

Needs and Uses of Road Safety Data within the UN SafeFITS Model



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To discuss the needs and uses of road safety statistics in individual countries and globally, especially in the context of the UN SafeFITS Model

<u>Structure</u>

- I. Needs and uses of road safety data
- II. The experience of Greece with road safety data
- III. The SafeFITS model
- IV. Road safety data in Albania

Database Exposure Causalities Foreasting Safety Management Safety Performance Indicators Fore Industrialized Countries Industrialized Countries Injuries Decision Making S Emerging Economy Estatistical Models - Causalities Global Road Safety Model Statistical Mo EconomyRoad User Particular Street Exposure Database Vehicle Exposure Statistical Models Emerging Economies Vehicle



I. Needs and uses of road safety data



Initial Considerations

- Road Safety is a typical field with high risk of important investments not bringing results.
- Absence of **monitoring** and accountability limits seriously road safety performance.
- Decision making in road safety management is highly dependent on appropriate and quality data.
- Very often we look where the data are and not where the problems and solutions are.





Effective strategies, the weakest link

- Institutional management functions
 - First pillar of the Decade of Action: Road safety management
- Interventions
 - Four other pillars of the Decade of Action
- Results
 - Less fatalities and injuries
 - Road safety targets: which is the acceptable road safety level?







Data needed for Road Safety Decision Support

Data to identify the problems

- Crash data
- Risk exposure and performance indicators

Data to identify the solutions

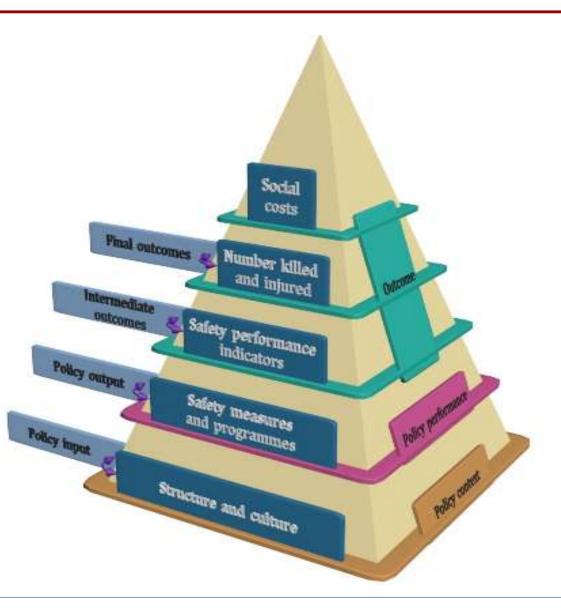
- data on measures implementation
- data on measures effectiveness

Macroscopic data

- for the whole population
- for a city, region, country, globally

Microscopic data

- driver, passenger pedestrian behaviour and performance
- junction, road segment, small area performance
- specific accident analysis data





Critical Data Properties

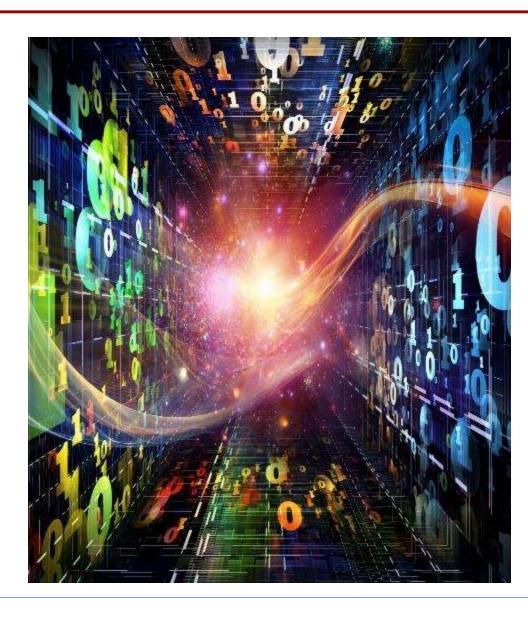
- Crash data are meaningful only if they are combined with **exposure data** (crash per km driven, per traffic characteristics, per time, etc.)
- Crash causalities are revealed when crashes are correlated with safety performance indicators (SPI) (behaviour, infrastructure, traffic, vehicles)
- The **evaluation of safety measures** effectiveness provides valuable information, necessary for matching problems with solutions
- Analysis of high resolution data reveals hidden and critical crash properties





Importance of Road Safety Data Collection

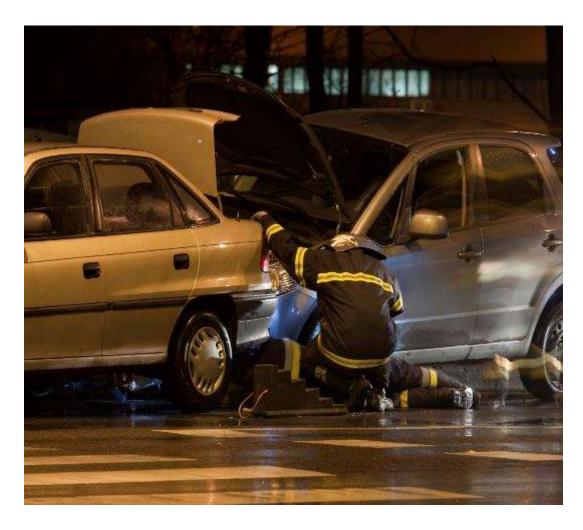
- **Identify high-risk sites**, prioritize needs and plan necessary improvements
- Investigate the **impact of various factors** (geometric characteristics, electric lighting, parking, driver training, enforcements, etc.) on accidents reduction
- In the **monitoring** of projects (e.g. signaling, lighting, signage, etc.) and actions (e.g. increased enforcement, parking ban) in order to improve road safety
- In "before and after" studies in order to determine the **effect of an intervention** at a road section or intersection
- In-depth investigation (experts' report) on a particular accident





Problems when Recording Road Accidents

- Definitions (accident, fatality etc.)
- Unclear determination of road accident location
- Insufficient or incorrect recording
- Insufficient accident coverage





Mortality rates & risk rates

Epidemiology approach

(fatalities per population, per licensed drivers)

- Road traffic risk approach (crashes per vehicle kilometres travelled, per road length, and per number of vehicles in the fleet)
- Road user at risk

(casualties per person kilometres travelled, per number of trips, per time spent in traffic)

- Basic requirements
 - Travel/mobility surveys for collecting veh-km or persons-km data
 - Traffic counts systems established on the national and main interurban road network (veh-km)
 - Vehicle / driver classification as per international standards

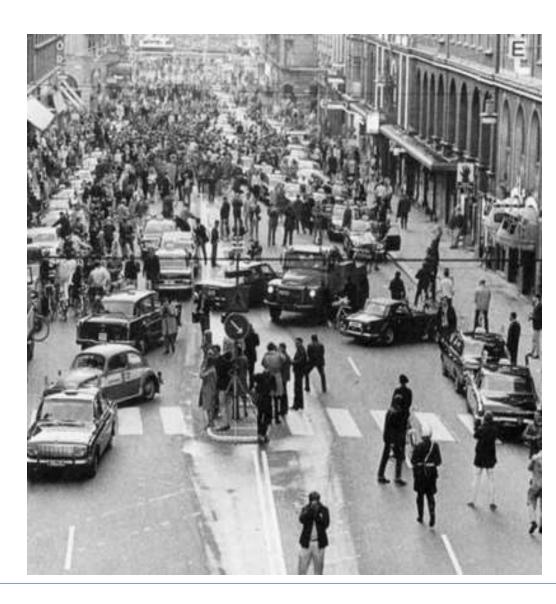




Exposure Indicators

Specific Exposure Indicators

- Population
- Driver population
- Road length
- Vehicle fleet
- Vehicle kilometres, Person kilometres
- Number of trips
- Time spent in traffic
- Disaggretated per road user, vehicle and road characteristics
- Time dimension?





How to define SPIs?

- SPIs should cover the whole road transport system: roads, behaviour, vehicles
- Measured by ways of surveys; sampling is needed
- A strong **causal relationship** should be present between risk and SPIs
- Relevant for **road safety policies** (action plans)





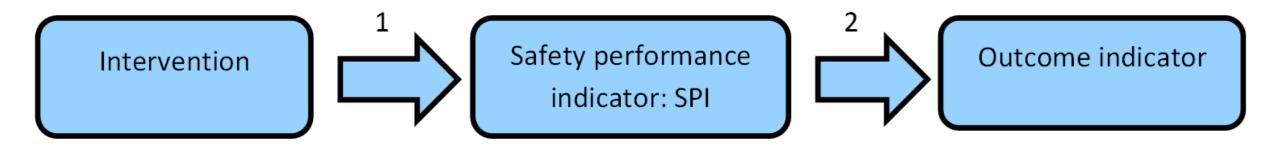
- Provide more complete picture of the road safety level
- Able to highlight the emergence of developing problems at an early stage
- Provide a means for monitoring, assessing and evaluating the effectiveness of safety actions applied
- Utilize qualitative and quantitative information to help determine a program's success in achieving its objectives
 - Able to reflect unsafe operational conditions
 - More general than direct outputs of specific safety interventions





Interventions, intermediate and final outcome

The relationship between Intervention, Safety Performance and Final Outcome indicators

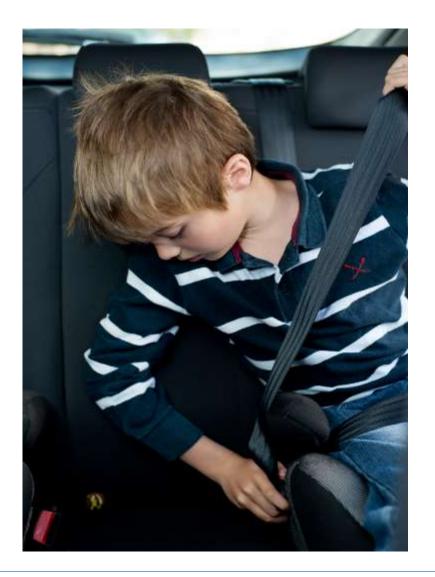




Road Safety Performance Indicators – examples (1/2)

Road User Behaviour

- Speed: mean speed and speed variance, speed limit violations
- Percentage of seat belts, child restraints and helmets' use
- Incidence/prevalence of drinking and driving
- Incidence/prevalence of mobile phone use/texting
- Failure to stop or yield at junctions or at pedestrian crossings
- Inadequate headways close following
- Use of reflective devices for cyclists and pedestrians
- Use of pedestrian crossing facilities by pedestrians





Road Safety Performance Indicators - examples (2/2)

Roads and vehicles

- Percentage of road network not meeting safety design standards
- Pavement friction on wet road surfaces
- Percentage of new cars with the top star rating according to NCAP
- Percentage of technically defective vehicles

Post-crash care

- EMS response time
- Quality of trauma care
- Number of hospital beds per population



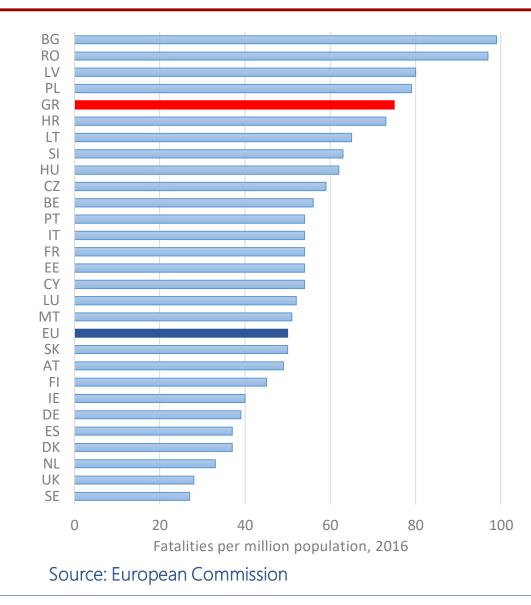


II. The Greek experience with road safety data



Road Safety in the EU

- In 2016, about 25.500 people were killed and 135.000 were seriously injured in road accidents in the EU
- In 2016, road accident fatalities were reduced by 2% after two years of stagnation and by 19% since 2010
- The mean number of road fatalities per million population was 50 in 2016 and was reduced by 43% compared to 2007
- Only 10 countries have a better performance than the EU average





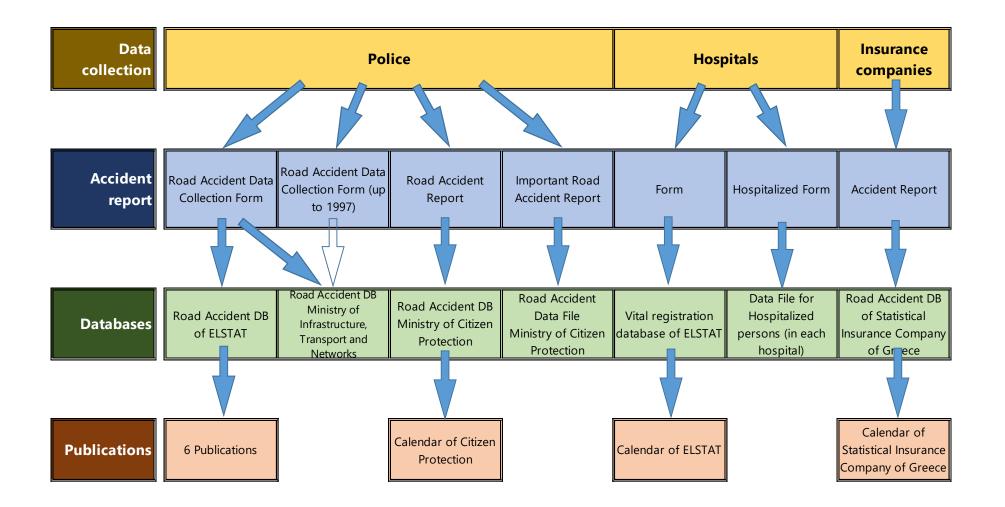
Road Safety in Greece

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Change 2006-2016
Fatalities	1.657	1.612	1.553	1.456	1.258	1.141	988	879	795	793	824	-50%
Injured persons	20.675	19.766	19.010	18.641	19.108	17.259	15.640	15.175	14.564	14.096	13.825	-33%
Accidents	16.019	15.499	15.083	14.789	15.032	13.849	12.398	12.109	11.690	11.440	11.318	-29%
Vehicles (x1000)	6.996	7.380	7.729	7.911	8.062	8.087	8.070	8.035	8.048	8.076	8.173	17%
Fatalities/million vehicles	237	218	201	184	156	141	122	109	99	98	101	-57%
Fatalities/million population	149	146	140	131	115	98	89	80	73	73	76	-49%
Source: ELSTAT												

- During the past decade, Greece was among the EU countries with the **worst road safety performance**
- However, Greece recorded an **impressive reduction in road fatalities by 46%** during the period 2009-2015
- This impressive reduction in road fatalities during economic crisis was stopped in 2015



Data Collection and Processing in Greece





- The **Police** are the first to arrive at the accident site and the last to update the related data
- Responsible to:
 - **Forward** the data to the Hellenic Statistical Authority (ELSTAT)
 - Maintain the National Data File
- Draw up an accident report by filling-in an accident data collection form





The Role of Police (2/2)

Task on accident site:

- Carry out an investigation
- Fill-in autopsy report, and part of the road accident data collection form (completed later on at the police headquarters)
- The road accident data collection forms are finalised with the necessary updates within 30 days from the day of the accident
- The source with **the most detailed data** collected at national level, in terms of variables and values collected

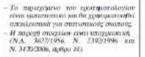




ELSTAT Database

- Detailed Disaggregate Data (1985-2012)
- Accident
- Vehicle
- Injured persons
- Road Accident Data Collection Form (DOTA)
- Updated since 1996
- Fatality Definition: Common European definition (Killed within 30 days from the day of the accident)
- Statistics
- Publication of aggregate statistics
- Provide with data international organizations (CARE, Eurostat, OECD etc.)







ΔΕΛΤΙΟ

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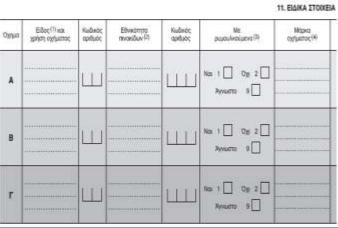
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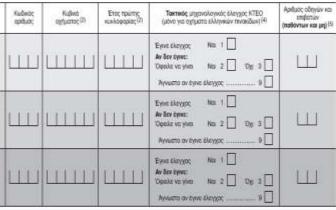
Road Accident Data Collection Form (1/3)

- Type of accident
- Type of area (inside/ outside built-up area)
- Type of road
- Time of accident (week/ time/ day/ month/ year)
- Injured persons (fatally, seriously, slightly)
- Number of vehicles involved
- Type of road surface
- Weather conditions
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- Night-lighting
- Specific characteristics of vehicles (type of vehicle, nationality, brand, cc, technical inspection, number of drivers and passengers)

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Road Accident Data Collection Form (2/3)

- Road characteristics
- Geometric road characteristics
- Type of accident
- Vehicle manoeuver type
- Injured pedestrians' position and movement
- Traffic regulation, signage and signaling
- Driver's license category and year
- Sketch

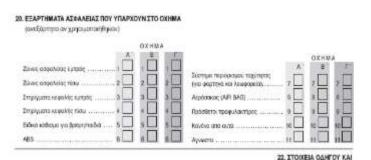
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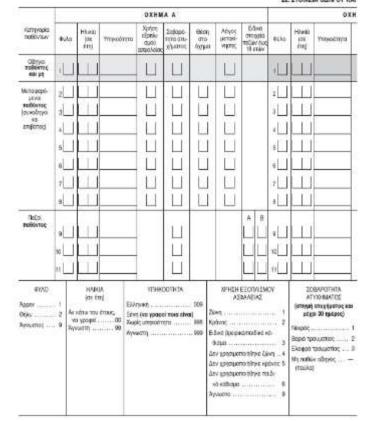
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Road Accident Data Collection Form (3/3)

- Restraints systems in vehicle
- Alcotest results
- Driver's and injured persons' information





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Data Files for Hospitalized Persons

In Hospitals

- Recording causes of hospitalization
- Recording road accident injured persons
- These files show the lowest degree of incomplete recording
- No central archive is kept, not electronic form

ELSTAT Vital Registration Database (demographic data included)

- Recording time and cause of death
- Statistics
- Publication of aggregate statistics





Comparison of Fatality Data from Different Sources

		Source		Correction Coefficient			
	ELSTAT*	Police*	Hospital*	Police-ELSTAT	Hospitals/ELSTAT	Average	
1990	1.737	1.986	2.247	249	1,29		
1991	1.790	2.013	2.246	223	1,25		
1992	1.829	1.995	2.252	166	1,23	1,20	
1993	1.830	2.008	1.986	178	1,09	1,20	
1994	1.909	2.076	2.221	167	1,16		
1995	2.043	2.149	2.435	106	1,19		
1996	2.157	2.175	2.540	18	1,18		
1997	2.105	2.141	2.333	36	1,11		
1998	2.182	2.229	2.324	47	1,07		
1999	2.116	2.181	2.226	65	1,05		
2000	2.037	2.103	2.288	66	1,12		
2001	1.880	1.911	2.035	31	1,08		
2002	1.634	1.655	1.865	21	1,14		
2003	1.605	1.613	1.794	8	1,12		
2004	1.670	1.547	1.984	-123	1,19		
2005	1.658	1.470	1.971	-188	1,19	1,15	
2006	1.657	1.493	1.851	-164	1,12	1,15	
2007	1.612	1.449	1.793	-163	1,11		
2008	1.553	1.550	1.722	-3	1,11		
2009	1.456	1.463	1.647	7	1,13		
2010	1.258	1.281	1.430	23	1,14		
2011	1.141	1.092	1.339	-49	1,17		
2012	988	976	1.191	-12	1,21		
2013	879	865	1.096	-14	1,25		
2014	795	798	1.025	3	1,29		
2015	793	796	956	3	1,21		

* up to 1995 on accident site, since 1996 within 30 days

Database of Vehicle Insurance Companies

Vehicle Insurance Companies of Greece

- Disaggregate data of road injury accidents and road accidents with only material damages
- Accident
- Driver
- Damage
- It's the unique source of data on road accidents with only material damages
- Only the accidents that are declared are recorded in the database





Traffic Data - Surveys

Data

- Motorway tolls
- Traffic Management Centre
- Other individual studies
- Previous studies
- Louis Berger Study (1979-1989)
- Annual Average Daily Traffic (AADT) of the main country's road network
- New National Survey of Origin Destination (1993)

Surveys

- In the context of the Metro Development Study (1996-2000), detailed origin - destination data were gathered for the area of Athens
- Vehicle mileage data for urban and intercity buses are available through the Athens Urban Transport Organization (OASA) and KTEL buses respectively







Traffic Measurement Technology

- Most common methods for collection of data on traffic volume:
 - permanent pneumatic tubes under the pavement (mainly in big cities)
 - tolls at motorways
 - traffic cameras (Athens and Athens Ring Road Motorway)
 - removable pneumatic tubes on the pavement surface (random – occasional measurements)



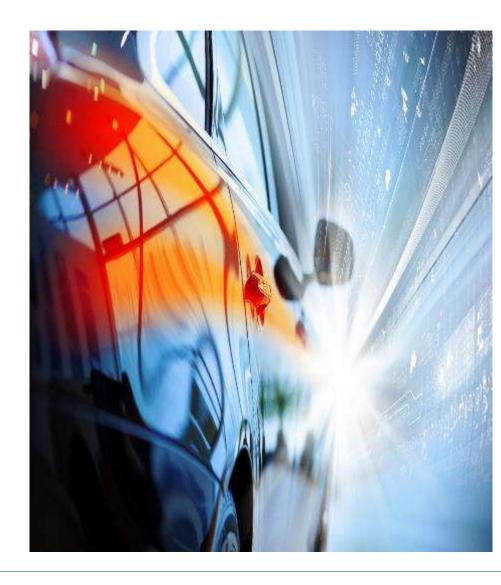


Database of Vehicles Fleet

- Disaggregate data
- Technical characteristics of vehicles
- Characteristics of registration licenses
- Data could be used in statistical road accident analyses providing useful indicators

Parameters limiting the potential of their exploitation

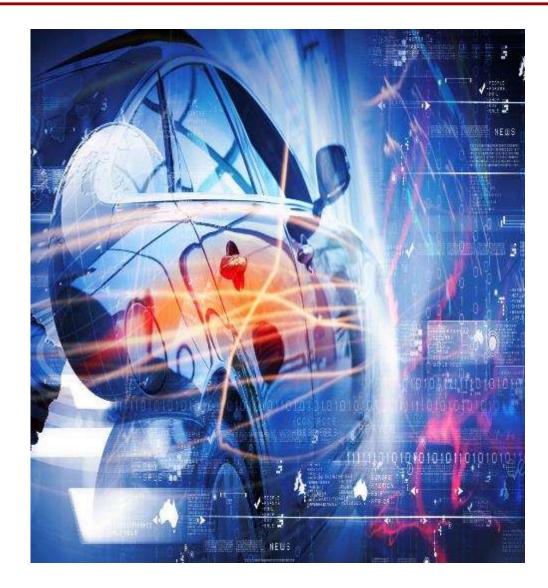
- Invalid recording of withdrawals
- No information for vehicles that are no longer in traffic
- No information on mopeds





Vehicle Fleet Statistics

- **ELSTAT** provides data regarding the vehicle fleet, derived from the Ministry of Infrastructure, Transport and Networks (MITN)
- Data are based on the issuing of **new vehicle registrations**
- The monthly report provides information, at country level, on the brand and type of the motor vehicle, as well as whether it is new or used
- The **annual data** present the breakdown of vehicles by type of vehicle and by geographical area
- The database **does not include** vehicles that move on rails, trolley busses, agricultural tractors and machinery, all motor vehicles of the armed forces, police, fire brigade, state services, diplomatic corps, foreign missions, and invalids of wars, as well as motorcycles with a cylinder capacity less than 50 cc
- Vehicle fleet data can be used as **exposure data** for the accidents and the accident involved vehicles





Safety Performance Indicators in Greece

- Data on Road Safety Performance Indicators are **not collected systematically** in Greece.
- Latest data come from an observational survey conducted by **NTUA** in 2009.
- Data on **seat-belt use, helmet use and mobile phone use** while driving were collected.





Seat-belt use rates in Greece

gr71. Seat belt use rate, Greece 2009

		Male			Female				
Driver	16-24	25-54	>55	16-24	25-54	>55			
Yes	71%	75%	71%	73%	84%	84%	77%		
No	29%	25%	29%	27%	16%	16%	23%		
Total	100%	100%	100%	100%	100%	100%	100%		

	Ins	ide built up	area	Outside built up area			
	Driver	Front seat	Rear seat	Driver	Front seat	Rear seat	
Yes	72%	68%	19%	88%	85%	28%	
No	28%	32%	81%	12%	15%	72%	
Total	100%	100%	100%	100%	100%	100%	

Vehicle type

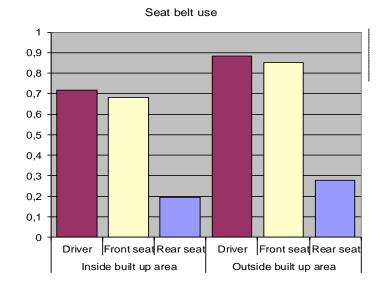
Driver	Driver Large		Total
Yes	77%	76%	77%
No	23%	24%	23%
Total	100%	100%	100%

Child restraint use

	Inside	Outside	Total
	built up area	built up area	
Yes	57%	59%	57%
No	43%	41%	43%
Total	100%	100%	100%

Issued :	November 6th, 2009
About the data :	<u>nrso-data-gr.pdf</u>
Sources:	<u>NTUA.2009</u>
Processing :	National Technical University of Athens - Road Safety Observatory

www.nrso.ntua.gr



- Around 1 out of 4 drivers do not use seat belts
- Females have higher seat belt use rates
- Only 19% of rear seat passengers use seat belt inside urban area and 28% outside urban area
- Child restrain use is 57% with no significant difference inside / outside urban area



Helmet use rates in Greece

gr72. Helmet use rate, Greece 2009

		Male			Female		Total
Driver	16-24	25-54	>55	16-24	25-54	>55	
Yes	61%	79%	67%	44%	82%	100%	75%
No	39%	21%	33%	56%	18%	0%	25%
Total	100%	100%	100%	100%	100%	100%	100%

Inside built up area Outside built up area

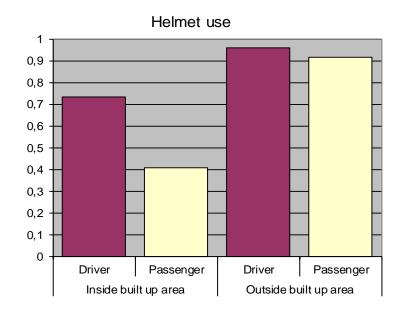
	Driver Passenger		Driver	Passenger	
Yes	73%	41%	96%	91%	
No	27%	59%	4%	9%	
Total	100%	100%	100%	100%	

Power Two Wheel

Driver	Large	Small	Total
Yes	80%	72%	75%
No	20%	28%	25%
Total	100%	100%	100%

Issued :	November 6th, 2009
About the data :	<u>nrso-data-gr.pdf</u>
Sources:	<u>NTUA,2009</u>
Processing :	National Technical University of Athens - Road Safety Observatory

www.nrso.ntua.gr



- 75% of motorcycle riders use their helmet
- Young females (16-24) have fewer helmet use rates than young males, while the opposite is the case for the other age groups
- Only 41% of motorcycle passengers use their helmet inside built-up areas
- More than 90% of riders use their helmet outside built-up areas



Mobile phone use while driving in Greece

gr73. Mobile phone use rate, Greece 2009

www.nrso.ntua.gr

		Male			Female		Total
	16-24	25-54	>55	16-24	25-54	>55	
Car driver	15%	9%	4%	16%	12%	1%	9%
PTW driver		2%	2%	12%	3%	0%	2%

Inside built up area Outside built up area

Car driver	11%	6%
PTW driver	2%	2%

	Large	Small	Total
Car driver	9%	10%	9%
PTW driver	2%	3%	2%

	Mobi	ile use	
0,12			
0,1 -			
0,08 +			Car driver
0,06 +			PTW d river
0,04 -		_	
0,02 -		_	
0 <u> </u>			
	built up rea	Outside bu up area	ilt

Issued :	November 6th, 2009
About the data	: <u>nrso-data-gr.pdf</u>
Sources:	<u>NTUA.2009</u>
Processing :	National Technical University of Athens - Road Safety Observatory

- Mobile phone use rate is increased for young car drivers (16 - 24)
- Mobile phone use rate is increased inside built-up area
- PTW riders present very low mobile phone use rates, except for young females (12%)

III. The SafeFITS Model



Objective

- To develop a macroscopic road safety decision making tool that will assist governments and decision makers, both in developed and developing countries, to decide on the most appropriate road safety policies and measures in order to achieve tangible results.
- Based on work carried out in the framework of the "Safe Future Inland Transport Systems (SafeFITS)" project of the United Nations Economic Commission for Europe (UNECE), financed by the International Road Union (IRU).





Conceptual Framework

Based on the five pillars of WHO Global Plan of Action (WHO, 2011) and an improved version of the SUNflower pyramid (2002):

SafeFITS layers

- 1. Economy and Management
- 2. Transport Demand and Exposure
- 3. Road Safety Measures
- 4. Road Safety Performance Indicators
- 5. Fatalities and Injuries

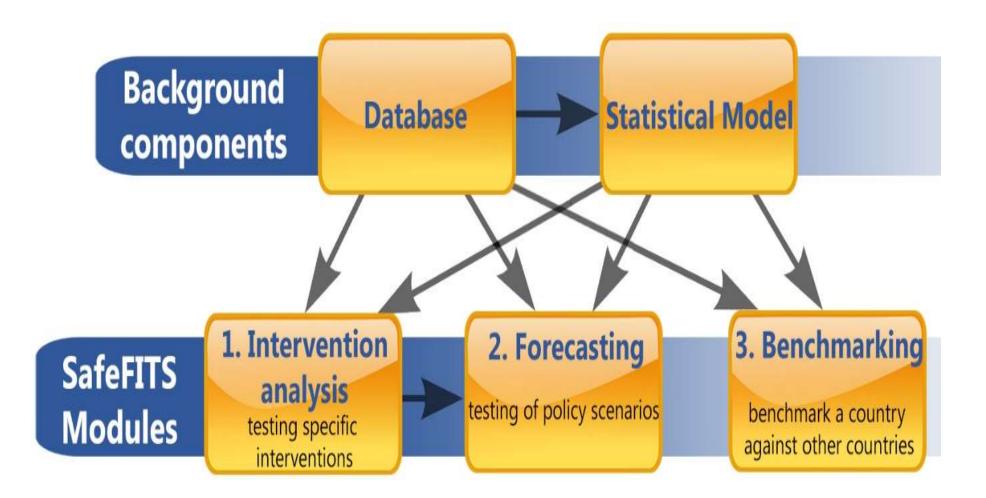
SafeFITS pillars

- 1. Road Safety Management
- 2. Road Infrastructure
- 3. Vehicle
- 4. User
- 5. Post-Crash Services

				PILLARS		
		1. Road Safety Management	2. Road Infrastructure	3. Vehicle	4. User	5. Post-Crash Services
	1. Economy & Management	Economic Deve- lopments, Strategy & Targets, Regu- latory framework (compliance with UN regulations)	Existence of motorways, of non-paved roads, of road tunnels, Existence of guidelines (for design, RSA etc.), Legislation on speeding	Number of regi- stered vehicles, Vehicle age, Technical inspe- ction legislation (maintenance, roadworthiness, overweight, ADR)	Requirements & regulations on drivers' licensing, Drivers' training, Medical exams of drivers, Legislation on alcohol / use of seatbelts / use of helmets	Trauma management sector level of development Number of hospitals / doctors / Intensive Care (IC) beds per population
	2. Transport demand & exposure	Transport Modal Split (road/rail, passerger/insight, private/public), Share of urban areas, Weather conditions	Exposure with regard to road type, Length of road per road type, Share of Motorway length out of the total road network, Number of railway level crossings	Exposure with regard to vehicle type, Share of PTW, HGV / carriage of dangerous goods vehicles in the vehicle fleet	Exposure with regard to age & gender	
LAYERS	3 Road Safety Measures	Assessment of measures, Data collection & analysis, International comparisons, Vehicle taxation, Road pricing	Treatment of High Risk Sites, Road Safety Audits, Tunnel Road Safety Manage- ment, Improve- ment of signage, Installation of road restraint systems, Lighting, Speed limits in urban areas Traffic Caliming	Renewal rate of wehicle fleet, Measures for second-hand vehicles, Vehicle related roadside controls, Automated driving	Enforcement, campaigns, Road safety education, Training	e-cail, First aid training, Existence & organisation of trauma centers
	4. Road Safety Performance Indicators	Safety targets, stakeholdeni' involvement, detail of analysis for intervention selection, economic evaluation	Number of RSAs conducted, Percentage of High Risk Sites treated	Global NCAP score, Mean age of the vehicle fleet per vehicle type, Existence of safety equipment, e-safety	Speeding / Drink & drive infringe- monts, Seatbelts use, Helmets use, Driver distraction, Driver fatigue	Emergency response time, Type of field freatment, Speed of treatment in hospital, Number of ambulances pe population, Number of good samaritanians per population
	5. Fatalities & Injuries	Fatalities / injuries per million inhabitants, fatalities / injuries per million passenger cars, fatalities / injuries per 10 billion passenger-km	Fatalities / injuries in motorways, in 2-lane rural roads, in urban roads	Share of motorcycle fatalities out of the total fatalities	Share of pedestrian / bicyclist / motorcyclist fatalities out of the total fatalities, drink-driving related fatalities	Death rate, Hospitalization in IC Unit, Total length of hospitalization



Overview of the SafeFITS model





Architecture of the SafeFITS Database

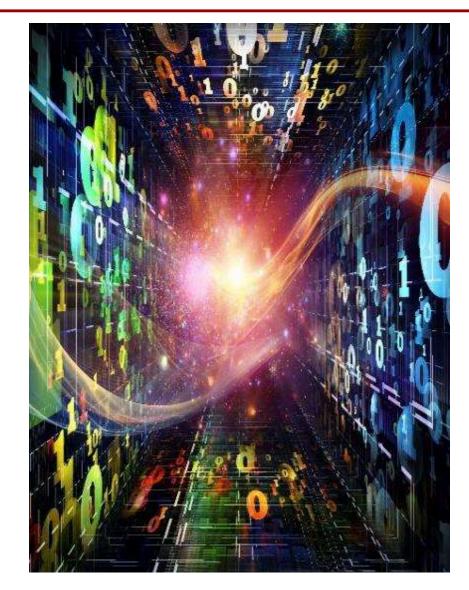
- Data from the five layers and the five pillars
- International databases explored: WHO, UN, IRF, OECD, etc.
- Data for **130 countries** with population higher than 2,8 million inhabitants
- Data refer to 2013 or latest available year





SafeFITS Database Overview

- Wherever data for 2013 were not available, the **latest data available** were used.
- The missing values of each indicator of the countries were filled with **the mean value** of the indicator in their regions.
- The respective information of each variable is **properly represented** in the database for the statistical process.
- Data for most variables were available for almost all countries.
- Low data availability is observed for few variables regarding:
 - the restraint use rates
 - the percentage of fatalities attributed to alcohol
 - the distribution of fatalities by road user type
 - transport demand and exposure indicators



Data Analysis Methodology

- **Two-step approach** of statistical modeling:
 - Estimation of **composite variables** (factor analysis) in order to take into account as many indicators as possible of each layer
 - Correlating road safety outcomes with indicators through composite variables by developing a regression model with explicit consideration of the time dimension

Model specification

 $\begin{array}{l} Log(Fatalities \ per \ Population)_{ti} = A_i + Log(Fatalities \ per \\ Population)_{(t-\tau)} + B_i \ ^* \ ^GDP_{ti} \ + K_i \ ^* \ ^[Economy \ \& \ Management]_{ti} \ + Li \\ ^* \ ^[Transport \ demand \ \& \ Exposure]_{ti} \ + M_i \ ^* \ ^[Road \ Safety \ Measures]_{ti} \\ + \ N_i \ ^* \ ^[RSPI]_{ti} \ + \ \varepsilon_i \end{array}$





[Comp_EM] = -0.250 (EM2_lt15yo) + 0.229 (EM3_gt65yo) + 0.228 (EM4_UrbanPop) + 0.224 (EM7_NationalStrategy) + 0.221 (EM8_NationalStrategyFunded) + 0.222 (EM9_FatalityTargets) Indicator loadings and coefficients on the estimated factor (composite variable) on Economy and Management

	Comp	onent
	Loadings	Score coefficients
EM1_Popdensity	,091	,029
EM2_lt15yo	-,778	-,250
EM3_gt65yo	,714	,229
EM4_UrbanPop	,709	,228
EM5_LeadAgency	,284	,091
EM6_LeadAgencyFunded	,226	,073
EM7_NationalStrategy	,697	,224
EM8_NationalStrategyFunded	,626	,201
EM9_FatalityTargets	,692	,222



Calculation of composite variables – Transport Demand and Exposure

[[Comp_TE] = 0.161 (TE1_RoadNetworkDensity) + 0.149 (TE2_Motorways) + 0.238 (TE3_PavedRoads) + 0.272 (TE4_VehiclesPerPop) + 0.267 (TE5_PassCars) -0.221 (TE7_PTW) - 0.117 (TE10_PassengerFreight) Indicator loadings and coefficients on the estimated factor (composite variable) on Transport Demand and Exposure

	Comp	oonent
	Loadings	Score coefficients
TE1_RoadNetworkDensity	,497	,161
TE2_Motorways	,460	,149
TE3_PavedRoads	,734	,238
TE4_VehiclesPerPop	,839	,272
TE5_PassCars	,825	,267
TE6_VansLorries	-,132	-,043
TE7_PTW	-,681	-,221
TE8_Vehkm_Total	,269	,087
TE9_RailRoad	,136	,044
TE10_PassengerFreight	-,360	-,117



Calculation of composite variables - Measures

 $[Comp_ME] = 0.069(ME2_ADR) +$ 0.045(ME4 SpeedLimits urban) + 0.064(ME6 SpeedLimits motorways) + 0.088(ME7 VehStand seatbelts) + 0.091(ME8_VehStand_SeatbeltAnchorages) + 0.092(ME9_VehStand_FrontImpact) + 0.091(ME10 VehStand SideImpact) + 0.090(ME11 VehStand ESC) + 0.087(ME12 VehStand PedProtection) + 0.090(ME13 VehStand ChildSeats) + 0.068(ME15_BAClimits) + 0.068(ME16_BAClimits_young) + 0.065(ME17 BAClimits commercial) + 0.057(ME19 SeatBeltLaw all) + 0.063(ME20 ChildRestraintLaw) + 0.034(ME22 HelmetFastened) + 0.038(ME23 HelmetStand) + 0.038(ME24 MobileLaw) + 0.035(ME25 MobileLaw handheld) + 0.038(ME27_PenaltyPointSyst) + 0.040(ME29_EmergTrain_nurses)



Eleonora Papadimitriou

dicator loadings and coefficients on the es	stimated factor (composite var	Table) on Measures
	Component	
	Loadings	Score coefficients
ME1_RSA	,245	,025
ME2_ADR	,681	,069
ME3_SpeedLaw	,229	,023
ME4_SpeedLimits_urban	,443	,045
ME5_SpeedLimits_rural	,200	,020
ME6_SpeedLimits_motorways	,634	,064
ME7_VehStand_seatbelts	,877	,088
ME8_VehStand_SeatbeltAnchorages	,906	,091
ME9_VehStand_FrontImpact	,908	,092
ME10_VehStand_SideImpact	,904	,091
ME11_VehStand_ESC	,891	,090
ME12_VehStand_PedProtection	,862	,087
ME13_VehStand_ChildSeats	,896	,090
ME14_DrinkDrivingLaw	,126	,013
ME15_BAClimits	,670	,068
ME16_BAClimits_young	,670	,068
ME17_BAClimits_commercial	,645	,065
ME18_SeatBeltLaw	,297	,030
ME19_SeatBeltLaw_all	,570	,057
ME20_ChildRestraintLaw	,628	,063
ME21_HelmetLaw	,236	,024
ME22_HelmetFastened	,334	,034
ME23_HelmetStand	,379	,038
ME24_MobileLaw	,375	,038
ME25_MobileLaw_handheld	,350	,035
ME26_MobileLaw_handsfree	-,295	-,030
ME27_PenaltyPointSyst	,378	,038
ME28_EmergTrain_doctors	,178	,018
ME29_EmergTrain_nurses	,399	,040

Indicator loadings and coefficients on the estimated factor (composite variable) on Measures

Calculation of composite variables - SPIs

[Comp_PI] = 0.144 (PI1_SeatBeltLaw_enf) + 0.155 (PI2_DrinkDrivingLaw_enf) + 0.152 (PI3_SpeedLaw_enf) + 0.160 (PI4_HelmetLaw_enf) + 0.155 (PI5_SeatBelt_rates_front) + 0.146 (PI6_SeatBelt_rates_rear) + 0.150 (PI7_Helmet_rates_driver) + 0.127 (PI8_SI_ambulance) + 0.116 (PI9_HospitalBeds) Indicator loadings and coefficients on the estimated factor (composite variable) on SPIs

	Compc	onent
	Loadings	Score coefficients
PI1_SeatBeltLaw_enf	,756	,144
PI2_DrinkDrivingLaw_enf	,812	,155
PI3_SpeedLaw_enf	,795	,152
PI4_HelmetLaw_enf	,837	,160
PI5_SeatBelt_rates_front	,811	,155
PI6_SeatBelt_rates_rear	,766	,146
PI7_Helmet_rates_driver	,784	,150
PI8_SI_ambulance	,667	,127
PI9_HospitalBeds	,607	,116



Final Statistical Model

The **optimal performing model** for the purposes of SafeFITS

- **Dependent variable** is the logarithm of the fatality rate per population for 2013
- The main **explanatory variables** are the respective logarithm of fatality rate in 2010 and the respective logarithm of GNI per capita for 2013
- Four **composite** variables: the economy & management, the transport demand and exposure, the measures, and the SPIs

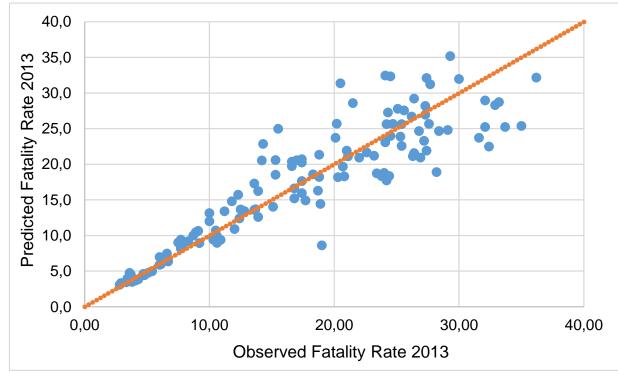
			95% Confide	ence Interval	Нурс	othesis Tes	t
Parameter	В	Std. Error	Lower	Upper	Wald Chi- Square	df	p-value
(Intercept)	1,694	,2737	1,157	2,230	38,291	1	<,001
Comp_ME	-,135	,0646	-,261	-,008	4,358	1	,037
Comp_TE	-,007	,0028	-,013	-,002	7,230	1	,007
Comp_PI	-,007	,0030	-,013	-,001	5,652	1	,017
Comp_EM	,007	,0051	-,003	,017	2,009	1	,156
LNFestim_2010	,769	,0462	,678	,859	276,322	1	<,001
LNGNI_2013	-,091	,0314	-,153	-,030	8,402	1	,004
(Scale)	,038						
Likelihood Ratio	1379,00						
df	6						
p-value	<,001						



Statistical Model Assessment

In order to **assess** the model, a comparison of the observed and the predicted values was carried out:

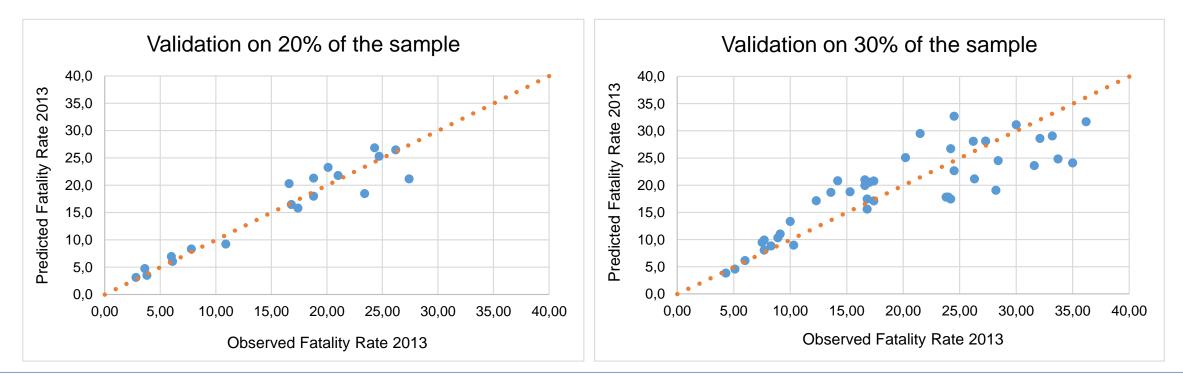
- The mean absolute prediction error is estimated at 2.7 fatalities per population, whereas the mean percentage prediction error is estimated at 15% of the observed value.
- The model is of very satisfactory performance as regards the good performing countries (low fatality rate) and of quite satisfactory performance as regards the medium performing countries.



Statistical Model Validation

In order to validate the model, a cross-validation was carried out with two subsets:

- 80% of the sample was used to develop (fit) the model, and then the model was implemented to predict the fatality rate for 2013 of the 20% of the sample not used
- 70% of the sample was used to develop (fit) the model, and then the model was implemented to predict the fatality rate for 2013 of the 30% of the sample not used

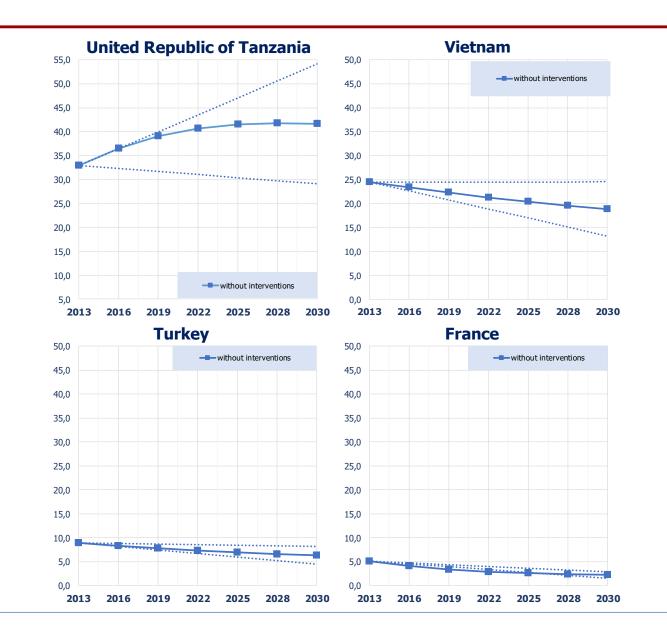




Model Application

Examples of statistical model application:

- one low performance country
- two middle performance countries
- one high performance country

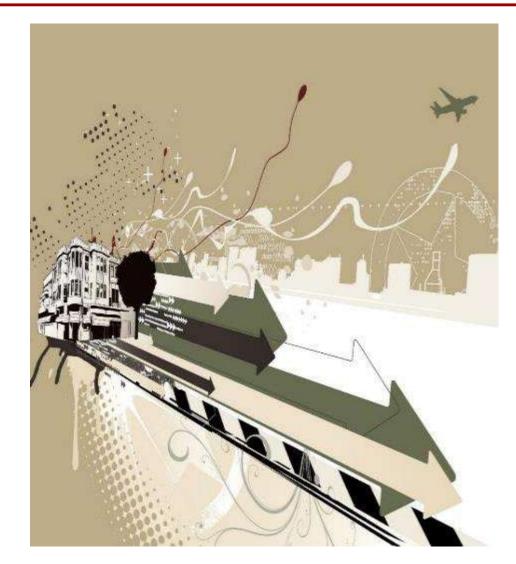




SafeFITS Model Demonstration - Albania

The overall model implementation includes 3 distinct steps:

- Step 1 Countries Benchmark
- Step 2 Forecast with no new interventions
- Step 3 Forecast with interventions





Step 1: Benchmark

<u>User input:</u>

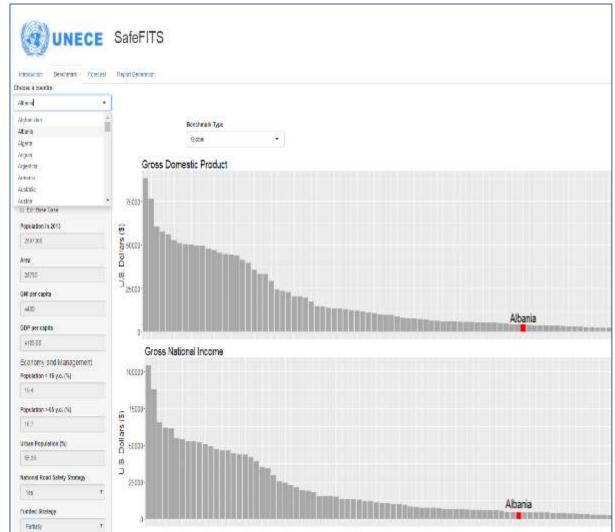
The user has the option to select a country, the category of indicators to be displayed and benchmark type.

<u>Analysis:</u>

The outputs are based only on the database and no statistical modeling implementation is taking place.

Benchmarking results:

- Reactive diagrams presenting a benchmark of the base year situation for a selected category
- Benchmarking takes place on a global and regional scale





Step 2: Forecast with no new interventions

<u>User input:</u>

The user selects the intervention year and the benchmark type

<u>Analysis:</u>

The SafeFITS model is implemented for the year of reference on the basis of GNI and demographic indicators projection

Forecasting results:

The trend for the variable fatalities per population through the years (2013-2031), alongside with the confidence intervals

Benchmarking results:

- Overall ranking
- Regional ranking

at a		SafeFl									
eventions Year	(Sarra		Berchmuni Type		1120000000						
612.			Skoll Second		Selected Contry Albania			Reset to Defe	κ£		
Intervention Group 1	Invervi	ention Group 2	Invervention Group 3			Variable	Base Case	intervention Set f	Intervention Set 2	Intervention Set 2	
Economy and	Econom		Economy and			Filialities	0.05	17 M	17.05	17.05	
Wanagement	Vanege		Venagement			Difference from Base Case		0.00	0.01	1.00	
National Road Sativly Stratingy	NUTIONAL STOTAGE	i Road Salaty 9	Hadarral Road Safwhy Strategy			Percente Offensice	~	0.00	0.00	10	
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145	0.57		(6)	10-							
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Paved Reads (%)	Pared R	Roads (%)	Paved Roads (%)	F	atalities - Current		Ciliere input	Entrance on the	Engineeri oo c	Capital and Carly	
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Naticle per Population	Vehicles	per Population	Whicle per Population	<u>(</u> 87)							
153.85	153,65		153.65								



Step 3: Forecast with interventions

<u>User input:</u>

The user selects the intervention year and then 3 different sets of interventions

Analysis:

The SafeFITS model is implemented for the forecasting year on the basis of the intervention set selected

Forecasting results:

The trend for the variable fatalities per population through the years (2013-2031), on which the forecast for the intervention year is also identifiable.

Benchmarking results:

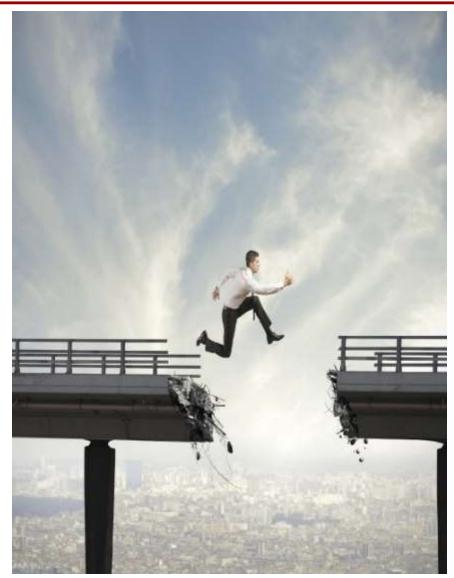
- Overall ranking
- Regional ranking

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ł	interventions Year		Benchmark Type	Selected Clur	8					
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	Intervention Group 1	Invervention Group 2	invervention Group 3		Variable	Base Case	Intervention Set 1	intervention Set 2	Intervention Set 3	
	Economy and	Economy and	Economy and		Fatalizes	17.05	16.23	56	\$6,72	
	Management.	Management	Management		Difference from Base Case	9 3 3	-881	4.6	-0.33	
	National Road Safety Strategy	National Road Safety Strategy	National Road Safety Strategy		Parasile (Kevera	₿£	4π	.278	4,14	
	Yes +	Yes +	Yes +	25						
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Model limitations and future improvements

- The SafeFITS model was developed on the basis of the most recent and good quality data available internationally, and by means of rigorous statistical methods. However, data and analysis methods always have some limitations.
- Data are primarily **directed at vehicle occupants** and thus, effects on road safety outcomes of VRUs may not be captured.
- The effects of interventions may not reflect the unique contribution of each separate intervention. It is strongly recommended to **test combinations of "similar" interventions** (e.g. several vehicle standards, several types of enforcement or safety equipment use rates etc.)
- The factor analysis procedure **does not assume or indicate that a direct causal relationship exists**.
- The **calibration with new data** will be the ultimate way to fully assess the performance of the model.





Benefits for the Policy Makers

- The first global road safety model to be used for policy support
 - Global assessments (i.e. monitoring the global progress towards the UN road safety targets)
 - Individual country assessments of various policy scenarios
- A framework which enhances the understanding of road safety causalities, as well as of the related difficulties.
- Full exploitation of the currently available global data, and use of rigorous analysis techniques, to **serve key purposes in road safety policy analysis**: benchmarking, forecasting.
- An important step for **monitoring**, evidence-base and systems approach to be integrated in decision-making.



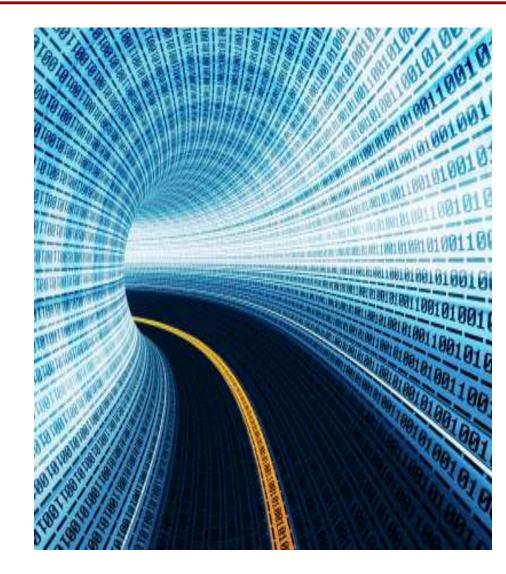


IV. Road Safety Data in Albania



Data for Albania in SafeFITS Database

- In the SafeFITS model data for 2013 have been used.
- Missing data mainly for exposure and safety performance indicators
- For the missing values, the latest available data were used.
- Some of the latest available data in international databases may not refer to a recent year (e.g. latest data for road network length in Albania from 2002).
- Full time series of fatality data exist in international databases.
- Reported and WHO estimated number of fatalities for Albania differ significantly.





Data for Albania – Economy and Management

a/a	Variable	Source of data	Data	Year of data
1	Population in thousands (2013)	World Bank Database	2.897.366	2013
2	Area (sq km) (2013 or latest available year)	World Bank Database	28.750	2013
3	Gross national income per capita in US \$ (2013 or latest available year)	World Bank Database	4,48	2013
4	Population density	World Bank Database	100,8	2013
5	Percentage of population under 15 years old (2013 or latest available year)	World Bank Database	19,40	2013
6	Percentage of population over 65 years old (2013 or latest available year)	World Bank Database	16,70	2013
7	Percentage of urban population (2013 or latest available year)	World Bank Database	55,38	2013
8	Existence of lead agency	WHO, 2015	Yes	2013
9	The lead agency is funded	WHO, 2015	Yes	2013
10	Existence of national road safety strategy (2013)	WHO, 2015	Yes	2013
11	The strategy is funded (2013)	WHO, 2015	Partially	2013
12	Existence of fatality reduction target (2013)	WHO, 2015	Yes	2013



Data for Albania – Transport Demand and Exposure

a/a	Variable	Source of data	Data	Year of data
13	Length of road network (kms)	IRF, 2015	18.000	2002
14	Road network density (2013 or latest available year)	IRF, 2015	0,63	2002
15	Percentage of motorways of total road network (2013 or latest available year)	IRF, 2015	0,00	2002
16	Percentage of paved roads of total road network (2013 or latest available year)	IRF, 2015	39,00	2002
17	Total number of vehicles in use (excl. 2-wheelers)	IRF, 2015	445.173	2013
18	Total number of vehicles in use (incl. 2-wheelers)	IRF, 2015	471.837	2013
19	Total number of vehicles in use per population (2013 or latest available year)	IRF, 2015	0,154	2013
20	Number of passenger cars (2013 or latest available year)	IRF, 2015	341.691	2013
21	Number of buses/motorcoaches (2013 or latest available year)	IRF, 2015	5.676	2013
22	Number of vans and lorries (2013 or latest available year)	IRF, 2015	71.142	2013
23	Number of power two wheelers (2013 or latest available year)	IRF, 2015	26.664	2013
24	Ratio of passenger cars in use of total vehicle fleet (2013 or latest available year)		0,72	2013
25	Ratio of vans and lorries in use of total vehicle fleet (2013 or latest available year)		0,15	2013
26	Ratio of powered two wheelers in use of total vehicle fleet (2013 or latest available year)		0,06	2013
27	Vehicle kilometres - total in millions (2013 or latest available year)	IRF, 2015	n/a	
28	Passenger kilometres - total in millions (2013 or latest available year)	IRF, 2015	7.918,0	2011
29	Passenger kilometres - road in millions (2013 or latest available year)	IRF, 2015	7.900,0	2011
30	Passenger kilometres - rail in millions (2013 or latest available year)	IRF, 2015	15,9	2012
31	Tonne kilometres - total in millions (2013 or latest available year)	IRF, 2015	n/a	
32	Ratio of rail per road passenger transport (2013 or latest available year)		0,0023	2011
33	Ratio of passenger per freight transport (2013 or latest available year)		n/a	



Data for Albania – Road Safety Measures

a/a	Variable	Source of data	Data	Year of data
34	Road safety audits on new roads	WHO, 2015	Yes	2013
35	Existence of ADR law	UNECE database	Yes	2013
36	Existence of speed law (2013)	WHO, 2015	Yes	2013
37	Maximum speed limits on urban roads (2013)	WHO, 2015	40 km/h	2013
38	Maximum speed limits on rural roads (2013)	WHO, 2015	80 km/h	2013
39	Maximum speed limits on motorways (2013)	WHO, 2015	110 km/h	2013
40	Vehicle standards-seat belts (2013)	WHO, 2015	No	2013
41	Vehicle standards-seat belt anchorages (2013)	WHO, 2015	No	2013
42	Vehicle standards-frontal impact (2013)	WHO, 2015	No	2013
43	Vehicle standards-side impact (2013)	WHO, 2015	No	2013
44	Vehicle standards-Electronic Stability Control (2013)	WHO, 2015	No	2013
45	Vehicle standards-Pedestrian Protection (2013)	WHO, 2015	No	2013
46	Vehicle standards-child seats (2013)	WHO, 2015	No	2013
47	Existence of drink-driving law (2013)	WHO, 2015	Yes	2013
48	BAC limits less than or equal to 0.05 g/dl (2013)	WHO, 2015	Yes	2013
49	BAC limits lower than or equal to 0.05g/dl for young/novice drivers (2013)	WHO, 2015	Yes	2013
50	BAC limits lower than or equal to 0.05g/dl for commercial drivers (2013)	WHO, 2015	Yes	2013
51	Existence of seat-belt law (2013)	WHO, 2015	Yes	2013
52	The seat-belt law applies to all occupants (2013)	WHO, 2015	Yes	2013
53	Existence of national child restraints law (2013)	WHO, 2015	Yes	2013
54	Existence of helmet law (2013)	WHO, 2015	Yes	2013
55	Law requires helmet to be fastened (2013)	WHO, 2015	No	2013
56	Law requires specific helmet standards (2013)	WHO, 2015	Yes	2013
57	Existence of national law on mobile phone use while driving (2013)	WHO, 2015	Yes	2013
58	The law applies to hand-held phones (2013)	WHO, 2015	Yes	2013
59	The law applies to hands-free phones (2013)	WHO, 2015	No	2013
60	Demerit/Penalty Point System in place (2010)	WHO, 2013	Yes	2010
61	Training in emergency medicine for doctors (2013)	WHO, 2015	No	2013
62	Training in emergency medicine for nurses (2013)	WHO, 2015	Yes	2013



Data for Albania – Safety Performance Indicators

a/a	Variable	Source of data	Data	Year of data
63	Effectiveness of seat-belt law enforcement (2013)	WHO, 2015	7	2013
64	Effectiveness of drink-driving law enforcement (2013)	WHO, 2015	5	2013
65	Effectiveness of speed law enforcement (2013)	WHO, 2015	6	2013
66	Effectiveness of helmet law enforcement (2013)	WHO, 2015	4	2013
67	Seat-belt wearing rate in fronts seats (2013 or latest available year)	WHO, 2015	16,00	2013
68	Seat-belt wearing rate in rear seats (2013 or latest available year)	WHO, 2015	n/a	
69	Helmet wearing rate for drivers (2013 or latest available year)	WHO, 2015	n/a	
70	Estimated % seriously injured patients transported by ambulance (2013)	WHO, 2015	11%-49%	2013
71	Number of hospital beds per 1,000 population (2012 or latest available year)	Wold Bank Database	2,60	2012



Data for Albania – Fatalities and Injuries

a/a	Variable	Source of data	Data	Year of data
72	Fatality rate per 100,000 population (2013)	IRF, 2015	10,18	2013
73	Fatality rate per 100,000 population (2010)	IRF, 2015	12,08	2013
78	Estimated Fatality rate per 100,000 population (2013)	WHO, 2015	15,10	2013
79	Estimated Fatality rate per 100,000 population (2010)	WHO, 2013	12,70	2013
85	Share of 4-wheelers fatalities (%) (2013)	WHO, 2015	50,8	2013
86	Share of 2-wheelers fatalities (%) (2013)	WHO, 2015	13,2	2013
87	Share of cyclist fatalities (%) (2013)	WHO, 2015	4,1	2013
88	Share of pedestrian fatalities (%) (2013)	WHO, 2015	31,2	2013
89	Alcohol related fatalities (%) (2013)	WHO, 2015	6,1	2013
90	Share of male fatalities (%) (2013)	WHO, 2015	80	2013
91	Share of female fatalities (%) (2013)	WHO, 2015	20	2013
92	Number of fatalities-IRF	IRF, 2015	295	2013
93	Reported number of fatalities-WHO	WHO, 2015	295	2013
94	Estimated number of fatalities-WHO	WHO, 2015	478	2013



Conclusions

- A variety of data is needed to support road safety decision making
- There are still many challenges on data availability and quality in most countries
- SafeFITS is the first global road safety model making full exploitation of the existing data - however the quality of the data poses limitations to the usability of the model
- The collection of more, more recent and more accurate data will allow to further improve SafeFITS
- Case studies in selected countries will allow to demonstrate the potential for model improvement and the importance of the quality of the data







Needs and Uses of Road Safety Data within the UN SafeFITS Model



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> Albania Road Safety Performance Review Capacity Building Workshop Durres, Albania, 6-7 February 2018