10th INTERNATIONAL CONGRESS ON TRANSPORTATION RESEARCH

ICTR 2021

September 1-3
Rhodes, Greece

Traffic Impact Assessment of Innovative Traffic and Parking Measures in the Center of Athens

Maria Oikonomou

Transportation Engineer, Researcher

Together with:
George Yannis, Eleni Vlahogianni, Eleni Papatzikou and Panagiotis Papadakos

National Technical University of Athens
Department of Transportation Planning and Engineering

Research framework

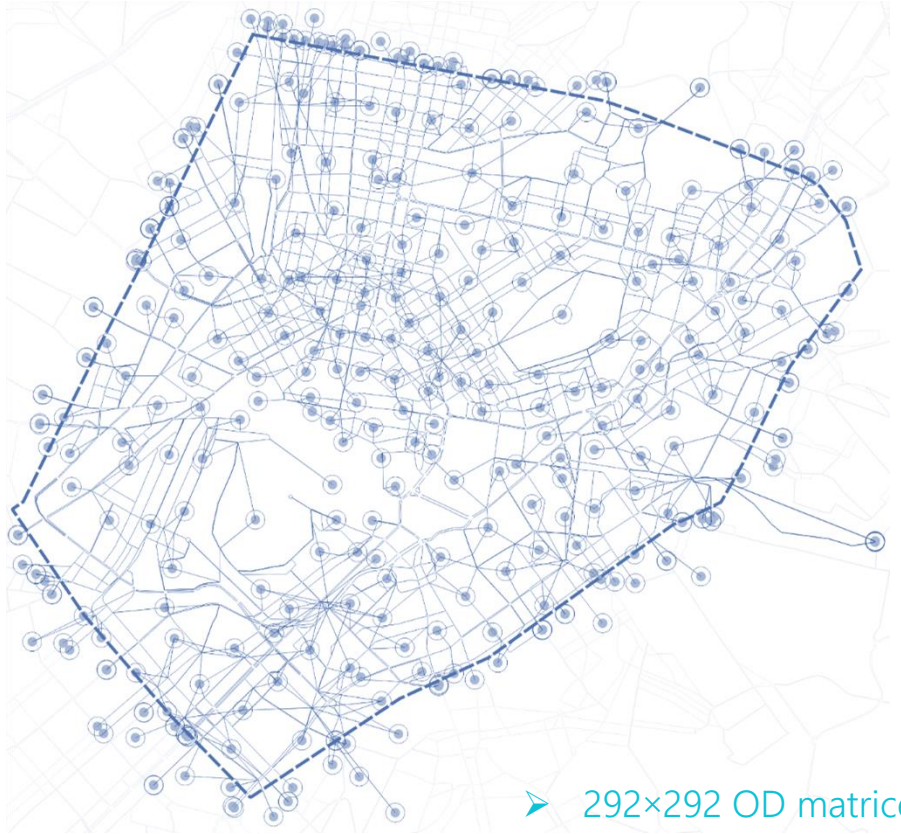
- Assess the traffic impacts of innovative traffic and parking arrangements in the center of Athens.
- Propose and examine interventions that are part of a new policy of upgrading the public space in Athens city focusing on two major urban management schemes:
  - The Athens Great Walk
    (upgrade and regeneration of road and pavement infrastructure)
  - Commercial Triangle and Plaka district free of private vehicles
    (special traffic and parking arrangements)

Introduction

- In modern cities, both authorities and citizens are faced daily with a series of options that affect urban mobility in short and long term. In particular, the transportation systems choices are several, complex and influence the city development.
- In the center of Athens, traffic delays and high travel times during peak hour conditions are noticed, due to the high inner city traffic. The large amount of motorcycles also affect the pedestrian traffic.
- Consequently, sustainable mobility practices, such as increase of sidewalks, prioritizing pedestrians, cyclists and public transport by the existence of exclusive lanes, parking management, etc., are imperatively required.

Methodology

- The examination of alternative traffic management schemes were performed through a macroscopic simulation analysis using the NTUA traffic simulation model for Athens in the Aimsun mobility software.
- The impact assessment was based on calculation of 6 Key Performance Indicators related to car traffic, public transport, bicycles and pedestrians. Comparing the current conditions with the alternative scenarios, the predominant scenario was found using a multi-criteria analysis.



- 292×292 OD matrices
- 1,137 nodes
- 2,580 road segments

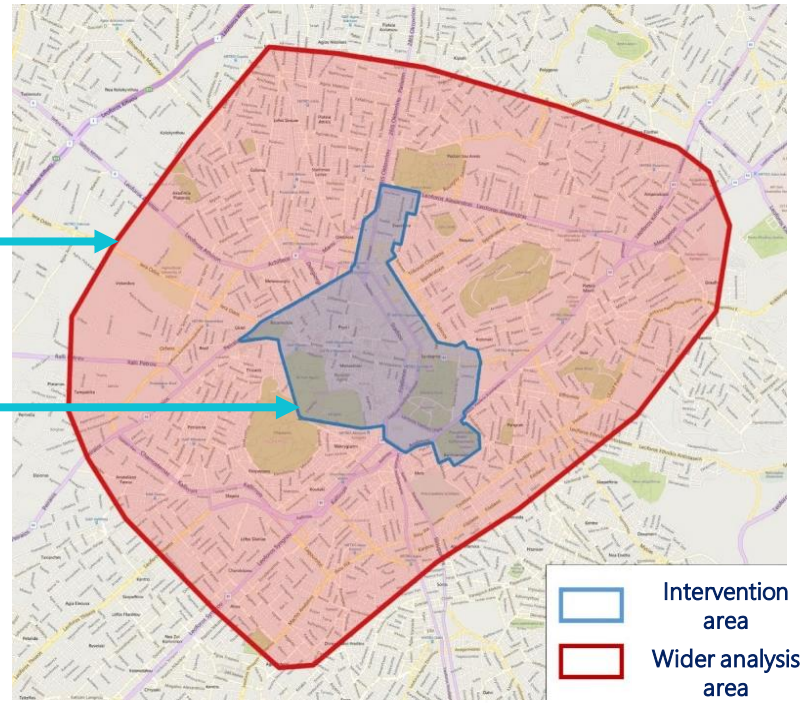
Analysis areas

The traffic impact assessment was performed on:

- Two analysis areas
- The current conditions (Scenario A)
- Alternative intervention scenarios (Scenario B1, B2, B3, B4, C0 and C1)
- During morning peak hour

Wider analysis area

Intervention area



Examined KPIs

- ΔA1. Average speed, vehicle-hours for private cars on the intervention area
- ΔA2. Level of service on the intervention area and the wider analysis area
- ΔA3. Travel times on selected road axes within the intervention area
- ΔA4. Urban reforms on road axes and streets with limited access to passenger cars
- ΔA5. Bus lanes length
- ΔA6. Average public transport speed on selected road axes of the intervention area

Alternative interventions

- Four alternative intervention scenarios (B1, B3, C1, C0 scenarios) were performed differing in the traffic conditions of Panepistimiou street and focused on:
  - Increase of sidewalks in several streets
  - New exclusive lanes for pedestrians, cyclists and public transport
  - Parking management
  - Traffic arrangements at Commercial Triangle and Plaka district
  - 30 km/h speed limit
- Two scenarios, B2 and B4, concerned modal shift from passenger cars to public transport (~9% and 8% respectively) of the corresponding scenario B1 and B3.

		B1/ B2	B3/ B4	C1	C0
K. Palama, Aigyptou Sq., Averof, Aischinou, Frinihou, Agras, Artemidos free of private vehicles		√	√	√	√
Olgas Av. free of private vehicles		√	√	√	√
Panepistimiou	Increase of sidewalk: 2 traffic lanes for all vehicles & 1 new parallel flow bus lane & removal of contraflow bus lane	√			
	Increase of sidewalk: 3 traffic lanes for all vehicles & 1 new parallel flow bus lane & removal of contraflow bus lane		√		
	Increase of sidewalk: 1 traffic lanes for all vehicles & 1 new parallel flow bus lane & removal of contraflow bus lane			√	
	Free of private vehicles				√
Akadimias: Traffic flow reversal & 1 new parallel flow bus lane					√
Syntagma square: Increase of sidewalk: 3 traffic lanes for all vehicles & 1 new bus lane		√	√	√	√
Amalias Av.: Increase of sidewalk: 2 traffic lanes for all vehicles & 1 new bus lane		√	√		√
Athinas, Ermou, Mitropoleos, Aiolou free of private vehicles		√	√	√	√
Perikleous, Kolokotroni, Lekka free of private vehicles				√	
M. Avriliou, Kriezotou, Tositsa, Monastiriou, Timaiou: Increase of sidewalk		√	√		√
I. Attikou, R. Feraiou, Othonos free of private vehicles		√	√	√	√
Commercial Triangle and Plaka district free of private vehicles		√	√		√
Filellinon, Akadimias, Sofias Av.: 1 new bus lane		√	√	√	√
A. Sygrou: 1 new bus lane		√			√
30 km/h speed limit in intervention area		√	√		√
Traffic Signal Optimization Programs		√	√	√	√

Simulation results

- Comparing the alternative intervention scenarios, there are no major differences, while the choice of the B1/B2 scenario over the rest of the scenarios seem to pave the way for the implementation of a new sustainable urban mobility plan.
- More specifically, B1/B2 scenario offers accessibility to pedestrians and cyclists, improves public transport operation and reduces passenger cars.
- Overall, B1/B2 scenario provides a significantly upgraded quality to urban mobility compared to the current conditions by offering more comfortable, safer and green trips.

			B1	B2	B3	B4	C0	C1
Private cars traffic	ΔA1	Vehicle-hours for private cars (intervention area)	+7,2%	-22,6%	+4,3%	-22,5%	+24.5%	+6,70%
		Average vehicle speed (intervention area)	-18,1%	-3,1%	-13,5%	-0,4%	-28,3%	-16,50%
	ΔA2	Level of service (intervention area)	+7.8%	+4,2%	+6,7%	-5,5%	+13,6%	+3,60%
		Level of service (wider analysis area)	+1.8%	-3,7%	+1.1%	-3,6%	+4,4%	+2,30%
	ΔA3	Travel times (intervention area)	+18,1%	+3,1%	+13,5%	+0,4%	+28,3%	+16,50%
Public transport & Pedestrian traffic	ΔA4	Urban reforms on road axes	+10ha	+10ha	+9ha	+9ha	+10ha	+6ha
		Streets with limited access to passenger cars	+5ha	+5ha	+5ha	+5ha	+5ha	+4ha
	ΔA5	Bus lanes length (affecting 50+ bus lines)	+3,8km	+3,8km	+2,6km	+2,6km	+2,1km	+2,1km
		Average public transport speed (Panepistimiou)	+28%	+35%	+32%	+37%	-7,2%	+28%
	ΔA6	Average public transport speed (Akadimias)	+22%	+26%	+23%	+27%	-	+22%

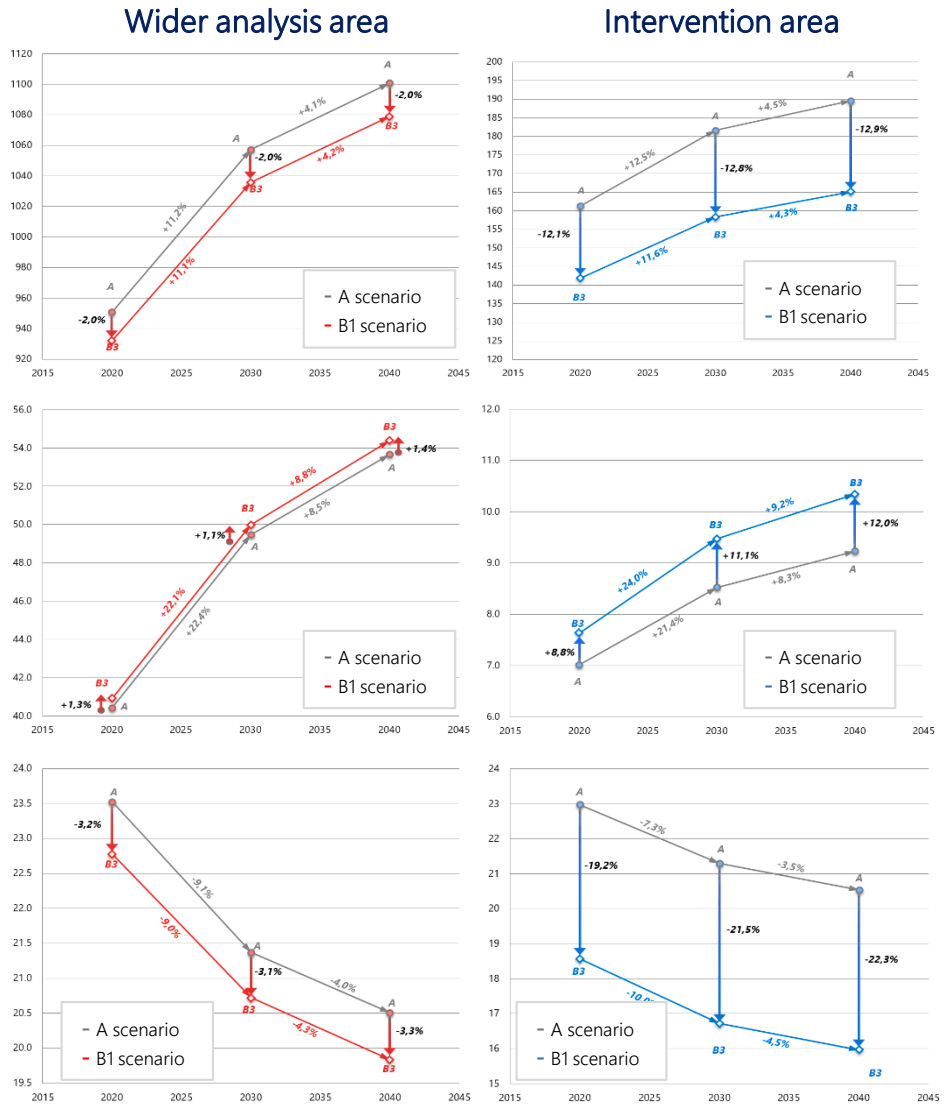
Multi-criteria analysis results

- According to the Analytical Hierarchy Process method results, B1 scenario is evaluated 32% higher than the current conditions, while B3 scenario is 30%, C0 scenario is 24% and C1 scenario is 22%.
- In addition, B1 scenario showed a slightly lower performance in motorized travel related indicators, while presented overall the optimal performance among the alternative intervention scenarios.

		B1	B3	C0	C1
ΔA1	Vehicle-hours for private cars (intervention area)	3,3%	3,4%	2,8%	3,3%
	Average vehicle speed (intervention area)	2,3%	2,4%	2,0%	2,4%
ΔA2	Level of service (intervention area)	2,0%	2,1%	1,9%	2,1%
	Level of service (wider analysis area)	1,7%	1,7%	1,7%	1,7%
ΔA3	Travel times (intervention area)	6,5%	6,6%	6,0%	6,6%
	Urban reforms on road axes	5,2%	5,1%	5,0%	5,2%
ΔA4	Streets with limited access to passenger cars	49,8%	48,4%	51,3%	42,2%
	Bus lanes length (50+ lines affected)	23,0%	23,0%	23,0%	21,6%
ΔA5	Average public transport speed (Panepistimiou)	18,5%	17,7%	15,1%	16,8%
ΔA6	Average public transport speed (Akadimias)	19,8%	20,1%	14,7%	19,8%
Total		**132%**	**130%**	**124%**	**122%**

Future traffic demand

- In order to assess the respective annual traffic impacts in future horizons (2030 and 2040), demand changes forecasting data were taken into account.
- The future horizons impacts on wider analysis area showed that, annual vehicle-kilometers were 2% reduced due to the B1 scenario implementation in all three time horizons, while annual vehicle-hours were 1% increased and average speed 3% reduced.
- Accordingly, on the intervention area, annual vehicle-kilometers were 12% reduced, annual vehicle-hours were 10% increased and average speed 20% decreased due to B1 implementation in all three time horizons.



Conclusions

- Regarding traffic impact indicators, it was noticed that the proposed interventions lead to significant benefits in mobility in the center of Athens, achieving the completion of the Athens Great Walk, which will make the center of Athens even more attractive.
- Proposed traffic regulations lead to reduction of average speed improving road safety and developing a new culture for safer behaviour of all road users.
- The release of the Commercial Triangle and Plaka district from private vehicles proves that the city can operate differently focusing on human life instead of motorized traffic.

10th INTERNATIONAL CONGRESS ON TRANSPORTATION RESEARCH

ICTR 2021

September 1-3
Rhodes, Greece

Traffic Impact Assessment of Innovative Traffic and Parking Measures in the Center of Athens

Maria Oikonomou

Transportation Engineer, Researcher

Together with:
George Yannis, Eleni Vlahogianni, Eleni Papatzikou and Panagiotis Papadakos

National Technical University of Athens
Department of Transportation Planning and Engineering