National Technical University of Athens
Road Safety Observatory

Online workshop in the framework of
6th UN Global Road Safety Week
17 - 23 May 2021
Streets for Life
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Decade of Action for Road Safety 2021 - 2030
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Thursday 20 May 2021

Innovation in Road Safety Research

Societal Level Impacts of Connected and Automated Vehicles

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Together with:
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The LEVITATE project

- **Partners:**
  LOUGH (UK), AIT (AT), AIMSUN (ES), **NTUA (EL)**, POLIS (BE), SWOV (NL), TOI (NO), TfGM (UK), City of Vienna (AT), QUT (AU), TJU (CN), UMTRI (US)

- **Duration of the project:**
  36 months (December 2018 – December 2021)

- **Framework Programme:**
  Horizon 2020 - The EU Union Framework Programme for Research and Innovation – Mobility for Growth

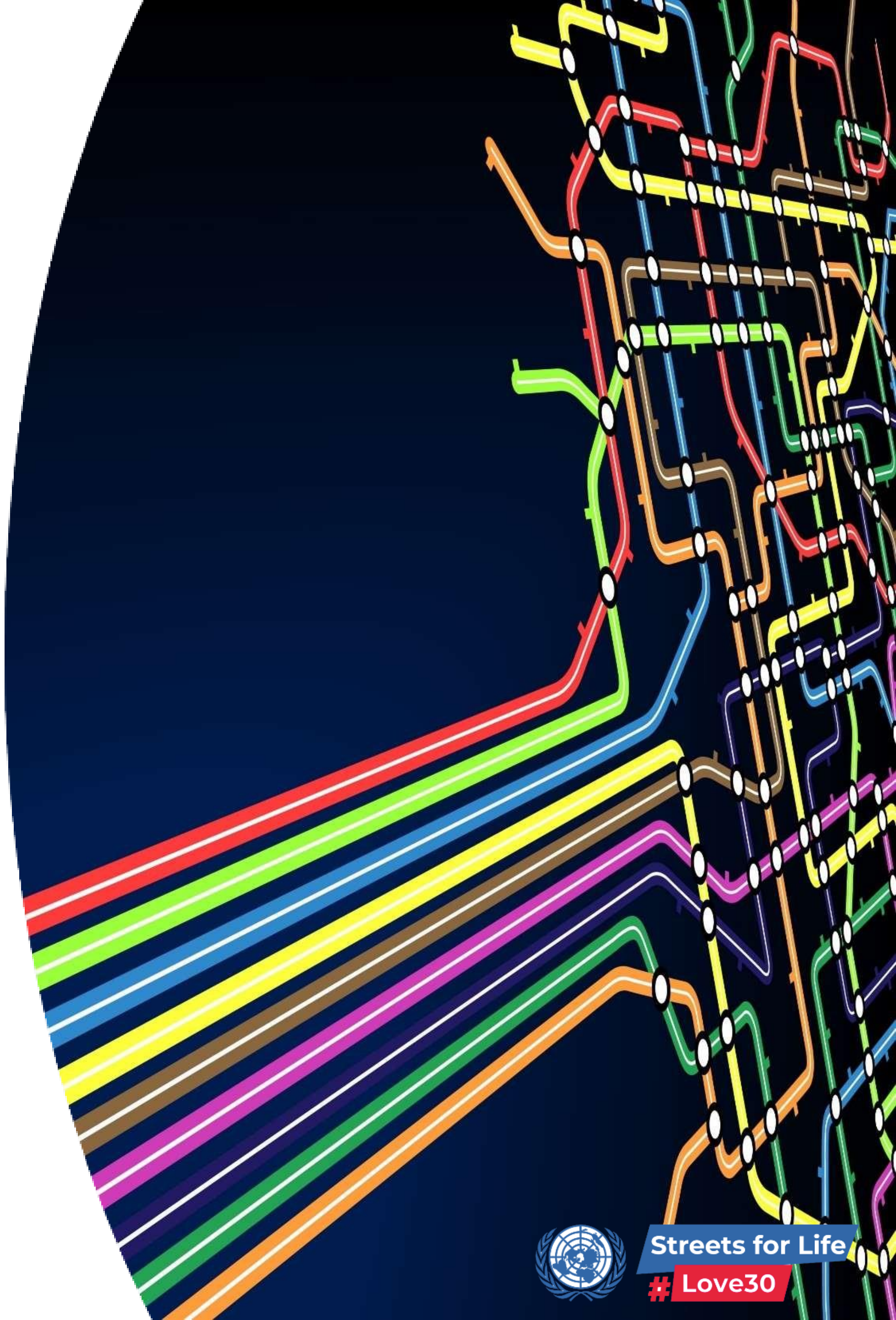
Scope

- LEVITATE focuses on the development of a new impact assessment framework, in order to enable policymakers to manage the introduction of connected and automated transport systems, maximise the benefits and utilise the technologies to achieve societal objectives

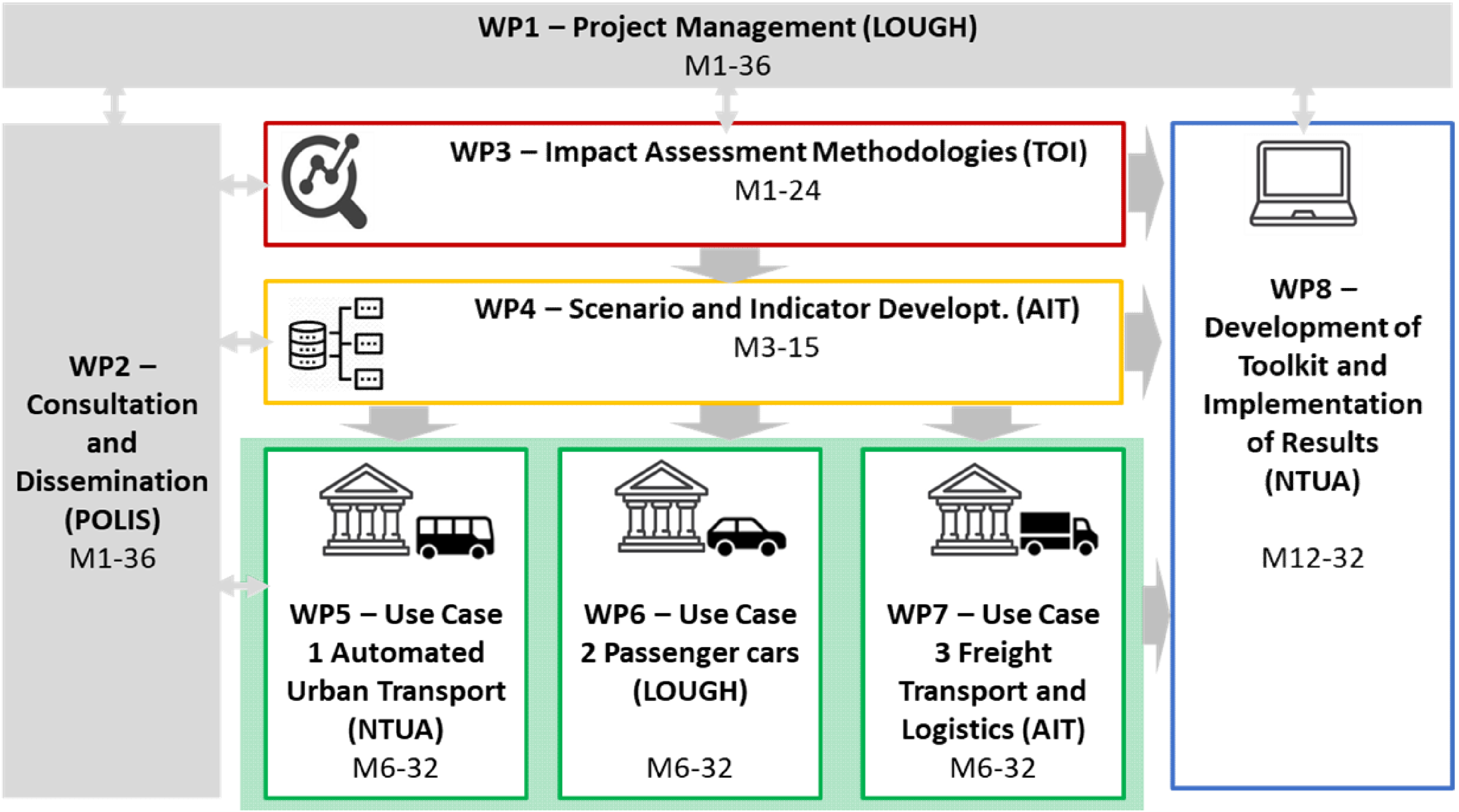
- Development of an open access web-based Policy Support Tool targeting Decision makers at all levels: Municipalities, Regional Authorities and National Governments

Objectives

- New web-based **Policy Support Tool** – Decision Support System.
- Range of **forecasting and backcasting** scenarios: automated urban transport, passenger cars, freight services.
- Multi-disciplinary methodology to assess short, medium and long term **impacts**.
- **Case studies**: mobility, environment, safety, economic and societal indicators.



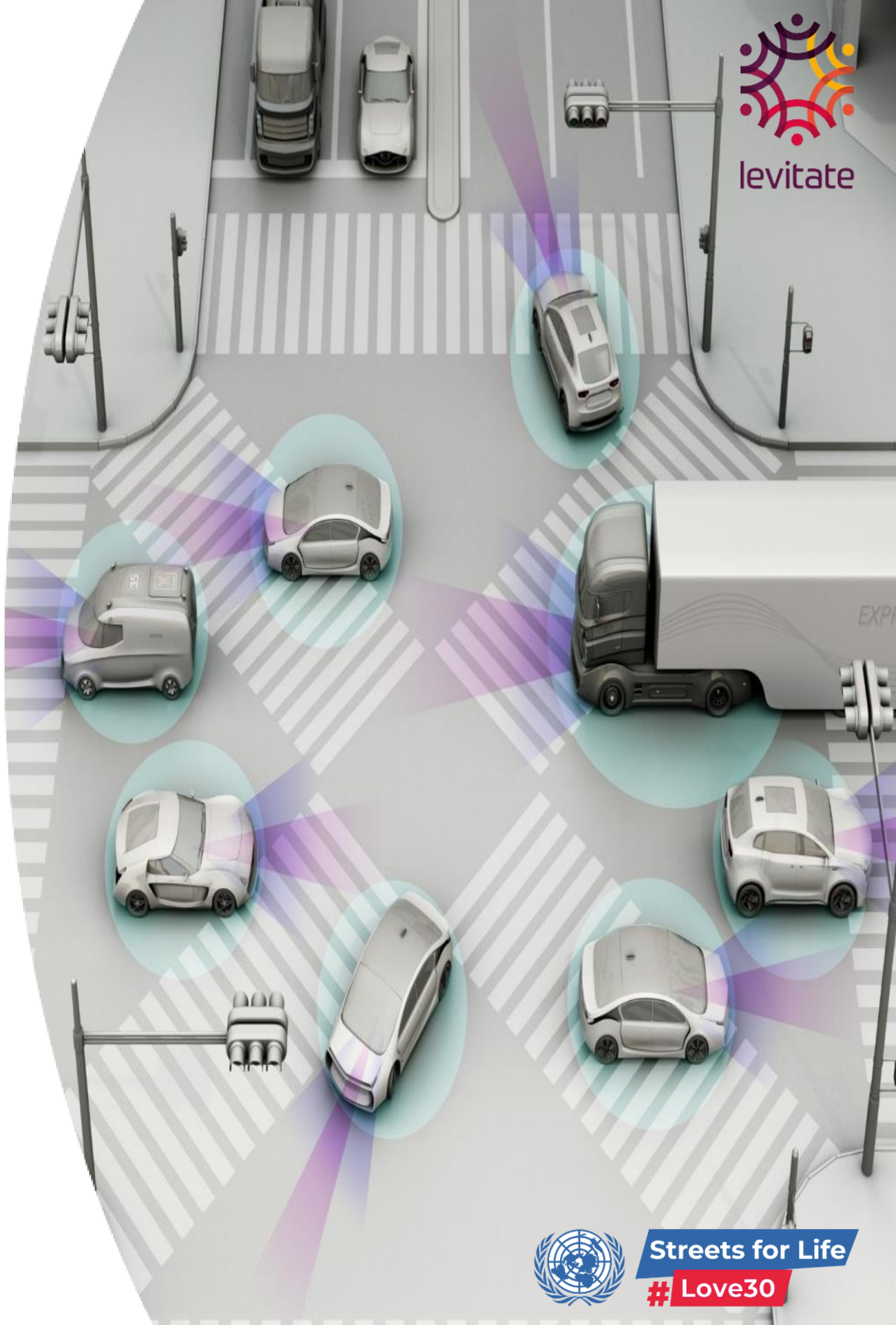
Structure



WP1 – Project Management (LOUGH)
M1-36
WP2 – Consultation and Dissemination (POLIS)
M1-36
WP3 – Impact Assessment Methodologies (TOI)
M1-24
WP4 – Scenario and Indicator Developt. (AIT)
M3-15
WP5 – Use Case 1 Automated Urban Transport (NTUA)
M6-32
WP6 – Use Case 2 Passenger cars (LOUGH)
M6-32
WP7 – Use Case 3 Freight Transport and Logistics (AIT)
M6-32
WP8 – Development of Toolkit and Implementation of Results (NTUA)
M12-32

Sub-Use Cases

- Automated **Urban** Transport:
  - Point to point AUSS,
  - Anywhere to anywhere AUSS,
  - Last-mile AUSS,
  - E-hailing.
- Automated **Passenger** Cars:
  - Automated ride sharing,
  - GLOSA,
  - Parking space regulations,
  - AV dedicated lanes,
  - City tolls,
  - CAVs parking behaviors.
- Automated **Freight** Transport:
  - Fully automated delivery,
  - Fully automated delivery with night shifts only,
  - Automated freight consolidation,
  - Hub to hub automated transfer.



Methods and Impacts (1/2)

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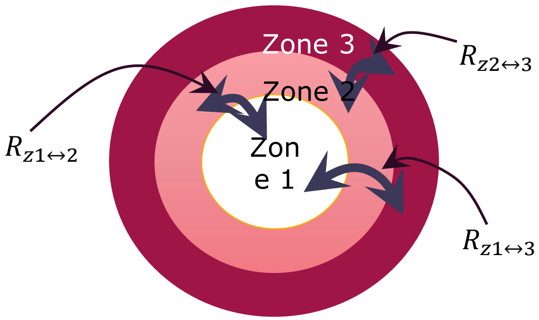
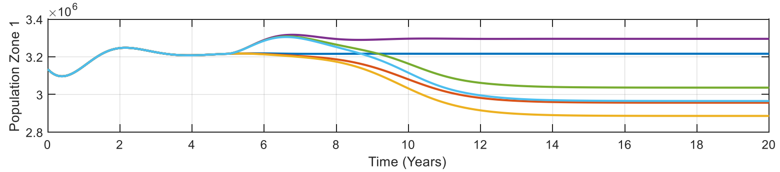
- **Microsimulation**
  - AIMSUN software: Athens, Manchester, Vienna
  - Impacts: Traffic, Safety, Emissions
- **Road Safety**
  - Models for Athens, Manchester, Vienna
  - Impacts: Crashes, Vulnerable road users
- **System Dynamics**
  - Impacts: Commuting distances, Space management/demand for parking
- **Mesoscopic Simulation**
  - MATSIM model for Vienna
  - Impacts: Modal split





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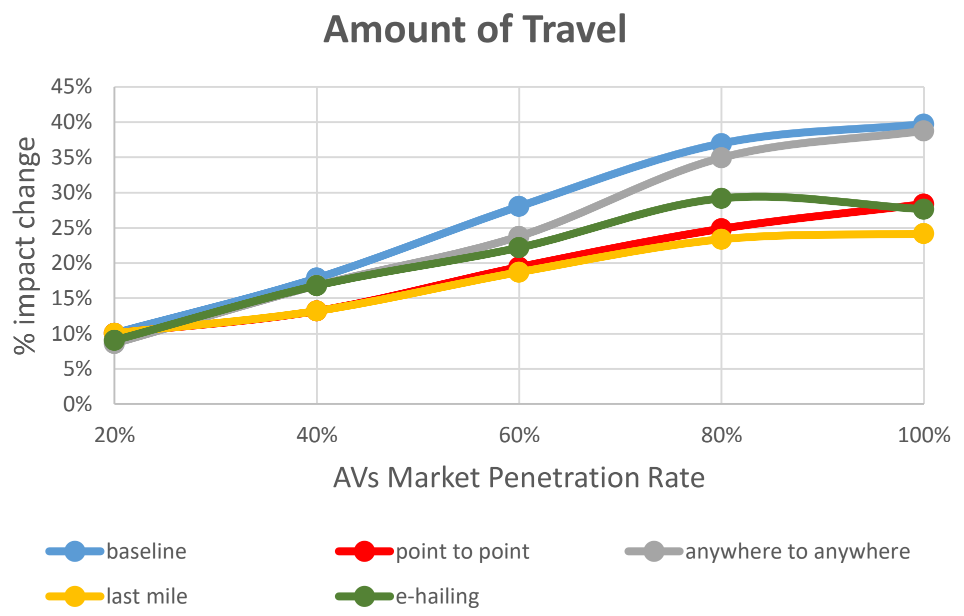
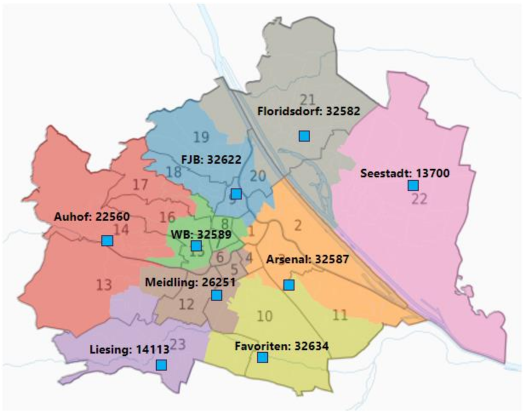
Methods and Impacts (2/2)

- **Delphi**
  - 63 experts, 2 rounds, 15 SUCs
  - Impacts: Travel time, Vehicle operating cost, Public health, Energy efficiency, Parking space, Vehicle utilisation rate, Vehicle occupancy, Access to travel, Amount of travel, Inequality in transport, Shared mobility rate
- **Operations Research**
  - Freight transport SUCs (Austria model)
  - Impacts: Energy efficiency, Travel time, Emissions
- **CBA**
  - Economic appraisal of all the proposed interventions





Policy Support Tool (PST)

Knowledge Module

Bibliography

Levitate results

- use case results
- predefined impact assessment scenarios

Tools Documentation

Guidelines

Estimator Module

Forecasting sub-system

Policy Interventions

- introduction of a city toll for non-automated vehicles
- economic incentives for AV purchase
- provision of dedicated lanes for AVs
- introduction of tax on vehicle ownership, traffic restrictions for non-automated vehicles
- .... etc.

Links

Factors

- Vehicle type
- Area type
- GDP
- AV penetration rate (per SAE Level)
- Automation type
- Level of shared mobility
- Vehicle ownership rate
- Share of electric vehicles
- Share of pedestrians
- Share of cyclists
- Share of PTWs
- .... etc.

Inter-relations

Impacts

- Crashes
- Fatalities
- Air Pollution
- Noise Pollution
- Energy efficiency
- Vehicle purchase cost
- Vehicle operating cost
- Vehicle maintenance cost
- Vehicle insurance cost
- Direct cost of travel
- Change in travel time
- Travel comfort
- Valuation of travel time
- Congestion
- Pavement wear
- .... etc.

Inter-relations

Interrelations

Backcasting sub-system

Utilization of forecasting in an iterative process ("goal seek"), testing alternative policy interventions until the desired impact(s) is obtained

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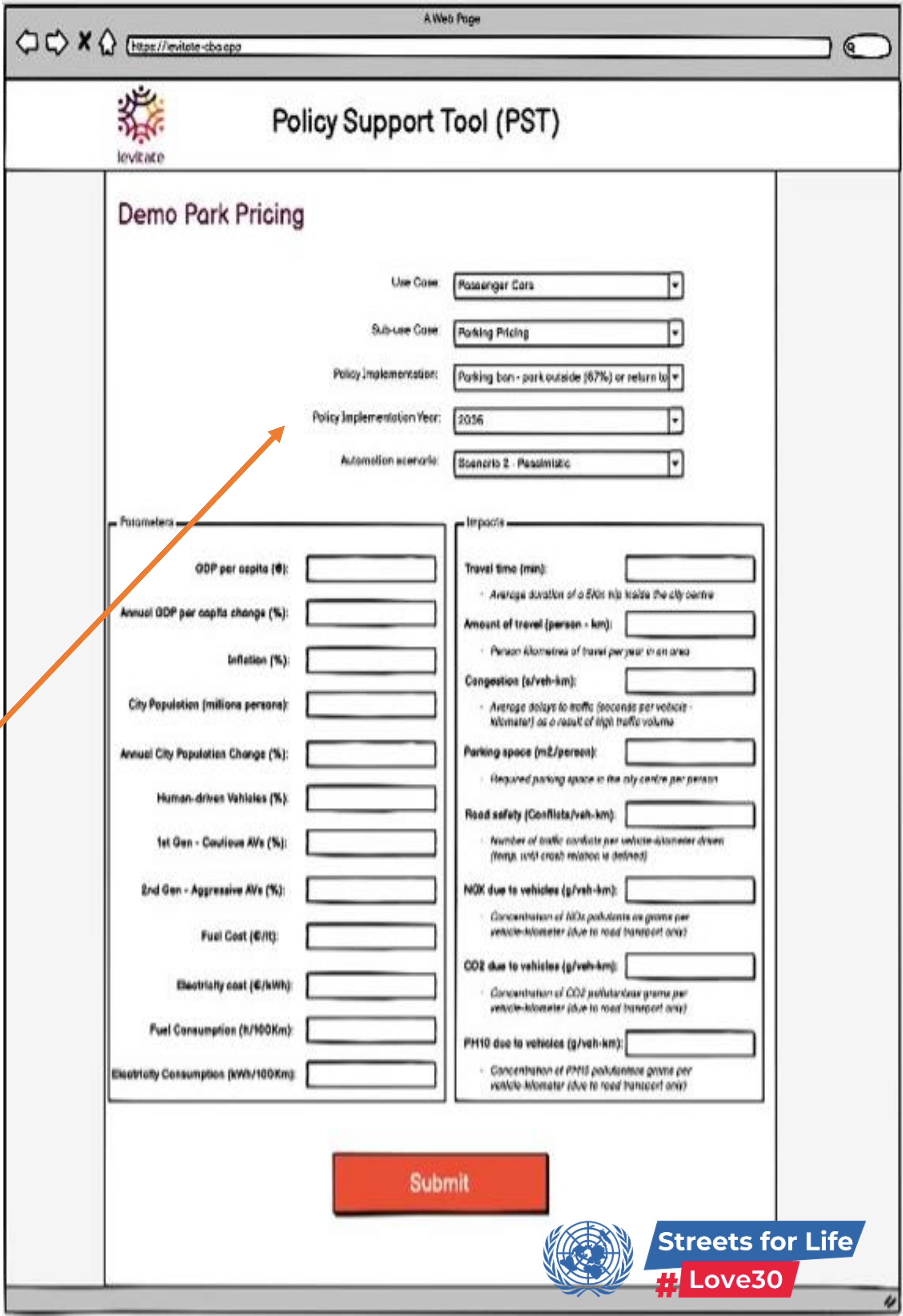
PST functionality (1/2)

- Selection of use case, sub-use case and policy implementation.
- Selection of implementation year and automation scenario.
- Selection of initial values and details of sub-use case implementation.

As an example, the case of Parking pricing is being examined and the year 2036 for the pessimistic automation penetration scenario



PST functionality (2/2)

- Estimation of **forecasted impact indicator** values for reference scenario (without SUC).

- Estimation of forecasted impact indicator values for **intervention scenario** (with SUC).

- SUC impact estimation-presentation of results.

The selected impact is **NOx due to vehicles** for this example

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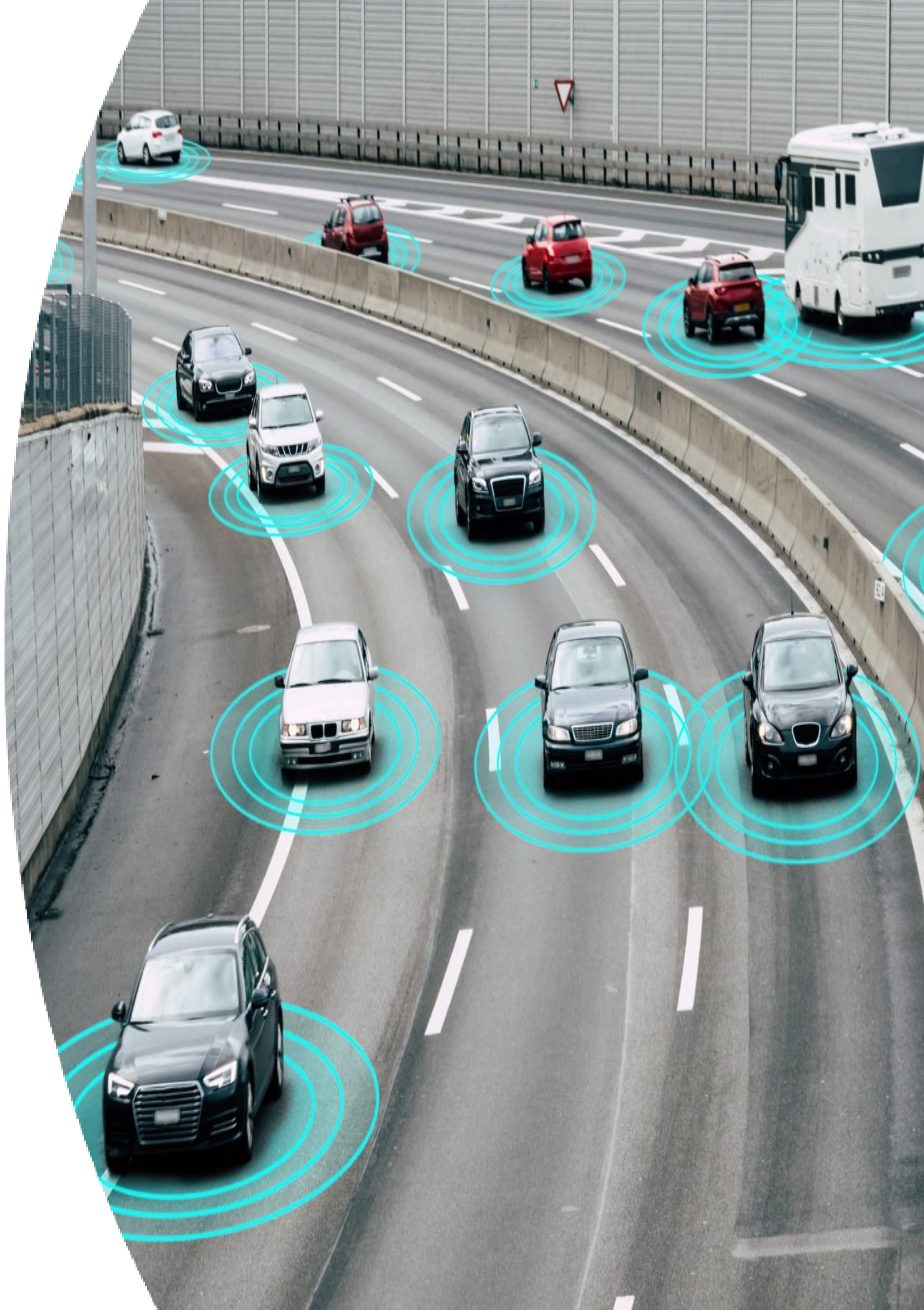
Results

- ➢ Automation reduces conflicts improving road safety.
- ➢ Improvement of energy efficiency and thus of public health.
- ➢ Big environmental impact by reducing emissions.
- ➢ Increase of access to travel and thus increase of the amount of travel.
- ➢ Reduction of delay time hence increase of total distance travelled.
- ➢ More impacts to come…



Scientific and Social Impact

- Flexible tool for decision makers.
- Backcasting system providing insight on measures to reach cities objectives.
- Provide multidisciplinary impact assessment methodology.
- Identify significant impacts of CATS on safety, environment, mobility and society.
- Bridge the gap between technology and policy objectives.
- Support cities with CATS implementation without the unwanted and unforeseen consequences and rebound effects.

Future Challenges

- **Integration** of results of all different methods into a unified assessment framework
- **Investigation** of results **transferability** through comparison of theoretical approaches with simulated results
- **Establishment** of the Levitate PST as the go-to, one-stop-shop tool for the calculation of societal impacts of automation
- **Promotion** of evidence-based policy design in preparation for the advent of automation
- **Exploration** of the integration of new smart & green transport modes with automation

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