0189 Traffic Modelling - a Case Study for the Port of Chios Island

F. Orfanou, O. Basta, A. Dragomanovits, E. Vlahogianni & G. Yannis
National Technical University of Athens (NTUA), Greece

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INTRODUCTION

The present paper presents the background, methodology and results of a detailed traffic analysis study for the expansion and upgrade of the port of Chios island in Greece, and aims to serve as a case study for the efficient application of macroscopic and microscopic traffic simulation models in complex, real world situations.

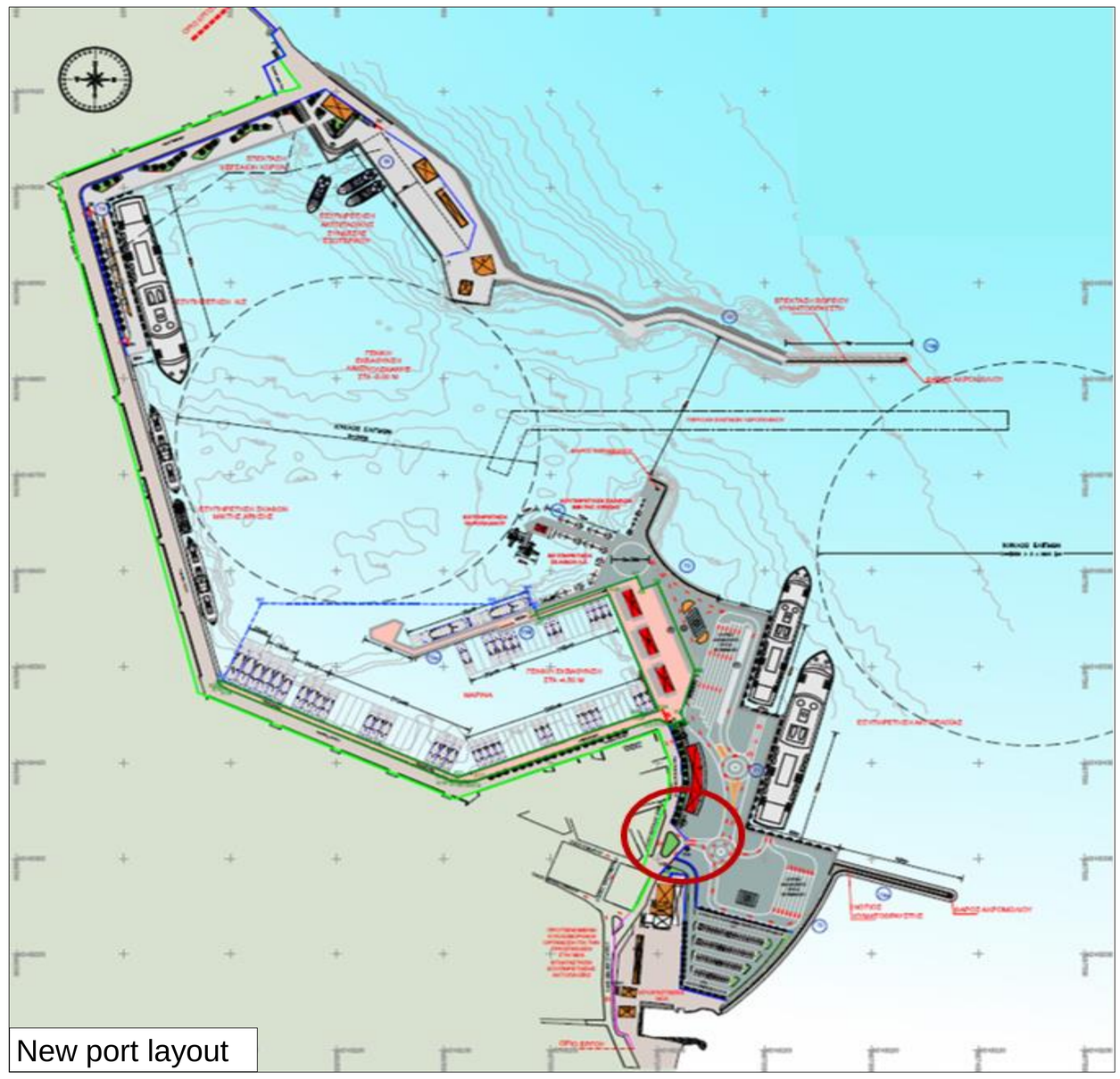
The port is situated inside Chios city limits, which is the capital of the island, on the east coast and 4km north of the island's airport. Both the port and the airport affect the traffic of the city of Chios due to the arrival/departure of ships and planes respectively. The demand created by these two poles of attraction and generation of movements is added to the traffic of the city and additionally loads its road network.

PORT UPGRADE

The examined port upgrade involves the expansion of the port area to the south, to accommodate two additional docking spaces for large domestic ship lines and create additional areas for vehicle parking and maneuvers. As the port is situated inside Chios city limits and encompasses several distinct operations within condensed available space, the study area creates a complex background environment with several challenges for the traffic engineer.

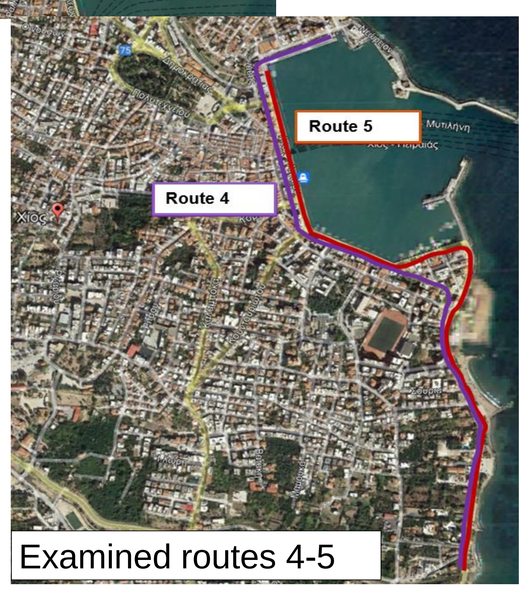
DATA COLLECTION

- Data for the existing road network and traffic control settings were gathered, for the operation of existing public transport, for on- and off-street parking, as well as for the existing and future (after the upgrade) operation of the port.
- Traffic counts took place in August 2021, at intersections in the close and wider area of the port. The traffic counts concerned traffic composition and the number of passenger vehicles, heavy vehicles, motorbikes, buses and bicycles was recorded.
- The demand of the port was based on the traffic data estimated in the design of the Master Plan. Also, passenger traffic data for the year 2022 were used to analyze the current situation.
- Data from the Chios Tourism Office were used, in order to estimate how tourist traffic is distributed on the island, (percentage of beds in each municipal unit as well as information from island residents).
- Data regarding the airport demand was selected from the Hellenic Statistical Authority.



Examined routes 1-2

Examined route 3



Examined routes 4-5

Average travel time of the selected routes per examined scenario

	Scenario 1 (min)	Scenario 2 (min)	Scenario 3 (min)	S3 - S1 (%)	Scenario 4 (min)	S4 - S2 (%)
Route 1	7,8	11,7	3,8	-51,3%	8,4	-28,3%
Route 2	6,4	8,4	3,4	-46,6%	3,6	-59,8%
Route 3	8,5	9,1	3,9	-54,1%	8,3	-8,3%
Route 4	5,4	6,5	4,7	-11,9%	6,0	-7,8%
Route 5	5,8	9,7	5,6	-3,7%	7,4	-23,7%

Results of the traffic simulation of the wider port area

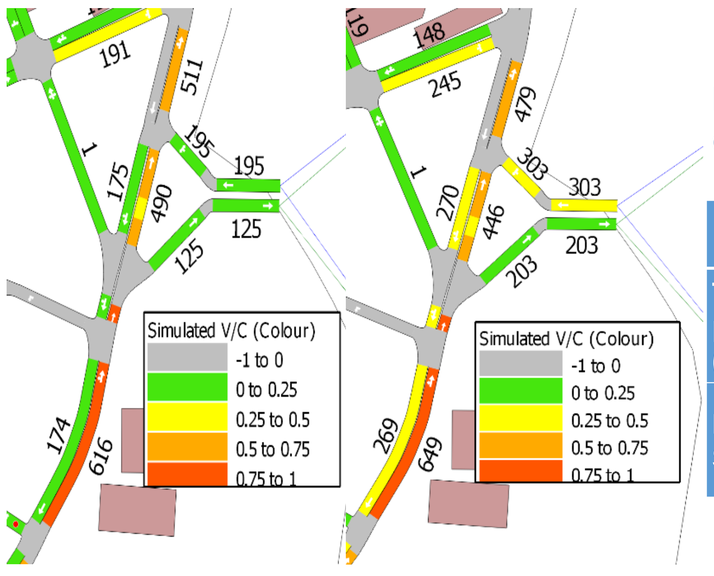
	Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)	S3-S1 (%)	Scenario 4 (S4)	S4-S2 (%)
Vehicle-kilometers (veh.km)	18.669,8	22.050,3	18.989	1,7%	20.816,1	-5,6%
Average speed (km/h)	37,99	37,66	39,19	3,2%	38,28	1,6%
Total delay per vehicle (sec/km)	54	61,24	41,86	-22,5%	54,93	-10,3%
Average number of stops/ vehicle	0,45	0,44	0,43	-4,4%	0,44	0%

METHODOLOGY

- Existing and future traffic demand from all traffic generators was estimated and realistic scenarios were developed for the assessment of the impact of the foreseen port upgrades.
- A macroscopic traffic simulation model was developed and calibrated using available Origin-Destination (OD) data and traffic volumes from local counts, which was used to estimate traffic impacts from the future operation of the port services. Furthermore, a microscopic traffic simulation model was used to estimate delays and levels of service for the roads at close vicinity to the port's new gate.

CONCLUSIONS

The study concluded that the proposed port layout is expected to result in the improved traffic operation at the city center as, due to the port gate relocation, traffic related to domestic ship lines is relocated to higher class and capacity roads further away from the city center. Total estimated delay times per vehicle are reduced, both according to the macroscopic model (wide study area) and the microscopic model (port gate area). A minor drawback identified was the expected slight increase of total vehicle-kilometers travelled.



Results of the microscopic simulation of the new gate of the new port for the years 2022 (S3) and 2046 (S4)

	Scenario 3 (S3)	Scenario 4 (S4)	S4-S3 (%)
Total delay per vehicle (sec/veh)	14,16	22,30	36,5%
Level of Service	B	C	▼