Analysis of the Acceptability and Cost Benefits of Reducing the Speed Limit to 80 km/h on the Intercity Road Network in Greece

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Introduction

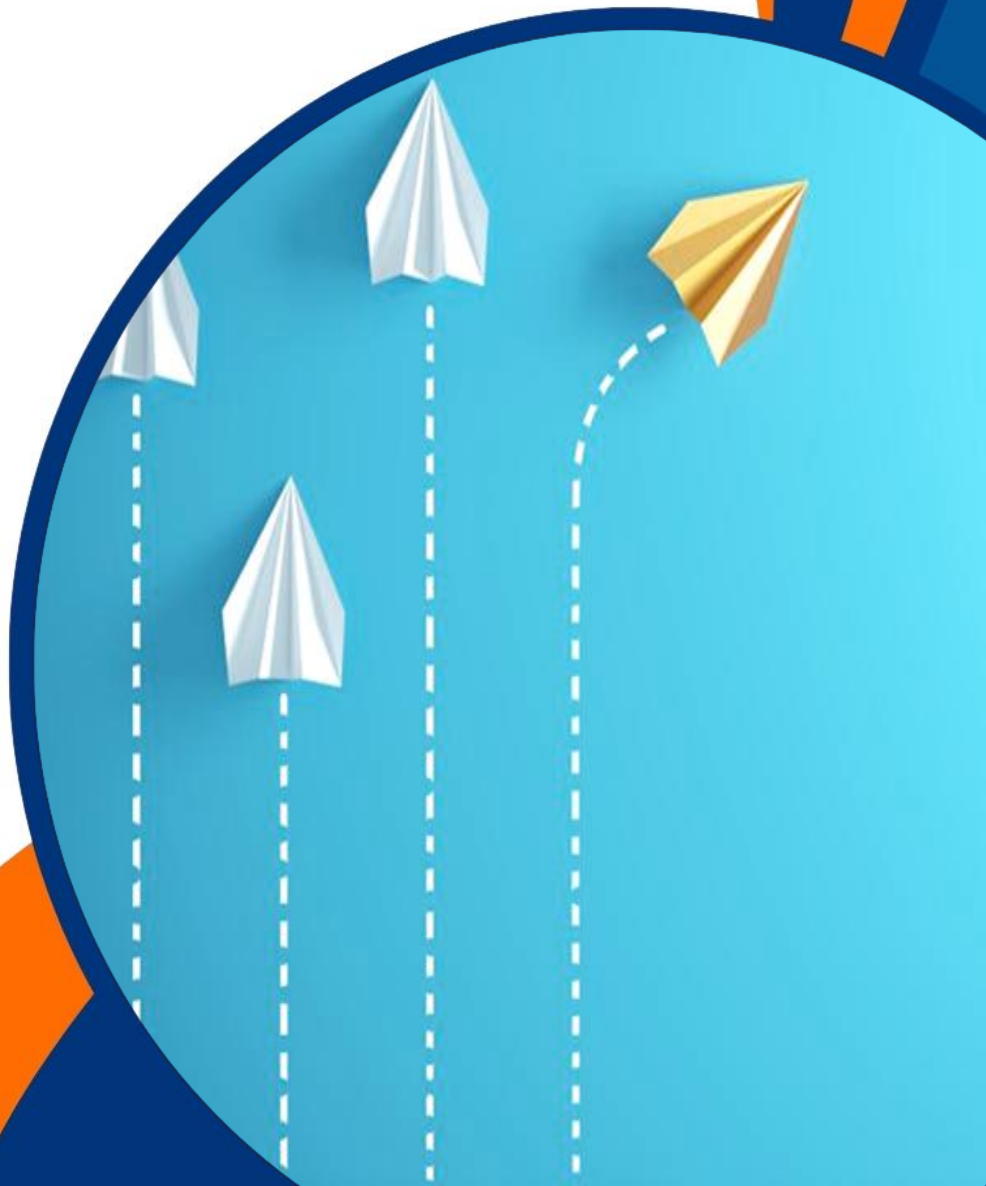
- Over the last decades, several studies have focused on the impact of speed and speed limit on road safety, showing that driving speed and road crashes frequency and severity are highly correlated

- Towards reducing the negative impacts of speed on road safety and promoting safe and sustainable mobility for all, there is a global trend to implement lower speed limits

- Reducing the speed limit on the Greek interurban road network, constitute a measure that is estimated to not only reduce road crashes but also bring significant economic benefits to Greek society

Objectives

- The objective of the present study is twofold:
  - Examination of the acceptability of reducing the speed limit on the interurban road network in Greece from 90 km/h to 80 km/h
  - Investigation of the socio-economic feasibility of the proposed intervention



Scientific Literature Findings

- Results of the implementation of lower speed limits in different countries

Study	Parameter	Annual impact	Country
1. Road Traffic			
1.1 Travel Time			
ONISR, 2020	Travel Time	+2 %	France
1.2 Fuel Consumption			
ONISR, 2020	Fuel	-3%	France
2. Road Safety			
2.1 Slight Injuries			
Lopez-Aparicio et al., 2020Susana Lopez-Aparicio, et al. 2020	**Slight Injuries**	-14%	Norway
Elvik, 2004	**Slight Injuries**	-16%	NA
ITF, 2018	**Slight Injuries**	0%	Sweden
2.2 Serious Injuries			
Lopez-Aparicio et al., 2020	Serious Injuries	-19%	Norway
Elvik, 2004	Serious Injuries	-30%	NA
ITF, 2018	Serious Injuries	0%	Sweden
2.3 Fatalities			
Lopez-Aparicio et al., 2020	**Fatalities**	-23%	Norway
Elvik, 2004	**Fatalities**	-41%	NA
ITF, 2018	**Fatalities**	-42%	Sweden
ONISR, 2020	**Fatalities**	-10%	France
3. Environment			
3.1 Climate Change (CO_2)			
ONISR, 2020	CO_2	-3%	France

Data Collection

- An online questionnaire-based survey of 408 valid answers
- Questionnaire Structure

Section A: Driving Experience - Mobility

- Driving experience
- Travel habits
- Road crash history
- Violations of the Road Traffic Code

Section B: Knowledge and Views

- Role of driving speed on road safety
- Reasons for the implementation of the 80 km/h speed limit
- Speeding on the interurban road network

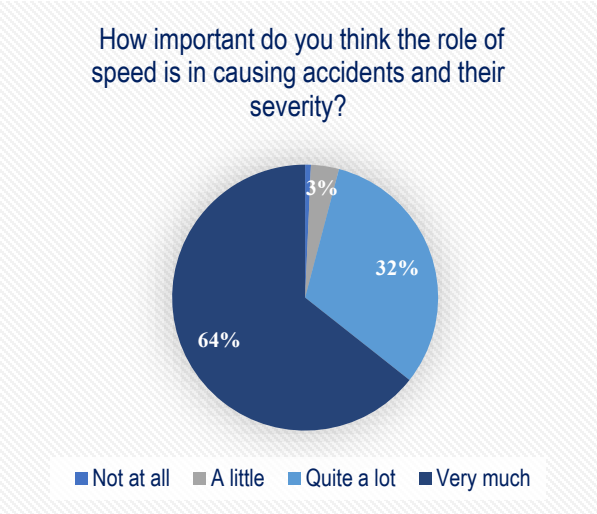
Section C: Speed limit reduction scenarios

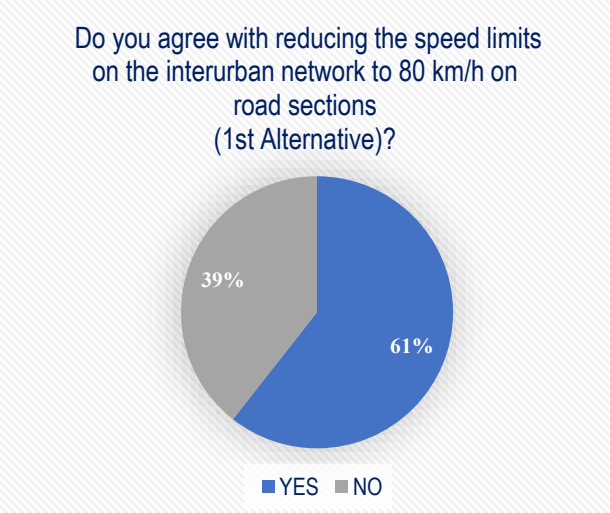
- 10 different scenarios of 3 parameters: travel time, fuel consumption, probability of being involved in a road accident with injury
- 3 alternatives: a) speed reduction to 80 km/h on road sections and no change at level junctions (60 km/h), b) reduction to 50 km/h at level crossings, c) no change

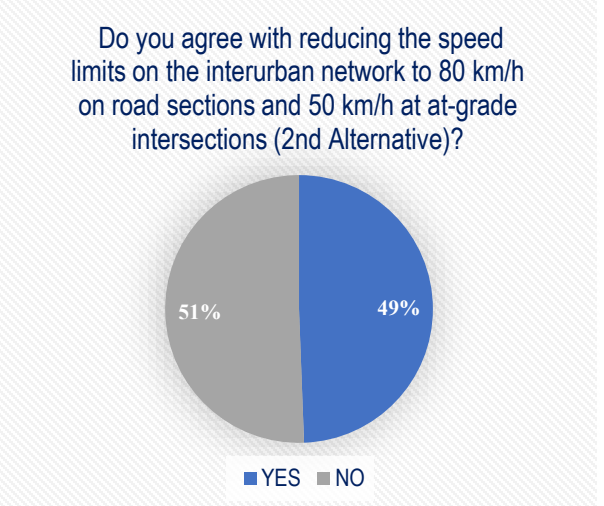
Section D: Demographics

- Gender
- Age
- Education level
- Annual income

Descriptive Statistics







- Participants are a little to quite worried about the possibility of being involved in a road accident, while the majority (64%) perceive that the impact of speed in causing accidents is quite significant
- 60% of the participants support the reduction of the speed limit on the interurban road network to 80 km/h, while under the stricter scenario the acceptance of the measure is relatively lower (49%)

Methodological Approach

- **Selection of logistic regression model**
  - Multinomial model: alternative choice among 1st speed reduction alternative, 2nd speed reduction alternative and no reduction
  - Utility function: $U_{in} = a_0 + a_1x_1 + a_2x_2 + \cdots + a_nx_n + \varepsilon_{in}$
  - Probability of choosing each alternative:

$$P_i = \frac{e^{U_i}}{1 + e^{U_j}}$$

- **Cost Benefit Analysis (CBA)**
  - Economic Net Present Value (ENPV):

$$ENPV = \sum_{t=0}^{t=n} \frac{B_t}{(1+SDR)^t} - \sum_{t=0}^{t=n} \frac{C_t}{(1+SDR)^t}$$

  - Internal Rate of Return (ERR):

$$\sum_{t=0}^{t=n} \frac{B_t}{(1+ERR)^t} - \sum_{t=0}^{t=n} \frac{C_t}{(1+ERR)^t} = 0$$

Multinomial Logistic Model

	1st Alternative			2nd Alternative		
Variables	Estimate	P-value	Odds ratio	Estimate	P-value	Odds ratio
Intercept	0,379	0,004	1,461	0,225	0,162*	1,252
Travel Time	-0,038	0,000	0,963	-0,038	0,000	0,963
Fuel Consumption	0,008	0,004	1,008	0,008	0,004	1,008
Likelihood of road accidents	0,027	0,000	1,027	0,027	0,000	1,027
Driving experience	NA	NA	NA	-0,341	0,000	0,711
Means of transport (two-wheelers)	-0,345	0,009	0,708	-0,442	<0.01	0,643
Means of transport (taxi)	1,491	0,161*	4,442	2,086	0,047	8,053
Means of transport (public transport)	0,687	0,000	1,988	0,729	0,000	2,073
Role of speed in causing accidents and their severity (No or little importance)	-1,385	0,000	0,250	-1,201	0,000	0,301
Role of pedestrians and cyclists in the choice of driving speed (No or little importance)	0,804	0,000	2,234	1,090	0,000	2,974
Gender (ref: Men)	0,486	0,000	1,626	0,561	0,000	1,752
Annual family income (ref: 10.000€ - 25.000€)	-0,429	0,000	0,651	-0,429	0,001	0,651
Education (ref: secondary school, high school, student)	0,224	0,014	1,251	NA	NA	1,174

Multinomial Logistic Model Results

- 60% of Greek road users accept the reduction of the speed limit on the interurban road network to 80 km/h
- Increasing travel time reduces the likelihood of acceptance of the speed limit reduction measure, while reducing fuel consumption increases the likelihood of acceptance
- Reducing the probability of being involved in a road accident with injury leads to an increase in the acceptability of the measure
- Drivers with little driving experience, mainly using two-wheelers, and men are less likely to accept and adapt to the speed limit reduction

Cost – Benefit Analysis

Benefits and Costs			2025	2026	2027	2028	2029	2030	2031	2032
Costs		NPV (0,8%)	Application	Operation						
C1. Initial Investment Cost	K€	-122,000	-122,976	-	-	-	-	-	-	-
C1.1 Study		-744	-750	-	-	-	-	-	-	-
C1.2 Supply and installation of signs		-1,617	-1,630	-	-	-	-	-	-	-
C1.3 Supply and installation of cameras		-119,639	-120,596	-	-	-	-	-	-	-
C2. Operating cost	K€	-27,655	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
C2.1 Employment of additional human resources		-21,277	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756
C2.2 Operational system maintenance		-2,316	-300	-300	-300	-300	-300	-300	-300	-300
C2.3 Annual Mechanical equipment maintenance		-772	-100	-100	-100	-100	-100	-100	-100	-100
C2.4 Social media campaigns		-3,088	-400	-400	-400	-400	-400	-400	-400	-400
C2.5 Bi-annual Measure effectiveness		-77	-	-20	-	-20	-	-20	-	-20
C2.6 Maintenance of signs		-126	-16	-16	-16	-16	-16	-16	-16	-16
Costs (C1+C2)	K€	-149,655	-126,549	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
Economic Impacts and Benefits										
B1 Road User surplus	K€	-170	-12	-17	-23	-23	-24	-25	-26	-26
B1.1 Travel time		-311	-24	-34	-43	-43	-44	-44	-45	-45
B21 2 Fuel consumption		141	12	17	20	20	20	20	19	19
B2 Externalities	K€	320,598	31,762	43,925	53,785	41,624	41,522	41,471	39,221	38,897
B2.1 Road Safety		320,538	31,758	43,919	53,777	41,617	41,514	41,463	39,212	38,887
B2.2 CO2 emissions		59	4	6	7	8	8	9	9	10
Benefits (B1+B2)	K€	320,428	31,750	43,908	53,762	41,601	41,498	41,447	39,196	38,870
NPV	K€	170,773	-94,798	40,315	50,189	38,009	37,926	37,854	35,623	35,278
IRR		39.1%								
B/C Ratio		2.14								

Cost – Benefit Analysis Results

- Reducing the speed limit on the interurban road network to 80 km/h is predicted to result in
  - 136 fewer deaths,
  - 55 fewer serious injuries and
  - 486 fewer light injuries

  to drivers and passengers of passenger vehicles over a period of 8 years

- Reduction in fuel consumption of 163 thousand liters and a reduction in CO2 emissions of 324 tones

- Main economic benefit is due to the reduction in road accidents, which totals around €320 million over a period of 8 years

Conclusions

- Overall, the reduction of the speed limit is an economically rewarding and very beneficial intervention for society since the costs are significantly lower compared to the benefits that arise during the 8 years of operation
- While the increase in travel time plays a decisive role in the acceptance of the speed limit reduction, road safety is a more decisive factor
- The measure being studied has gained substantial acceptance from commuters; therefore, it is crucial to explore the enactment of suitable laws and the development of a comprehensive, integrated action plan at the state level

Policy Implications

- Strong public support (~60%) suggests good implementation potential
- Road safety improvements outweigh the modest increase in travel time
- Excellent economic performance: ENPV ≈ €171 million, ERR = 39.1%, B/C = 2.14
- Implementation should combine legislation, automated enforcement, public awareness campaigns, and continuous monitoring
- Gradual implementation, supported by stakeholder engagement and periodic evaluation, can further improve public acceptance and long-term compliance

Future Research

- Conduction of an in-depth long-term cost-benefit analysis that extends beyond the initial 8 years of operation
- Investigation of accident rates, severity, and types of accidents before and after the implementation of the measure to quantify its effectiveness in reducing road accidents
- Analysis of the effects of the speed limit reduction on traffic flow and congestion
- Evaluation of the effectiveness of public education and awareness campaigns associated with the speed limit reduction
- Investigation of the potential role of emerging technologies, such as smart traffic management systems and autonomous vehicles

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