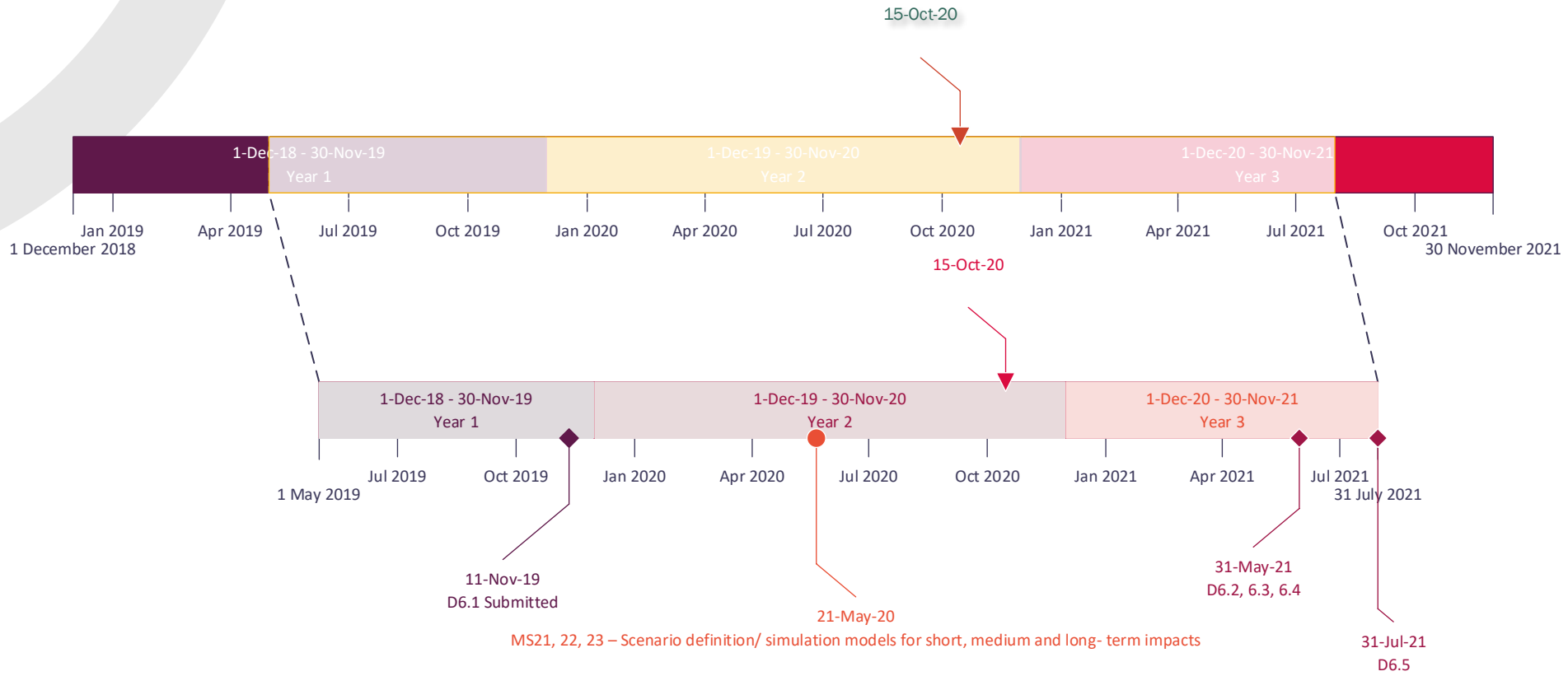
Forecast short-, medium- and, long-term impacts of automated passenger cars on safety, mobility, environment, economy and society.

Objectives

- Define passenger car sub-use cases
- Identify methods and impact KPIs for sub-use cases
- Operationalise the methods for impact assessments
- Forecast impacts from sub-use cases

levitate

WP Timeline



levitate

Sub-use cases

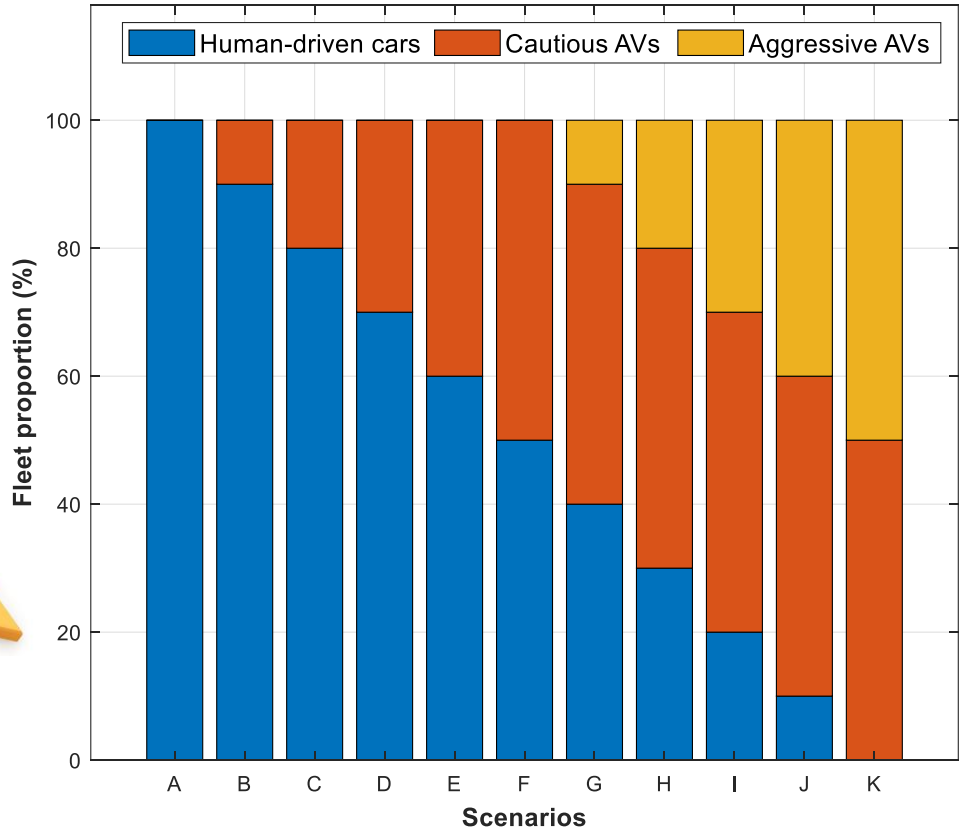
- Road use pricing
  - Empty km pricing
  - Static toll on all vehicles
  - Dynamic toll on all vehicles
- Automated ride sharing
- Parking space regulation:
  - Parking price
  - Replace on-street parking with public space
  - Replace on-street parking with driving lanes
  - Replace on-street parking with pick-up/drop-off parking
- Provision of dedicated lanes for AVs on urban highways
- Green Light Optimal Speed Advisory (GLOSA)

levitate

Impact assessments

Challenges

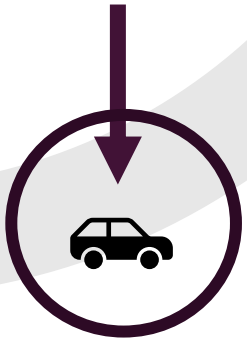
- Assumptions regarding cautious and aggressive driving behaviour
  - ✓ Phase wise entry of automated vehicle fleet
- Changes in human behaviour (choice)
  - ✓ Input required by the user



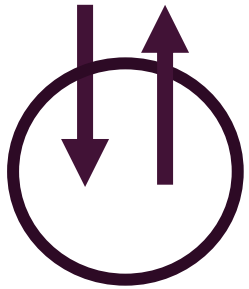
levitate

Parking behaviour

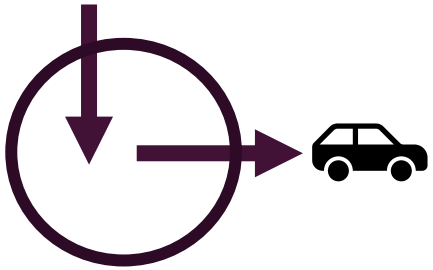
Scenarios



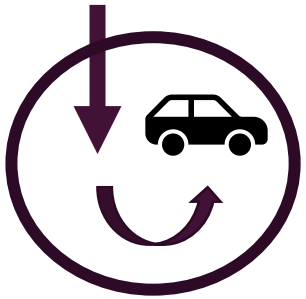
Enter and park inside the area



Enter, drop off (30 seconds) and return to origin to park



Enter, drop off and return to outside parking to park



Enter and drive around (short stay)

Drop off and return to origin (origin inside the area)

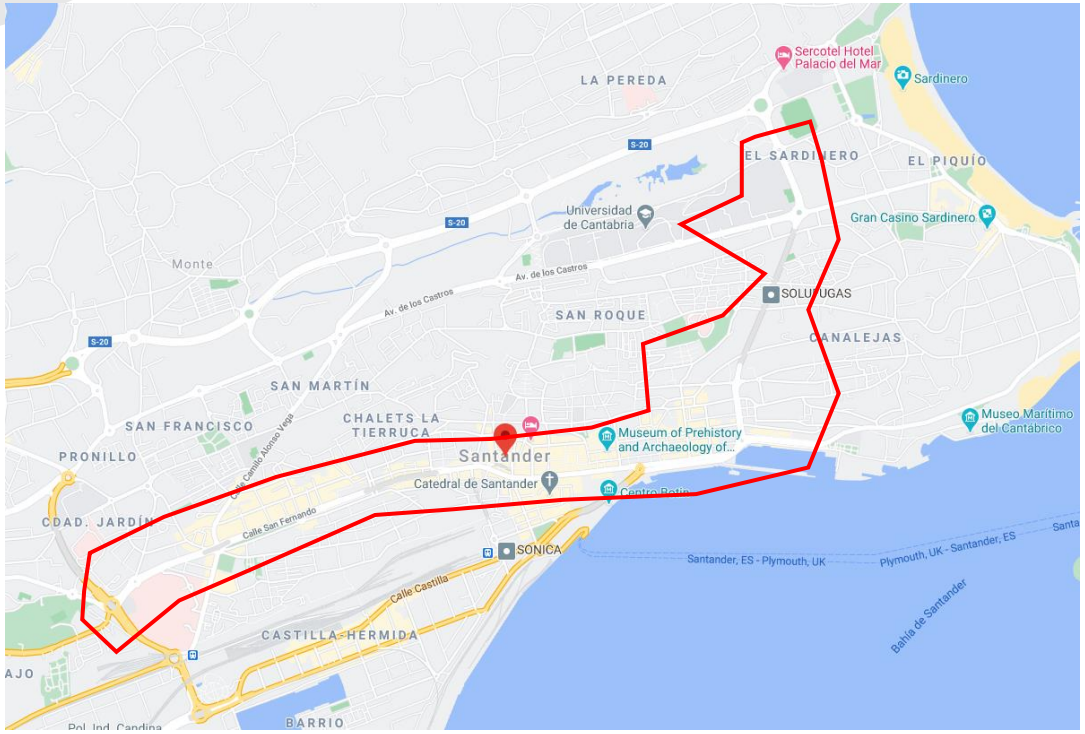
	Return to Origin %	Park Outside %	Drive around %	Park Inside %
Baseline	0%	0%	0%	100%
Case 1 (balanced)	22%	45%	20%	13%
Case 2 (Heavy drive around)	0%	0%	100%	0%
Case 3 (Heavy Return to origin and Park outside)	33%	67%	0%	0%

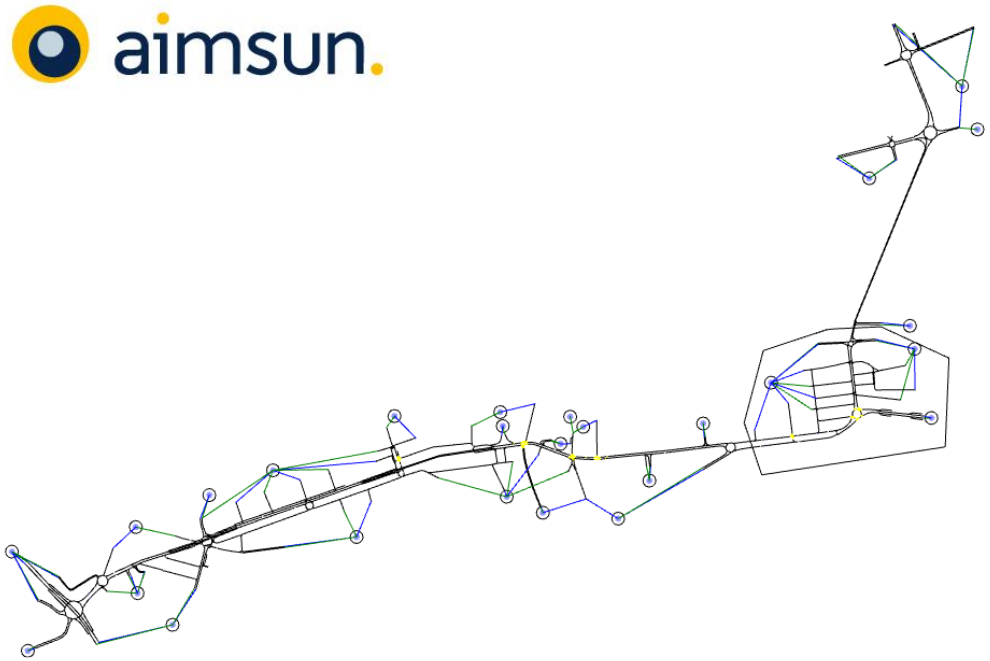
levitate

Parking behaviour

Network

AIMSUN (**A**dvanced **I**nteractive **M**icroscopic **S**imulator for **U**rban and Non-Urban **N**etworks)



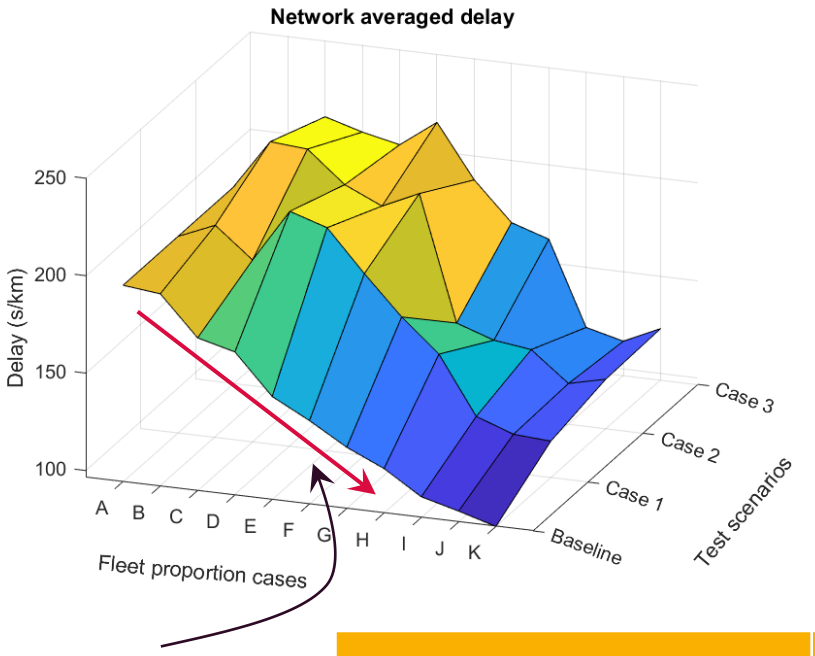


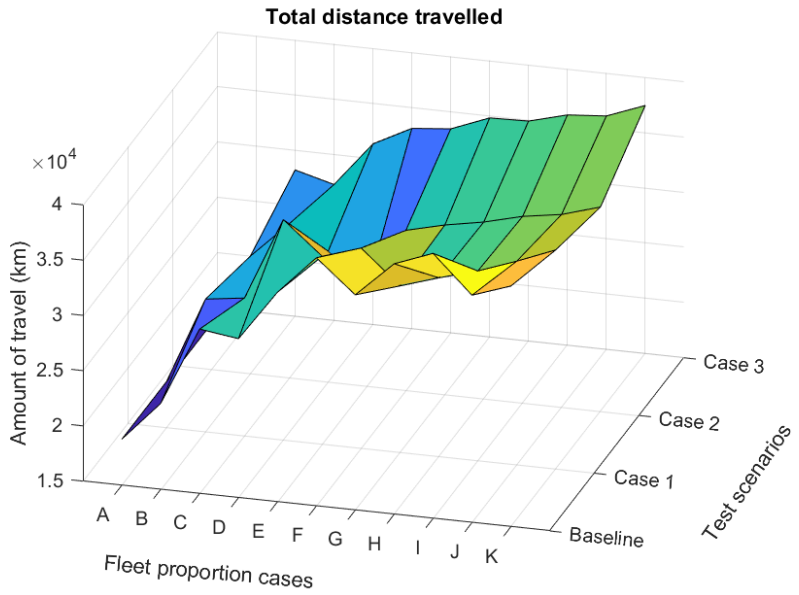
levitate

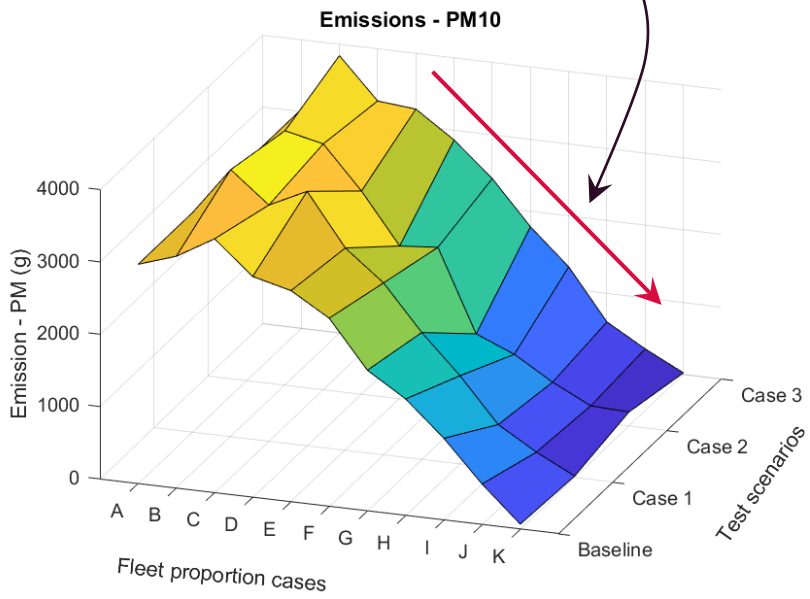
Parking behaviour

Results

Vehicle electrification







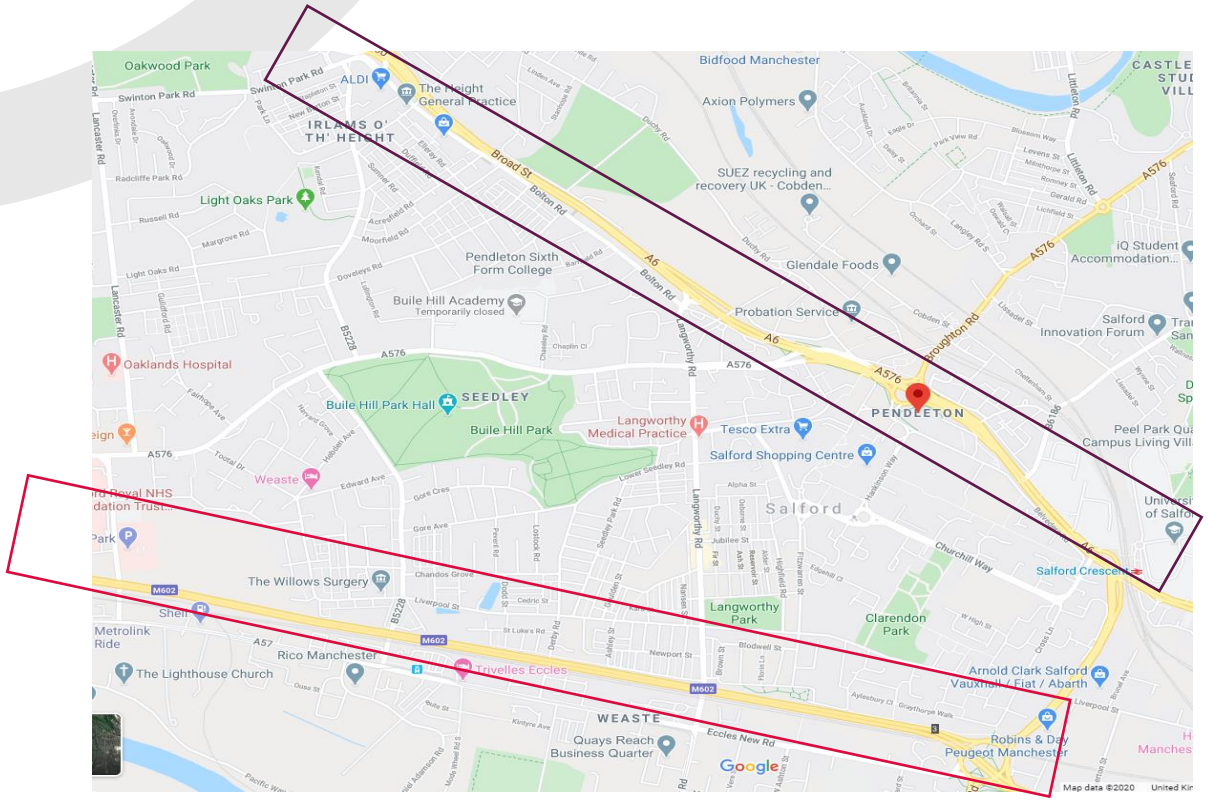
Increase in capacity

	Return to Origin %	Park Outside %	Drive around %	Park Inside %
Baseline	0%	0%	0%	100%
Case 1 (balanced)	22%	45%	20%	13%
Case 2 (Heavy drive around)	0%	0%	100%	0%
Case 3 (Heavy Return to origin and Park outside)	33%	67%	0%	0%

levitate

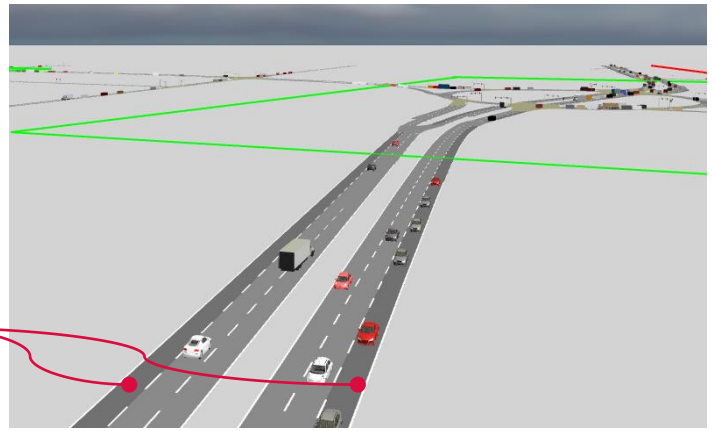
Provision of dedicated AV lanes

Scenarios



Greater Manchester

Dedicated lane for AVs



Baseline scenario – no dedicated lane

Motorway (outermost) – dedicated lane on a motorway outermost lane

Motorway (innermost) – dedicated lane on a motorway innermost lane

Motorway and A road – dedicated lane on a motorway and A road (outermost)

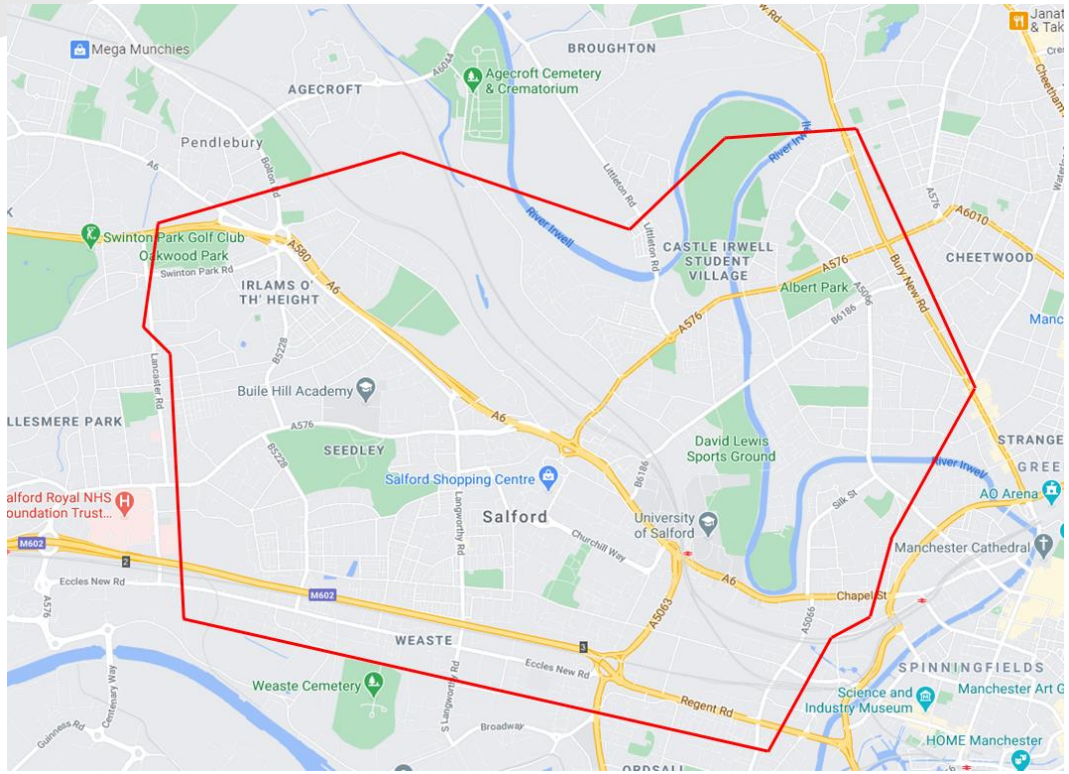
Dynamic control – dedicated (outermost) lane however, the lane is AVT with dynamic control of lanes

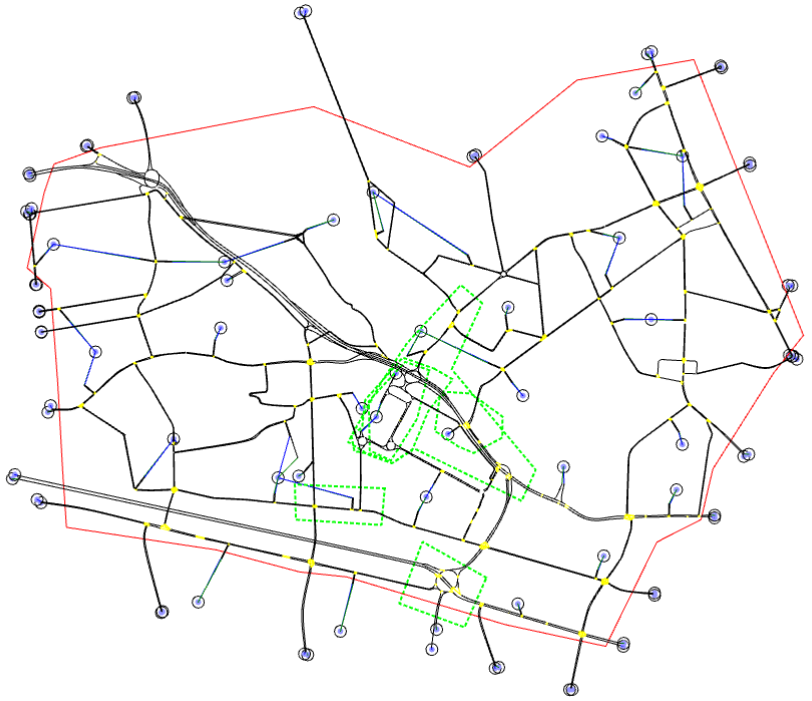
levitate

Provision of dedicated lanes

Network

AIMSUN (**A**dvanced **I**nteractive **M**icroscopic **S**imulator for **U**rban and Non-Urban **N**etworks)





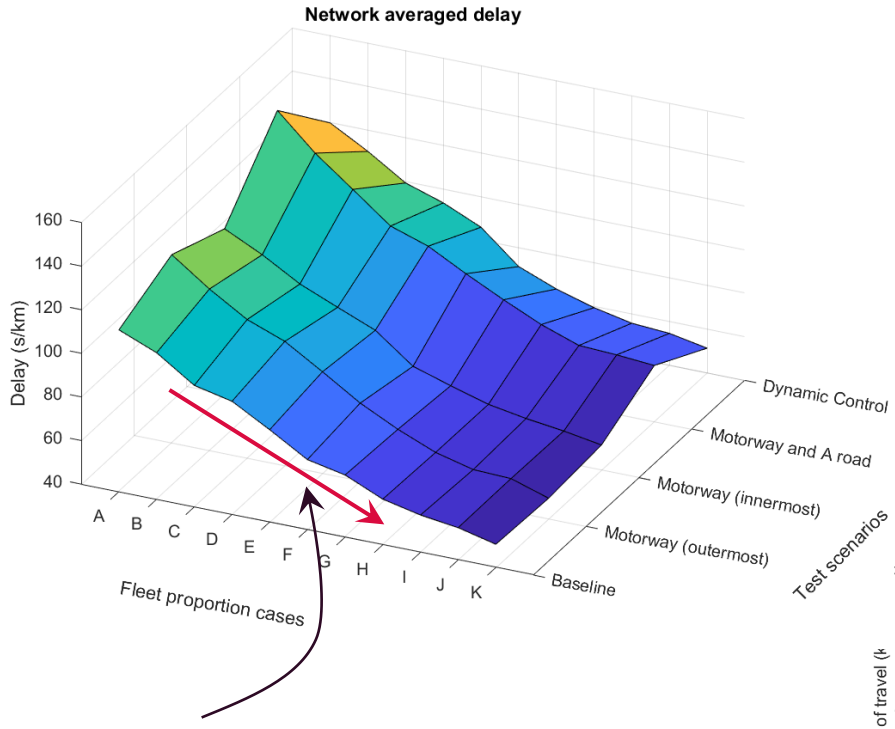
aimsun.

Transport for Greater Manchester

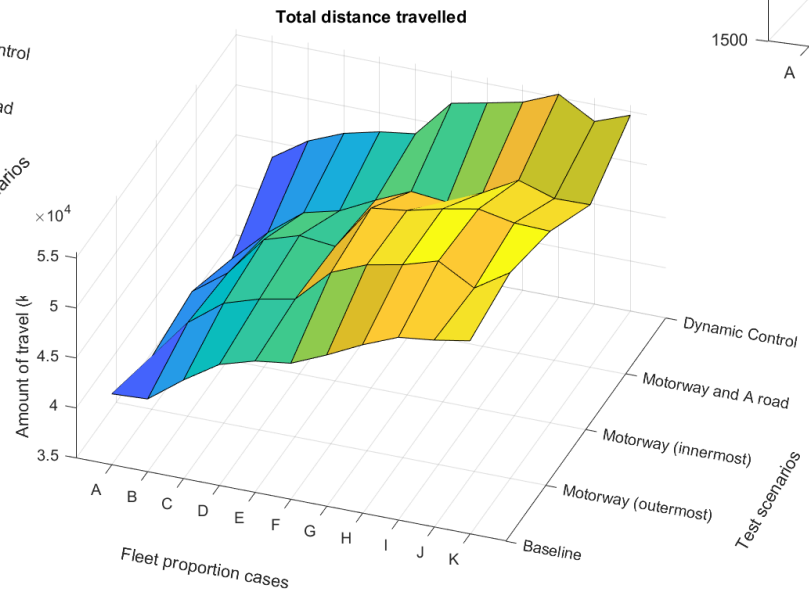
levitate

Provision of dedicated lanes

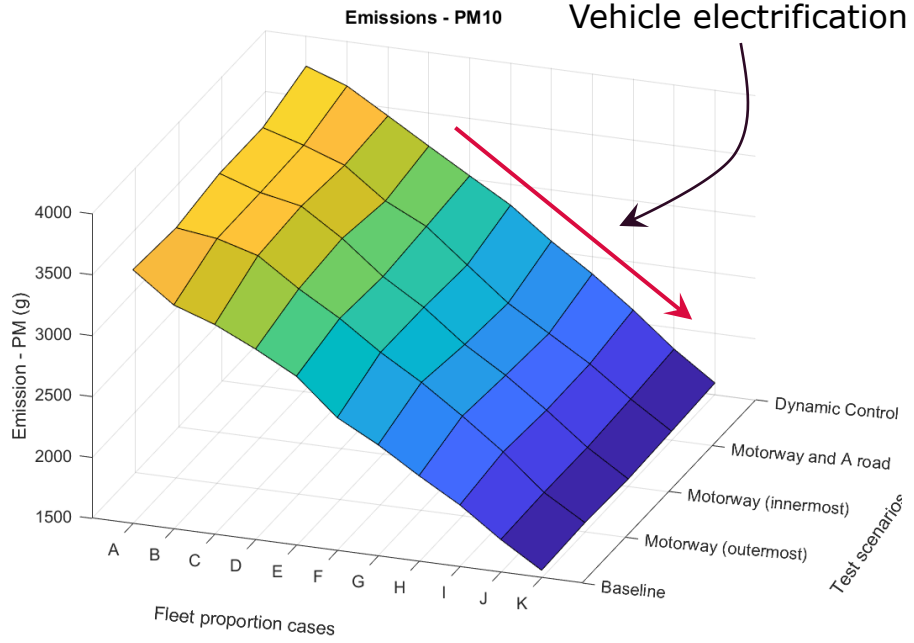
Results



Increase in capacity



Vehicle electrification



levitate

Discussions

- Increase in delay and decrease in total travel caused by heavy drive around scenario → expected due to more congestion build up.
- Dedicated lane could benefit more in highway settings rather than urban settings due to intersections and merging lanes.
- Authorities can use the results to navigate through policy landscape to harness positive benefits from new technologies/transport modes.

Acknowledgement

LEVITATE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824361.