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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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Abstract

The aim of this paper is the investigation of public acceptance and socio-economic feasibility of reducing the speed limit in the interurban road network in Greece, from 90km/h to 80 km/h. For this purpose, a stated preference survey including 10 hypothetical scenarios with the variables of travel time, fuel consumption and probability of road accident with injury, was answered by 408 commuters. Then, a multinomial logistic regression model was developed to identify prevailing parameters affecting public acceptance. Afterwards a Cost Benefit Analysis (CBA) was conducted to investigate the socioeconomic feasibility of the measure, up to the year 2032. The analysis showed that reducing the speed limit in the Greek interurban road network requires low investment cost compared to the substantial positive impact on social welfare, presenting a positive economic Net Present Value and a high Financial Internal Rate of Return (39.1%), indicating its feasibility of over time.

Keywords: road safety; speed limits; stated preference analysis; multinomial logistic regression models; Cost Benefit Analysis

1. Introduction

Despite continued global and European efforts to improve road safety, traffic accidents remain one of the leading causes of premature death worldwide. According to the World Health Organization, approximately 1.19 million people around the world die each year due to road accidents and between 20 and 50 million people survive non-fatal injuries. More than half of all road traffic fatalities occur among vulnerable road users, such as pedestrians, cyclists and

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motorcyclists. Road traffic injuries are the leading cause of death for children and young adults aged 5–29. Yet two thirds of road traffic fatalities occur among people of working age (18–59 years) (Global Status Report on Road Safety, 2023).

In the European Union, progress has been made, but road fatalities remain high. In 2022, over 20,000 people lost their lives on EU roads. Greece, while having achieved a substantial reduction in traffic fatalities over the past decade (over 50% decrease from 2010 to 2022), still ranks above the EU average, with 54 deaths per million inhabitants compared to the EU average of 46 per million (European Commission, 2023).

Over the last decades, several studies have focused on the effects of speed and speed limit on road safety, showing that driving speed and road accident frequency and severity are highly correlated (Aarts & Van Schagen, 2006). Driving on the high-speed motorway network can cause negative impacts such as air pollution, high fuel consumption and serious road accidents (Jin & Rafferty, 2021). To reduce the negative impacts of speed on road safety and promote safe and sustainable mobility for all, there is a global trend to implement lower speed limits (De Pauw et al., 2013). In addition to road safety, reducing driving speed can contribute to greener and more economical driving.

Reducing the speed limit on the Greek interurban road network, apart from its contribution to reducing road accidents and consequently injuries and mortality, is a measure that is estimated to bring significant economic benefits to the state. Road accidents cost Greek society around €2.7 billion per year, while the actual cost could potentially exceed €8 billion per year if the actual number of casualties and accidents with property damage alone are taken into account (ITF, 2020).

In this context, the main objective of the present study is to investigate the acceptability of the reduction of the speed limit in the interurban road network of Greece from 90 km/h to 80 km/h, as well as to investigate the socio-economic viability of the proposed intervention. In order to achieve this objective, an extensive literature review was initially carried out and is presented in the next section (Section 2). To investigate the acceptance of the measure by commuters, a specially designed questionnaire was developed and is described in Section 3. A multinomial logistic regression mathematical model was then developed from which the variables affecting commuter acceptance of the speed limit reduction under consideration were derived. In addition, to investigate the socio-economic viability of the measure, a Cost Benefit Analysis (CBA) was carried out, in which indicators such as the Net Present Value (NPV) and the Economic Rate of Return (ERR) were estimated with a time horizon up to 2032. The results of the analyses are presented in Section 4. Finally, Section 5 summarizes the conclusions of this work and presents future challenges.

2. Literature Review

This literature review deals with the reduction of the speed limit on the interurban road network from 90 km/h to 80 km/h and its impact on society and the environment. The implementation of this measure has been investigated and implemented by several countries internationally, such as France which implemented it on two-way roads without a divider on the interurban network from 01/07/2018. Even other European countries have made similar reductions e.g. Sweden (from 90 to 80 km/h), Norway (investigations also for 60 km/h), with the main purpose of improving road safety by reducing road accidents.

According to the international literature, the results of speed limit reduction on interurban roads are common in many cases. However, the international and European community has drawn the attention of the authorities to the urgent need to reduce speed limits, a measure that will have several positive effects in various areas such as road safety, the environment and society in general. The following table summarizes the results of the literature review on the effects of reducing the speed limit on interurban road network.

Table 1. Effects of reducing the speed limit on interurban road network

a/a	Reference	Annual change (%)	Parameter	Country
1. Traffic				
1.1 Travel time				
	ONISR, 2020	+2 %	Travel time	France
1.2 Fuel consumption				
	ONISR, 2020	-3%	Fuel	France

2. Road Safety				
2.1 Slightly injured				
	Lopez-Aparicio et al., 2020	-14%	Minor injuries	Norway
	Elvik, 2004	-16%	Slightly injured	SE
	ITF, 2018	0%	Slightly Injured	Sweden
2.2 Seriously injured				
	Lopez-Aparicio et al., 2020	-19%	Severely injured	Norway
	Elvik, 2004	-30%	Severely injured	SE
	ITF, 2018	0%	Heavily Injured	Sweden
2.3 Fatally injured				
	Lopez-Aparicio et al., 2020	-23%	Fatalities	Norway
	Elvik, 2004	-41%	Fatalities	SE
	ITF, 2018	-42%	Fatalities	Sweden
	ONISR, 2020	-10%	Fatalities	France
3. Environment				
3.1 Climate change (CO_2)				
	ONISR, 2020	-3%	CO_2	France

As shown in the Table, the implementation of a new speed limit has an impact in different areas. In terms of road safety, reducing the speed limit from 80 to 60 km per hour will have a positive impact on road safety. Reducing speed limit from 80km/h to 60km/h in Oslo, Norway, caused a reduction in road accidents ranging from 24.7% - 50.9% for fatal accidents, 19.4% - 42.8% for accidents with serious injuries and 13.6% - 32.2% for accidents with minor injuries, with the maximum reduction rate being related to full compliance and acceptance of commuters with the measure (Lopez-Aparicio et al., 2020). The table above shows the percentage change in injuries and fatalities from the reduction of the speed limit in Oslo, adjusted for the speed reduction under consideration in Greece. In France, the speed limit reduction did not have an impact on the total number of road accidents with injury, but it did have an impact on their severity: with a reduction from 90 km/h to 80 km/h, the fatality rate on the interurban network decreased from 15.2 deaths per 100 accidents in the same reporting period to 13.7 deaths in 2019, a 10% reduction (French Road Safety Observatory, 2020).

In addition to its impact on road accidents, speed has a significant impact on the environment. It is strongly related to greenhouse gas emissions (mainly CO_2) and local pollutants (CO, NOx, HC, particulate matter), as well as to fuel consumption. Carbon dioxide (CO_2) is produced in proportion to fuel consumption and is therefore also directly related to speed. By maintaining a constant driving speed of 90 km/h instead of 110 km/h, the driver can save about 23% in fuel consumption, however, at lower speeds (below about 20 km/h), a reduction in speed does not necessarily have a corresponding effect on fuel consumption (ITF, 2020). Research on the effects of speed limit reduction on air pollutant emissions shows a wide range of results. In particular, in France, a 3% reduction in CO_2 was observed by reducing the speed limit on the interurban road network from 90 km/h to 80 km/h (French Road Safety Observatory, 2020).

In addition, the reduction of fatalities, slight and serious injuries in road accidents by reducing the speed limit from 90 to 80 km/h is quantified using the Power Model of Nilsson (Nilsson, 1982) which seems to be satisfactory for the interurban road network. This model relates the increase in fatalities, serious injuries and total injuries to the 8^{th}, 6^{th} and 4^{th} power, respectively, of the increase in average speed. The estimated reduction in average speed due to a 10 km/h reduction in the speed limit on the interurban road network is estimated to be equal to 3.6 km/h, according to the following relationship (Elvik, 2012):

$$Y = -0.0058 * x^2 + 0.2781 * x - 0.23423 \quad (1)$$

Where:

- y= change in average speed (km/h)
- x= change in the speed limit (km/h)

Subsequently, since the reduction of the speed limit is to result in a reduction of the average traffic speed, an increase in travel time is predicted. In similar applications of this measure, and more specifically in France, an increase in travel time of 2% has been observed (French Road Safety Observatory, 2020).

The above results of the literature review (Table 1) are used as assumptions and input data in the Cost-Benefit Analysis.

3. Methodology

A stated preference survey was designed to explore the objective of this research. The questionnaire was divided into four sections covering a total of 43 questions. The questionnaires were collected in the form of an online survey via Google Forms. A total of 408 questionnaires were collected. The first section of the questionnaire consists of questions regarding driving experience, main mode of transport, frequency of driving and possible involvement in road accidents. The second section examines the respondents' views on road accidents in Greece. In the third section, 10 different scenarios are introduced for a hypothetical three (3) hour out-of-town (long-distance) journey. Specifically, a choice between three alternatives is requested based on three parameters: travel time, fuel consumption, and the probability of being involved in a road accident with injury.

- Alternative 1: Reduction of speed from 90 km/h to 80 km/h on road sections, with no change at at-grade intersections (remaining at 60 km/h).
- Alternative 2: Reduction of speed from 90 km/h to 80 km/h on road sections, and reduction to 50 km/h at at-grade intersections.
- No change.

The following table shows a sample of one random scenario out of 10 in which respondents were asked to choose between the alternatives.

Table 2. Scenario structure

	1st Alternative	2nd Alternative	No Change
Increase in travel time (minutes)	10	20	0
Reduction of fuel consumption (%)	10%	15%	0%
Reduction in the probability of road accidents with injuries (%)	20%	50%	0%

The fourth and final section of the questionnaire includes questions about the demographic characteristics of respondents. The recording of socio-economic characteristics serves to test the representativeness of the sample and in the mathematical model to be developed subsequently. In particular, it was found that the gender distribution was even (Men: 52%, Women: 48%) and that the majority of respondents were young people up to 35 years old (18-24 years: 41%, 25-34 years: 33%, 35-54 years: 17%, 55+: 9%).

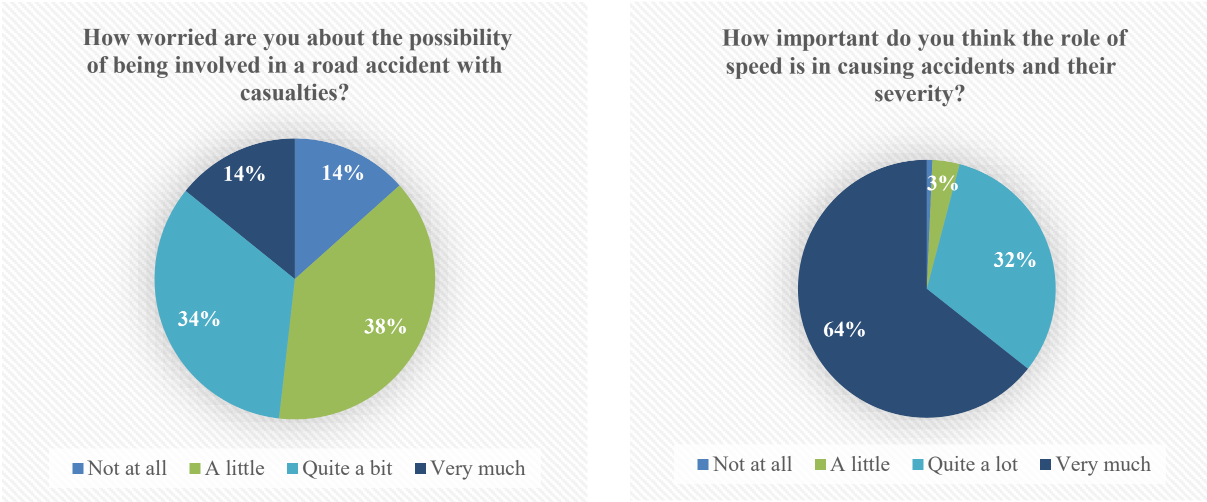

Fig. 1. Graphs from the responses of survey participants.

From the graphs above, it can be seen that survey participants are mostly 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.

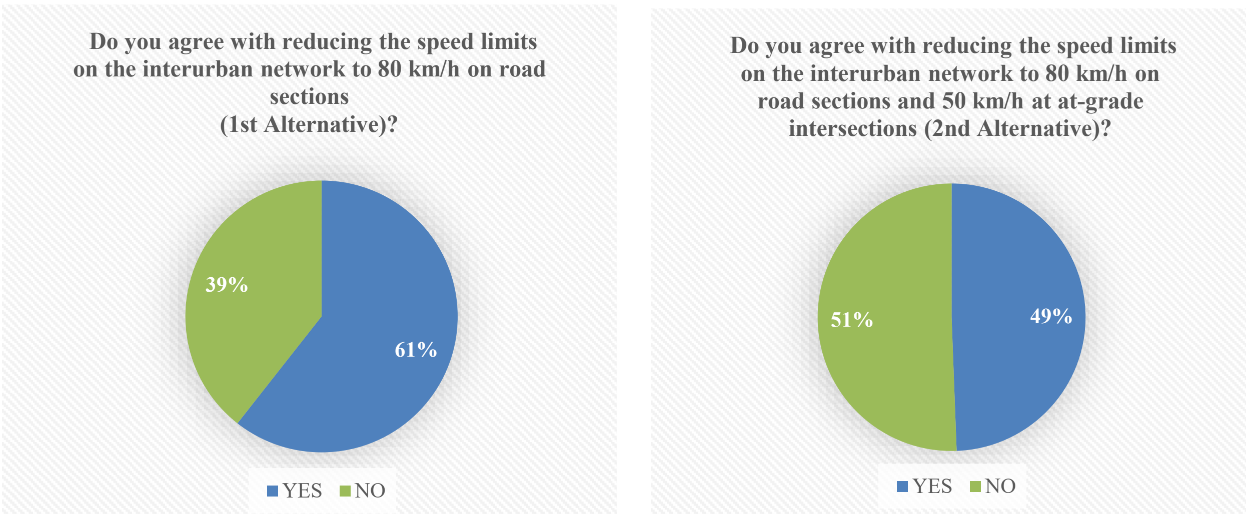

Fig. 2. Graphs from the responses of survey participants.

Based on the above, it appears that approximately 60% of the survey participants support the reduction of the speed limit on the interurban road network to 80 km/h, while under the stricter scenario—which also includes a reduction at at-grade intersections—the acceptance of the measure is relatively lower (49%).

4. Theoretical background

4.1. Regression accounting

The logistic regression model can be used both in the development of the binary forecasting model, where the possible contingencies are two, and in the development of a model with more alternatives - the multinomial forecasting model. The operation of the method is the same for both cases. This paper will focus on the multinomial model, analysing the scenarios where the options are "1st alternative: reduction of speed from 90 km/h to 80 km/h on road sections, with no change at at-grade intersections (remaining at 60 km/h)", "2nd alternative: reduction of speed from 90 km/h to 80 km/h on road sections, and reduction to 50 km/h at at-grade intersections" and "No Change: 90 km/h on road sections and 60 km/h at at-grade intersections".

The utility function of the logistic regression is given by the relation:

$$U_i = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + ... + \alpha_n x_n \quad (2)$$

Where:

- Ui, the utility function of event i
- $x_1,...,x_n$, the variables of the problem
- α_0, the constant representing the influence of factors not included as variables in the mathematical model
- $\alpha_1...\alpha_n$, the coefficients of the variables

The probability of event i taking place is given by the relation:

$$Pi = \frac{e^{U_i}}{1+e^{U^i}} \quad (3)$$

Another concept worth analysing, since it is used in this paper, is that of the odds ratio. This is a fraction in the numerator of which is the probability that the event will occur and in the denominator the probability that it will not. If, therefore, P denotes the probability that the event will occur and 1-P the probability that it will not occur, then the ratio is P/(1-P). In general:

$$\text{logit}(P) = \text{loge} = \beta + \beta_x + + \beta_{vx} \quad (4)$$

- When odds >1 the probabilities increase
- When odds <1 the odds decrease

4.2. Cost-benefit analysis

Cost Benefit Analysis (CBA) is a widely used economic evaluation technique that allows to determine the economic viability of investments (Sartori et al., 2014). Considering that financial-economic performance of a project may not be a sufficient indicator of the suitability of the investment for the wider society, socio-economic analysis comes to the fore which aims to calculate the project's profitability taking into account distortions and constraints in markets (EIA, 2025). In the context of CBA, a comparison of multiple scenarios representing the situation with the project under consideration against a baseline scenario of "no project" (Initial Zeroing Scenario) is required (European Commission, 2014). The costs and benefits of the evaluated scenarios are then compared to determine whether the project is worth implementing in terms of social welfare (European Commission, 2014).

Costs and benefits arising at different points in time should be discounted using a social discount rate (SDR). The SDR reflects the opportunity cost of capital from a longitudinal perspective for society as a whole. In the context of this paper, it is proposed to use a social discount rate equal to 0.8% (European Commission, 2021).

Using the appropriate SDR and after all costs and benefits of the project have been converted into monetary terms, it is possible to calculate the economic return of the project based on the following indicators (European Commission, 2014).

- Economic Net Present Value (ENPV): the difference between the discounted benefit and the discounted cost. The investment is considered economically viable when the ENPV is positive. This ratio is calculated from the following equation.

$$ENPV = \sum_{t=0}^{t=n} \frac{B_t}{(1+SDR)^t} - \sum_{t=0}^{t=n} \frac{C_t}{(1+SDR)^t} \quad (5)$$

Where:

- B_t, C_t : the benefits and costs expressed in monetary units occurring in year t of the investment with t=0,1,…,n
- SDR: social discount rate

- Economic Internal Rate of Return (ERR): the discount rate that zeroes out the net present value of the cost and benefit flows of an investment. ERR is an indicator reflecting the relative profitability of an investment and is calculated by solving the following relationship:

$$\sum_{t=0}^{t=n} \frac{B_t}{(1+ERR)^t} - \sum_{t=0}^{t=n} \frac{C_t}{(1+ERR)^t} = 0 \quad (6)$$

- Benefits/Costs ratio (B/C): Ratio of discounted economic benefits and costs.

For an investment under consideration to be considered economically viable, the following should be satisfied:

- The ENPV indicator must be positive (ENPV>0).
- The ERR must be greater than the SDR (ERR>SDR).
- The B/C ratio must be greater than one (B/C>1).

The methodology of this analysis in the context of this paper is based on the Guide for Cost Benefit Analysis of European Investment Projects (Sartori et al., 2014) and the Guide for the Economic Valuation of Investment Projects at the European Investment Bank (EIB, 2013). Finally, revisions and clarifications recently published by the European Commission are taken into account, compared to what is mentioned in the 2014 CBA Guide (European Commission, 2021).

5. Results And Discussion

5.1. Acceptance model

To achieve the objective of this study to investigate commuters' acceptance of the reduction of the speed limit from 90 km/h to 80 km/h on the interurban road network in Greece, a multinomial logistic regression model was developed (Kontaxi et al., 2024). After a series of several tests, the multinomial logistic regression model was developed for each of the two proposed alternatives (two total multinomial logistic regression models) for speed limit reduction, as shown in the following table. The main purpose was to identify the parameters that influence the choice between the three alternatives under investigation. Variables are considered statistically significant at the 95 % standard level, except for those indicated by '*'.

Table 3. Results of the multinomial model acceptance measure of the speed limit reduction measure

	1hAlternative			2hAlternative		
Variables	Coef.	p-value	Odds ratio	Coeff.	p-value	Odds ratio
Constant value	0,379	0,004	1,461	0,225	0,162*	1,252
Increase in travel time	-0,038	0,000	0,963	-0,038	0,000	0,963
Reduction in fuel consumption	0,008	0,004	1,008	0,008	0,004	1,008
Reduction in the probability 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

Main means of transport: two-wheeler	-0,345	0,009	0,708	-0,442	<0.01	0,643
Main means of transport: taxi	1,491	0,161*	4,442	2,086	0,047	8,053
Main means of transport: public transport	0,687	0,000	1,988	0,729	0,000	2,073
No or little importance of the role of speed in causing accidents and their severity	-1,385	0,000	0,250	-1,201	0,000	0,301
No or somewhat important role of pedestrians and bicycles in the choice of driving speed	0,804	0,000	2,234	1,090	0,000	2,974
Gender (reference: Men)	0,486	0,000	1,626	0,561	0,000	1,752
Annual Family Income 10.000€ - 25.000€	-0,429	0,000	0,651	-0,429	0,001	0,651
Education (reference:	0,224	0,014	1,251	NA	NA	1,174

The above Table leads to various conclusions which are set out below. Regarding the acceptance of both Alternative 1 and 2, one unit of increase in travel time leads to a 4% reduction in the probability of choosing to reduce the speed limit on the interurban network. This means that as travel time increases, the probability of the commuter accepting a speed limit reduction decreases. Similarly, a potential reduction in fuel consumption of one percent (1%) leads to an increase in the probability of choosing to reduce the speed limit on the long-distance network by 100%. This means that as the probability of reducing fuel consumption increases, the probability of accepting the measure increases significantly. The increase in the acceptability of the two alternatives (103% increase in acceptability) appears to be equally significant when the probability of being involved in a road accident with injury is reduced by 1%.

In addition, respondents with up to 9 years of driving experience are 29% less likely to accept a reduction of the speed limit both on road sections and at at-grade intersections (Alternative 2), compared to those with more experience, which may be understandable as more experienced drivers seem to have a better understanding of the importance of speed in road safety and, in addition, new drivers tend to drive at high speeds. Regarding the acceptance of the speed limit reduction only on road sections (1st Alternative), driving experience does not seem to play a statistically significant role.

Respondents whose main means of transport is a two-wheeler are 29% and 36% less likely to comply with the speed limit reductions under consideration under Alternatives 1and 2 respectively, compared to commuters using a passenger car as their main means of transport. In contrast, those using taxis and public transport as their main means of transport are more likely to accept the speed limit reduction.

Those who do not consider the role of speed to be important in causing accidents are 70-75% less likely to accept and comply with a speed limit reduction on the interurban road network, which makes sense. Also, respondents who consider the presence of pedestrians and cyclists not to be an important factor in their choice of driving speed are 2 to 3 times more likely to not respond positively to the reduction of the speed limit on the interurban road network. This result may be justified by the fact that the awareness of vulnerable users will be mainly from drivers who respect speed limits anyway and drive according to them.

Finally, in terms of demographic characteristics, women seem to be more likely to accept a reduction in the speed limit than men, the majority of whom tend to drive more dangerously and are willing to take higher risks in their driving (Islam & Mannering, 2021). Finally, respondents with a lower level of education seem to respond more negatively to the reduction of the speed limit on the interurban road network in Greece.

5.2. Cost-benefit analysis

In this section, the socio-economic analysis is carried out within the framework of the Cost-Benefit Analysis for reducing the speed limit from 90 km/h to 80 km/h on the interurban road network in Greece by the year 2032. For the preparation of this analysis, the European Commission's guidelines for the Cost-Benefit Analysis (CBA) of investment projects (Sartori et al., 2014) were taken into account. For the scenario of reducing the speed limit on the interurban road network, the investment and operational costs, as well as the following direct socio-economic benefits are estimated and taken into account:

Table 4. Costs - Benefits table

Costs (€)	Economic Impact - Benefits (€)
K1. Investment Costs (€)	Surplus of movers
K1.1 Preparation of a study	B1. Travel time
K1.2 Purchase and installation of signs	B2. Fuel consumption
K1.3 Purchase and installation of cameras	
K2. Operating costs (€)	Benefits of externalities
K2.1 Recruitment of staff	B3. Road Safety
K2.2 System operation and maintenance	B4. CO_2emissions
K2.3 Annual inspection of cameras-electronics	
K2.4 Information campaigns	
K2.5 Monitoring of the effectiveness of the measure	

Economic Impact-Benefits

To calculate the socio-economic impacts throughout Greece of the reduction of the speed limit on the interurban road network to 80 km/h, scenario 'S1' concerning the implementation of this speed limit reduction was investigated. Scenario 'S0' represents the status quo, i.e. the implementation and operation of the 90 km/h speed limit on road sections on the interurban road network. The purpose of comparing these two scenarios is to assess the economic performance of the scenario of reducing the speed limit to 80 km/h on the interurban road network and the economic benefit or cost of this measure. Similar research has been carried out for the reduction of speed limit in the urban area of Athens (Roussou et al., 2024).

To investigate the acceptance and compliance to the speed limit reduction by passenger cars drivers, a multinomial logistic regression model was developed for Alternative 2. Through the calculation of the utility function, the acceptance rate of the speed limit reduction on the interurban road network to 80 km/h on road sections and 50 km/h at at-grade intersections was calculated to be 57%. It is assumed that in the first year after the implementation of this measure, the acceptance rate will be that indicated by the questionnaire, while from the third year onwards the acceptance rate will have reached 100%, as a period of time is needed for drivers to be informed and mature.

Table 5. Results of a multinomial model of the acceptance of the speed limit reduction measure

Variables	Coeff.	p-value	Sign.	
Fixed value	0,250	0,004	0.025	*
Increase in Travel Time	-0,037	0,000	< 2.2e-16	***
Reduction in Fuel Consumption	0,008	0,004	0.005	**
Reduction in the probability of road accidents	0,026	0,000	< 2.2e-16	***

Coefficient. Significance: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

To assess the road safety impacts of the measure under consideration, the influence of reducing the speed limit to 80 km/h on road accidents, as observed in other cities, is taken into account according to the literature review (see Table 1). Therefore, the assumption is made that fatalities, serious and minor injuries in road accidents, with 100% acceptance of speed limit reduction, are to be reduced by 29%, 16% and 10% respectively, compared to the baseline scenario (S0). Subsequently, the number of seriously and slightly injured and fatalities in road accidents that took place in the year 2019 on the Greek interurban road network is collected (EL.STAT., 2023). It is worth noting that the assumption is made that in the year 2025, pending the recovery of the country from the effects of the COVID-19 pandemic, road safety is projected to be at approximately the same level as road safety as recorded in the year 2019. In order to calculate the cost of road safety, the social cost per death (2,148,034€), severe (273,574€) and minor injury (51,372€) as calculated for Greece is used (ITF, 2020). Finally, it is assumed that road safety improves annually by 2.5%, a rate derived from the evaluation of road safety data per year for European Union countries.

To estimate the value of travel time, a distinction is made between work-related and non-work-related travel, given their different unit costs (EUR/hour) (European Commission, 2014). Specifically for Greece, the value of working time is estimated at 11.4 €/hour, while the value of non-working time is estimated at 4.10 €/hour (European Commission, 2019). In this paper, the average value of travel time on the long-distance network in Greece is assumed to be 7.75 €/hour.

To estimate the impact on travel time in monetary terms due to the implementation of the proposed measure, the annual travel time in each scenario is calculated by taking into account the annual vehicle-hours without (S0) and with (S1) the speed limit reduction (Systema, 2022), multiplied by the value of travel time (7.75 €/hour) and the average vehicle occupancy (1.3 persons per vehicle) on the interurban road network. Based on the literature review, a 2% increase in travel time is considered due to the reduction of the speed limit to 80 km/h on interurban roads compared with the baseline (S0).

The petrol consumption of the Greek passenger vehicle fleet in the S0 scenario is derived from the vehicle-kilometres and fuel consumption (litres/km) for passenger vehicles (Yang & Bandivadekar, 2017). The fuel consumption targets for new passenger vehicles, as set by the European Union, are taken into account for forecasting fuel consumption until 2032. According to the literature, a 3% reduction in fuel consumption is expected as a result of the considered speed limit reduction.

A particularly important parameter in the socio-economic analysis is the price of petrol. At the beginning of 2022, the average petrol price in Greece was 2.05 €/litre. However, the price used in the socio-economic calculations should be net of taxes and fees (Sartori et al., 2014). Based on the ACEA guide (ACEA, 2021), the net price of petrol, after deducting the energy regulator fee, state fee, customs fees, and VAT, is 0.90 €/litre. Since fuel prices are influenced by various technical, political, and economic factors, long-term forecasting is challenging; therefore, a declining price trend is assumed based on forecasts from international organisations (EIA, 2025).

To calculate the environmental impact of the speed limit reduction, carbon dioxide (CO_2) emissions are considered. For the baseline scenario (S0), a passenger vehicle in Greece emits on average 142 g CO_2/vehicle-km in 2025 (EEA, 2022). The total CO_2 emissions from passenger vehicles are obtained by multiplying the annual vehicle-kilometres travelled on the interurban road network (Systema, 2022) by the average CO_2 emission rate per vehicle-km. The cost of CO_2 emissions is then calculated by multiplying total emissions by the unit cost of CO_2 (€/gram), which is 131 €/g CO_2 in 2025, increasing gradually to 250 €/g CO_2 by 2032 (European Commission, 2021). According to the literature (see Table 1), a 3% reduction in CO_2 emissions is assumed as a result of the speed limit reduction (ONISR, 2020).

Investment and operating costs

To determine the necessary economic performance indicators, both investment and operating costs must be calculated.

The investment cost refers to the initial expenditure required for the implementation of the measure. This includes the costs of conducting the feasibility and design study to select suitable locations for the cameras and signs, as well as the procurement of new specialised software to ensure optimal road safety.

The costs for vertical signage include the purchase and installation of new signs and poles, along with the removal of existing ones. The total number of signs required is estimated at 8,000 for the entire Greek long-distance road network. These signs will inform and remind drivers of the new speed limit. In addition, the purchase and installation of new cameras and radar systems are deemed necessary to ensure the effective enforcement of the measure. The investment also covers installation costs, software systems, and all auxiliary operational equipment, such as wireless communication units, cables, and control cards. To maximise the measure's effectiveness, cameras are to be installed at 8 km intervals (Newstead et al., 2024).

The operation of the measure requires the recruitment of additional traffic police personnel to monitor compliance with the new speed limit. The detailed estimation of required staff, shift schedules, and total man-hours for implementing the measure on the interurban network follows the methodology of Yannis et al. (2005). In addition, the establishment of citizen information centres is foreseen, serving as contact points for feedback and complaints to ensure continuous monitoring of public opinion.

The operating costs include the maintenance and operation of the speed limit enforcement system, including vertical signage. They also cover the periodic testing of cameras and electronic equipment to ensure proper system functionality, as well as a biennial audit involving a field survey to evaluate the measure's effectiveness. Finally, public information campaigns in the media are considered essential to ensure citizens are well-informed and smoothly adapt to the new speed limit.

Economic performance

In the framework of the socio-economic analysis for the reduction of the speed limit to 80 km/h on the interurban road network in Greece by 2032, the investment costs, annual operating costs, and the total socio-economic costs and benefits were estimated. To assess the economic efficiency of the measure, the Economic Net Present Value (ENPV), the Economic Rate of Return (ERR), and the Benefit-Cost (B/C) ratio were calculated. The table below summarises the estimated costs and benefits of the investment, as well as its economic performance indicators up to the year 2032.

Table 6. Socio-economic analysis of the implementation of the 80 km/h speed limit on the Greek interurban road network

			2025	2026	2027	2028	2029	2030	2031	2032
Benefits and costs		NPV (0.8%)	Implementation	Operation						
K1. Investment Costs	thousand €	-122,000	-122,976	-	-	-	-	-	-	-
K1.1 Study		-744	-750	-	-	-	-	-	-	-
K1.2 Cost of number plates		-1,617	-1,630	-	-	-	-	-	-	-
K1.3 Cost of cameras		-119,639	-120,596	-	-	-	-	-	-	-
K2. Operating Costs	thousand €	-27,655	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
K2.1 Personnel		-21,277	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756
K2.2 System operation		-2,316	-300	-300	-300	-300	-300	-300	-300	-300
K2.3 Annual camera system check		-772	-100	-100	-100	-100	-100	-100	-100	-100
K2.4 Media campaigns		-3,088	-400	-400	-400	-400	-400	-400	-400	-400
K2.5 Biennial effectiveness check		-77	-	-20	-	-20	-	-20	-	-20
K2.5 Maintenance of signage		-126	-16	-16	-16	-16	-16	-16	-16	-16
Costs (K1+K2)	thousand €	-149,655	-126,549	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
Economic Impact-Benefits										
Surplus of commuters	thousand €	-170	-12	-17	-23	-23	-24	-25	-26	-26
B1. Journey time		-311	-24	-34	-43	-43	-44	-44	-45	-45
B2. Fuel Consumption		141	12	17	20	20	20	20	19	19
Externalities	thousand €	320,598	31,762	43,925	53,785	41,624	41,522	41,471	39,221	38,897
B3 Road safety		320,538	31,758	43,919	53,777	41,617	41,514	41,463	39,212	38,887
B4 CO_2emissions		59	4	6	7	8	8	9	9	10
Benefits (B1+B2+B3+B4)	thousand €	320,428	31,750	43,908	53,762	41,601	41,498	41,447	39,196	38,870
NPV	thousand €	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								

According to the above table, the NRPV is approximately €171 million by 2032, with the gain in terms of social welfare being observed from the first year. At the same time, the ERR=39.1% is higher than the social reduction rate SDR (0.8%), which indicates the economic efficiency of the investment under consideration. Finally, the B/C ratio is greater than unity, which confirms the socio-economic viability of the measure in the long run.

6. Conclusions

The main conclusions of the present study regarding the implementation of the 80 km/h speed limit on the interurban road network concern both the acceptance of the measure by Greek commuters and its economic viability.

Approximately 60% of Greek commuters accept the reduction of the speed limit on the interurban road network to 80 km/h, while a stricter reduction, extending also to at-grade intersections, shows a lower acceptance rate (49%). The choice of any alternative to the speed limit reduction depends primarily on three factors: increased travel time, reduced fuel consumption, and reduced likelihood of injury crashes. An increase in travel time decreases the probability of acceptance, whereas reduced fuel consumption and improved road safety both increase it. Drivers with limited driving experience, those using two-wheelers, and male drivers are less likely to accept or adapt to the speed limit reduction.

Reducing the speed limit from 90 km/h to 80 km/h on the interurban network has a significant positive impact on road safety, CO_2 emissions, and overall societal welfare. The measure is projected to result in 136 fewer fatalities, 55 fewer seriously injured, and 486 fewer slightly injured drivers and passengers of passenger vehicles over an eight-year period, a benefit likely to be even greater when considering other vehicle types and pedestrians. Additionally, the reduction is estimated to lower fuel consumption by 163 thousand litres and CO_2 emissions by 324 tonnes. Notably, the main economic benefit stems from the reduction in road accidents, corresponding to approximately €320 million over eight years.

The analysis confirms that the reduction of the speed limit from 90 km/h to 80 km/h on the country's interurban network is an economically viable and socially beneficial intervention, as the operating and investment costs are significantly lower than the benefits accrued over the same period. Specifically, the Economic Net Present Value (ENPV) is positive, amounting to €171 million, while the Economic Internal Rate of Return (ERR) equals 39.1%, indicating a strong economic return on investment.

The findings also show that, although increased travel time influences the acceptance of the measure, road safety improvements are a more decisive factor. Therefore, the implementation of the 80 km/h speed limit appears to have substantial public support in principle. It is thus recommended that the State adopt appropriate legislation and develop a comprehensive action plan to facilitate the smooth integration of the new speed limit into the national road traffic regulations.

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