George Yannis, NTUA

Automated Urban Transport Services Webinar

Event: LEVITATE Webinar
Location: Online Meeting
Date: November 23, 2021

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

Program

- Introduction to LEVITATE Project — Andrew Morris (Loughborough University)
- Overview of Automated urban transport impact assessment — George Yannis (National Technical University of Athens)

- Microscopic simulation — Maria Oikonomou (National Technical University of Athens)
- Mesoscopic simulation — Johannes Muller (Austrian Institute of Technology)
- Automated ridesharing — Rajae Haouari (Loughborough University)
- System dynamics — Martin Zach (Austrian Institute of Technology)
- Delphi method — Julia Roussou (National Technical University of Athens)

- Conclusions —George Yannis (National Technical University of Athens)
- Questions and webinar closing — George Yannis (National Technical University of Athens)

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Use Cases

WP 5
Use Case 1
Automated Urban Transport (NTUA)
M6-32

WP 6
Use Case 2
Passenger cars (LOUGH)
M6-32

WP 7
Use Case 3
Freight Transport and Logistics (AIT)
M6-32

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WP5 steps in LEVITATE

Goal	Method	Explanation
1. Exploration for the sub-use cases to study and the impacts to quantify	Literature review	Existing literature on CCAM/CAVs/ADAS
	Stakeholder reference group (SRG) workshop	A group of key stakeholders – international/ twinning partners, international organisations, road user groups, actors from industry, insurances and health sector support the project and participated in workshops.
2. Quantification	Traffic microscopic simulation	AIMSUN microsimulation of traffic at the city-district level (based on modelling individual vehicles)
	Traffic mesoscopic simulation	MATsim modelling of behaviours and choices of individuals (based on groups or streams of vehicles) at the city level
	System dynamics	modelling technique where the whole system is modelled at an abstract level by modelling the sub-systems at component level and aggregating the combined output.
	Delphi study	The Delphi method was used to determine those impacts that cannot be defined by the other quantitative methods
3. Synthesis & discussion	Synthesis	Major impacts summarized for the policy areas Environment, Mobility and Society/ Economy/ Safety
	Policy considerations	Recommendations & considerations for policymakers based on the wider literature

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Automated Urban Transport Sub-use Cases

1. **Point to Point automated urban shuttle service (AUSS)**: automated urban shuttles travelling between fixed stations, complementing existing urban transport
   a) Point-to-point AUSS connecting two modes of transport
   b) Point-to-point AUSS in a large-scale network

2. **Autonomous mobility on-demand**: flexible on-demand automated shuttle bus service that includes anywhere-to-anywhere AUSS, last-mile AUSS and e-hailing, complementing existing urban transport

Impacts and Methods

Impact	Method
Short term impacts / direct impacts	
Travel time	Mesoscopic simulation/Delphi
Vehicle operating cost	Delphi
Access to travel	Delphi
Medium term impacts / systemic impacts	
Amount of travel	Mesoscopic simulation/Delphi
Congestion	Microscopic simulation
Modal split using public transport	Mesoscopic simulation/Delphi
Modal split using active travel	Mesoscopic simulation/Delphi
Shared mobility rate	Mesoscopic simulation/Delphi
Vehicle utilisation rate	Mesoscopic simulation/Delphi
Vehicle occupancy	Mesoscopic simulation/Delphi

Impact	Method
Long term impacts / wider impacts	
Road safety	Road safety method
Parking space	System dynamics/Delphi
Energy efficiency	Delphi
NO_X due to vehicles	Microscopic simulation
CO_2 due to vehicles	Microscopic simulation
PM_{10} due to vehicles	Microscopic simulation
Public health	Delphi
Accessibility in transport	Delphi
Commuting distances	System dynamics

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Conclusions

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Contents

- Impacts of AUSS on the environment
- Impacts of AUSS on mobility
- Impacts of AUSS on society, safety and economy
- Final remarks
- Upcoming webinar

Impacts on the environment

- Microsimulation results indicated that the **introduction of AVs** in the urban environment will significantly **reduce CO2 emissions**
- The introduction of **Automated Urban Shuttle Services** will lead to a **similar emissions reduction** as the baseline scenario
- The Delphi results indicated that all sub-use cases will **increase energy efficiency**.
- **Point-to-point AUSS** will lead to the largest energy efficiency increase in the long-term

Impacts on mobility (1/2)

- According to experts **access to travel** will be **increased** by the introduction of all AUSSs.
- Kilometers travelled and congestion levels depend on the CAVs market penetration rates. During the **transition phase** when conventional and mixed levels of first and second-generation CAVs share the urban roads **congestion levels** are **increased**.
- **Anywhere-to-anywhere AUSS** lead to the largest reduction in travel time

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Impacts on mobility (2/2)

- **Modal split using public transport** will be mostly affected by the introduction of CAVs. **Modal split using active travel** will be less affected.
- **Vehicle utilization rate** will be **reduced** after the introduction of AUSS compared to the baseline scenario
- **Vehicle occupancy** will be **reduced** after the introduction of on-demand AUSS

Impacts on society, safety and economy

- **Road safety** will be significantly **increased** after the introduction of CAVs and AUSSs in the urban environment. At larger shares of second generation vehicles (60-100%) the **crash rate** of urban transport vehicles can reach a **reduction** of up to 50%-69%.

- The Delphi results indicated that all AUSSs will **improve accessibility in transport**.

- **Point-to-point AUSS** is expected to deliver extra **benefits** for the city in terms of vehicle operating costs, less parking space required and better public health.

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Final remarks

- The **LEVITATE** impact assessment results **confirm** the results of other studies, showing that **positive impacts** on environment, economy, society and safety are to be expected when larger shares of first- and second-generation cooperative, connected and automated vehicles are introduced in the traffic system.
- **Benefits** (higher energy efficiency, better access to travel, improvement public health, and lower vehicle operating costs) have been estimated from the introduction of **point-to-point AUSS** and, to a lesser degree, from on-demand AUSS.
- All results will be introduced in the **LEVITATE PST**, after the necessary transferability studies, in order to give access to the impact assessment tool to all city managers and policy makers

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LEVITATE Upcoming Webinars

- Keep checking the LEVITATE project website
  https://levitate-project.eu/

- Case Studies

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