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TRB Global Road Safety Sub-Committee ANB10
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Washington D.C.

Road Safety Data, Knowledge and Decision Support Systems Global Challenges in the Digital Era

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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.

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** (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

Road Safety Observatories and Decision Support Systems

Road Safety Observatories

- ERSO, European Road Safety Observatory
- OISEVI, Ibero-American Observatory
- African Road Safety Observatory
- IRTAD, ITF Road Traffic and Accident Group
- Dacota, EC Project – Knowledge Centre
- NRSO – NTUA Road Safety Observatory
- National Observatories

Road Safety Decision Support Systems

- SafetyCube, EU Road Safety DSS
- SafeFITS, UNECE-Global Road Safety Model
- iRAP, Road Safety ToolKit
- PRACT, CEDR
- PIARC, WRA Road Safety Manual
- US NHTSA/FHWA CMF Clearinghouse
- AustRoads Road Safety Engineering Toolkit

Road Safety Observatories

European Road Safety Observatory, EC (1/2)

The ERSO is the information system of the European Commission with harmonised specialist information on **road safety practices and policy** in European countries.
ERSO and CARE are Managed by the European Commission – DG Move – Road Safety Unit (EC DG Move),

- Cooperation with **Eurostat** (EC Statistical Office)
- Assisted by the Road Accident Statistics National Experts Group (**CARE Experts Group**)

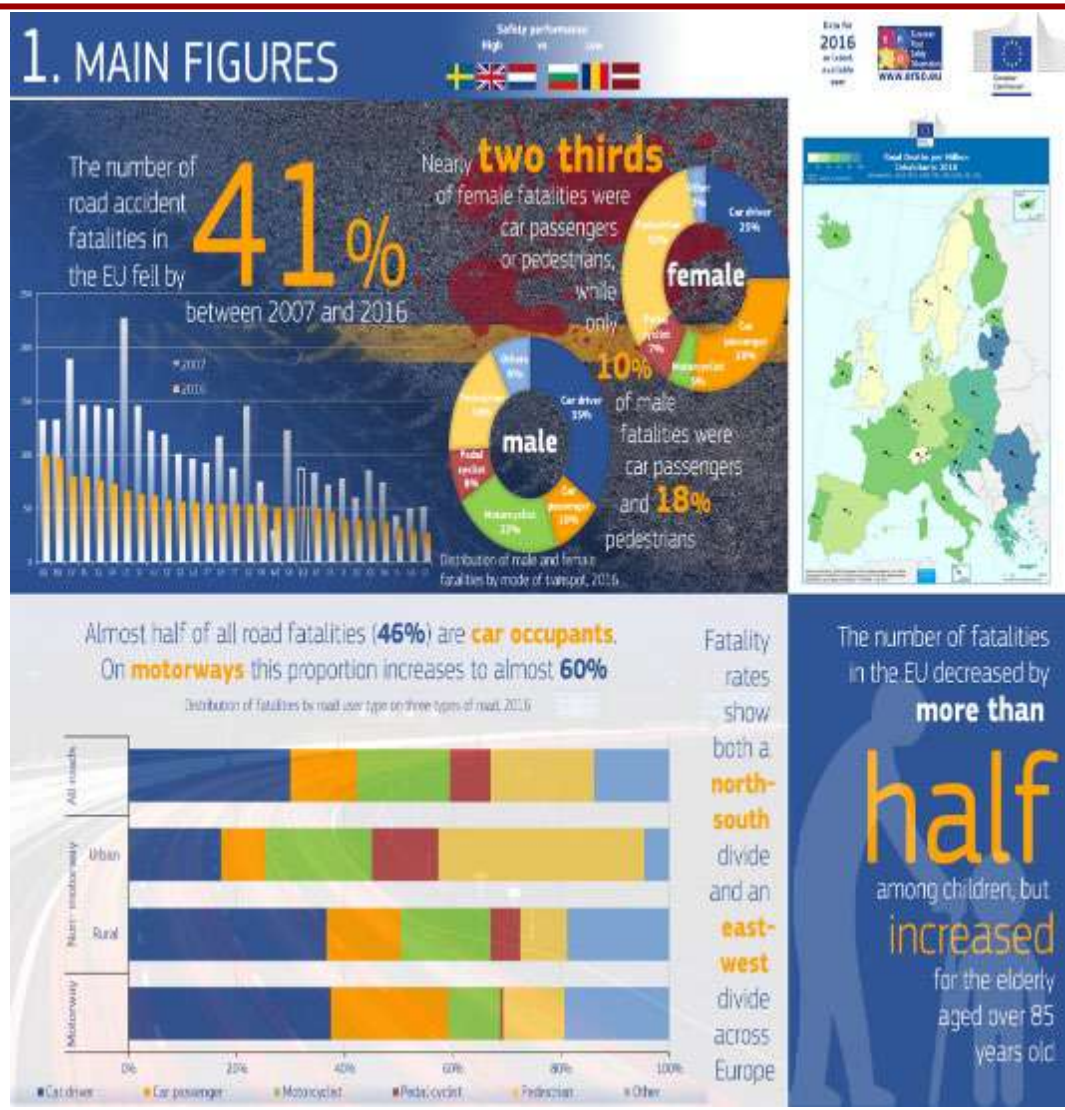
Methodology

- Definition of **common protocols** for data collection
- Availability, systematic collection and analyses of **data and information**
- **Presentation of the results** responding to users' needs
- **Continuity** in making all results publicly available

European Road Safety Observatory, EC (2/2)

- 22 Traffic Safety Syntheses

- Pedestrians and Cyclists	- e-Safety
- Work-related Road Safety	- Post Impact Care
- Speed & Speed Management	- Roads
- Cell Phone Use while Driving	- Speed Enforcement
- Fatigue	- Vehicle Safety
- Power Two Wheelers	- Cost-Benefit Analysis
- Novice Drivers	- Older Drivers
- Quantitative Targets	- Children
- Road Safety Management	- Serious injuries
- Driver Distraction	- Safety Ratings
- Integration of road safety in other policy areas	- Alcohol



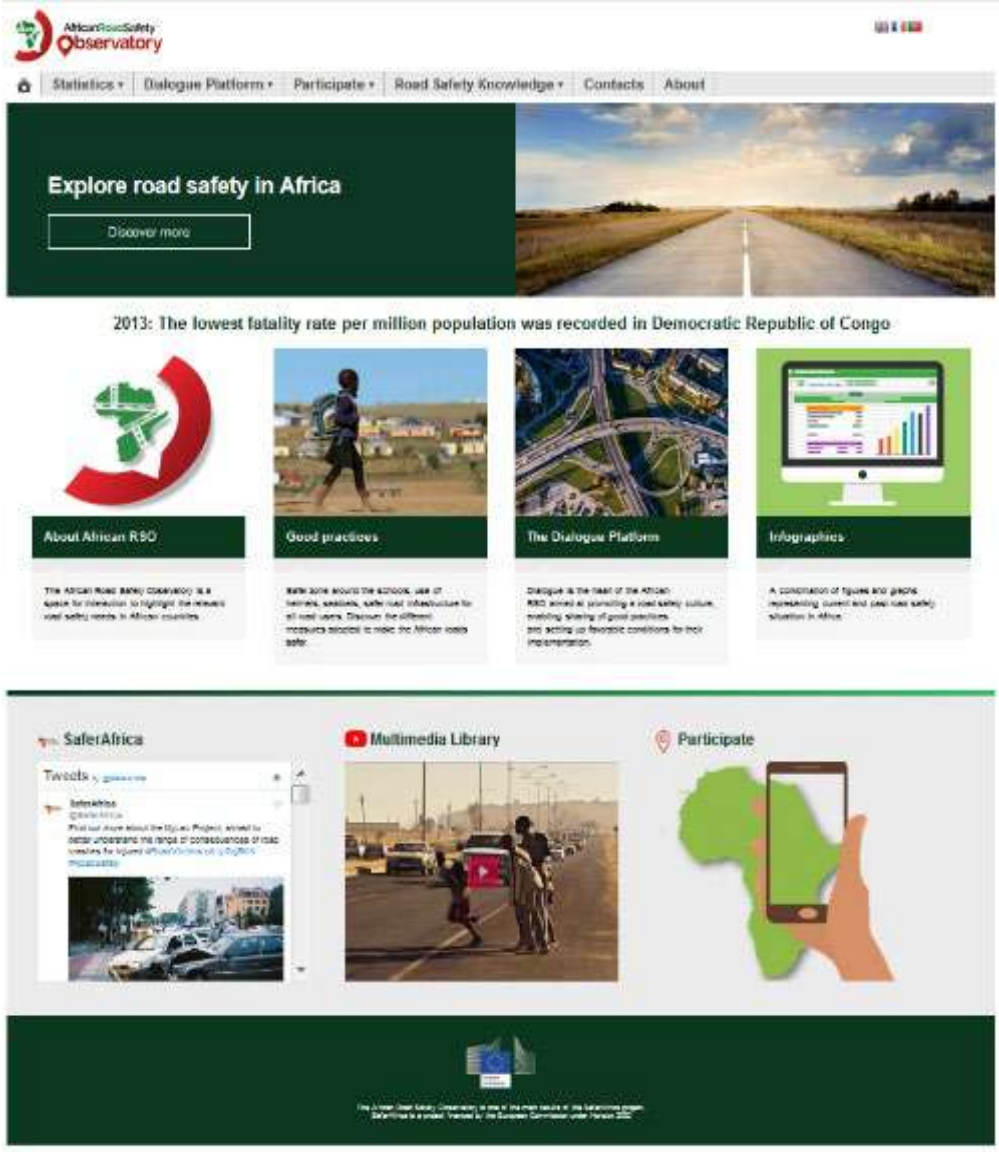
- 64 Infographics based on the above reports are available online at https://ec.europa.eu/transport/road_safety/specialist/erso_en

OISEVI, Ibero-American member countries

- The Ibero-American Road Safety Observatory **(OISEVI):** an international cooperation instrument comprising the highest road safety authorities of Ibero-American member countries.
- OISEVI conducts **critical surveillance** over national road safety policies and fosters their dissemination.
- A forum for **analyzing public policies** on road safety at the highest level of stakeholders
- Promotes **public policy formulation** for road safety, creation of National Lead Agencies or governing organizations and National Observatories.
- **Standardizes traffic data** collection, processing, analysis and dissemination.
- An **Ibero-American database** to reflect the evolution of road safety statistics and their comparability, for assessing actions.
- Promotes the participation of **different technical or financial** cooperation agencies

African Road Safety Observatory, a Horizons 2020 Project

- The African RSO aims to create **favorable conditions** and opportunities for the effective implementation of actions for road safety and traffic management in African countries
- Is being created alongside a **Dialogue Platform** between Africa and Europe (SaferAfrica project – until Sep 2019)
- **Objectives**:
  - Assess the implementation of the African Action Plan, alongside needs of stakeholders
  - Activate Twinning Programs between Africa and Europe
  - Conduct sharing of good practices, capacity-building activities and capacity reviews
- **Structure**:
  - Statistics
  - Good Practices
  - Dialogue Platform
  - Road Safety Management
  - Capacity Building
  - News



IRTAD, ITF/OECD (1/2)

- IRTAD Objectives:
  - **Exchange of information and methodologies** on safety trends and road safety policies
  - Suggest **possible improvements** to road accident and related traffic data collection and analyses.
  - **Collect accident data,** complementary to other sources
  - **Conduct data analysis** to provide advice on specific road safety issues.
  - Contribute to **international co-operation** on road accident data and its analysis.

- The IRTAD Group publishes regularly special reports on its analyses of topical data collection and methodology issues.
- IRTAD organises open Conferences

OECD

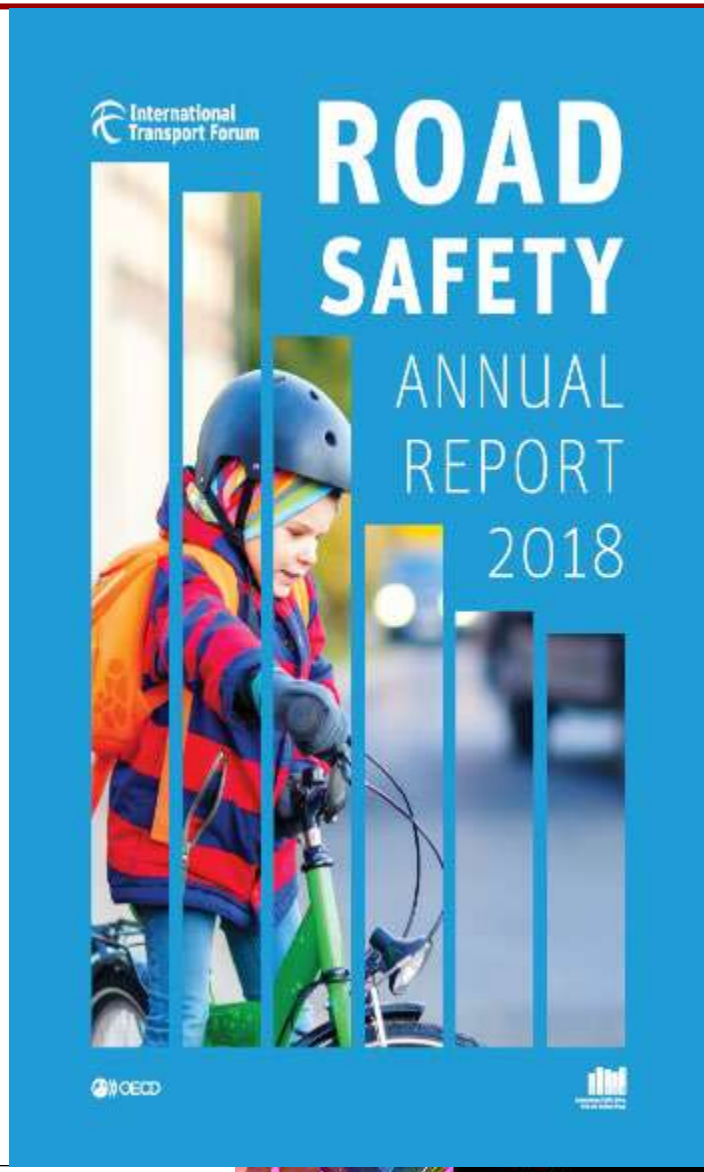
International Transport Forum

irtad

International Traffic Safety Data and Analysis Group

IRTAD, ITF/OECD (2/2)

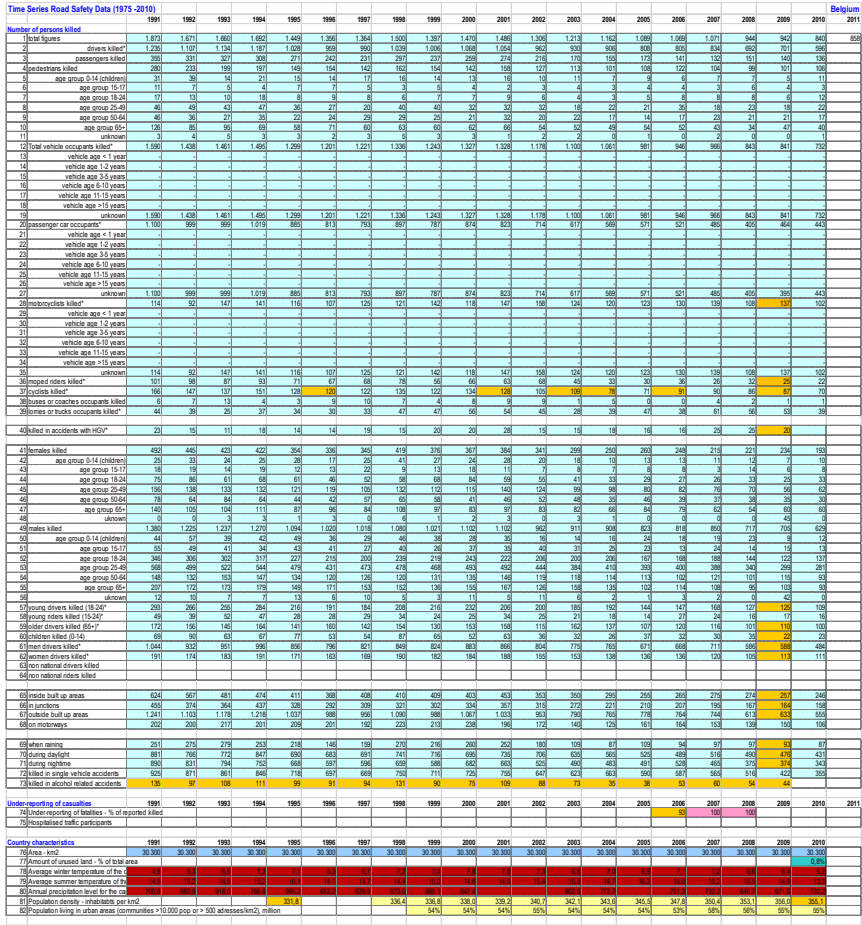
- Information comes directly from relevant **national data providers**.
- Data provided in a common format and common definitions, covering:
  - Injury **Accidents** by Road Network
  - Road **Fatalities** by Road Usage, Age, Gender and Age or by Road Network
  - **Hospitalised Road Users** by Road Usage, Age or Road Network
  - **Accident Involvement** by Road User Type and Associated Victim Data
  - **Risk Indicators**: Fatalities, Hospitalised or Injury Accidents Related to Population or Mileage figures
  - **Population** Figures by Age Bands
  - **Vehicle Population** by Vehicle Types
  - **Network Length** Classified by Road Network
  - **Mileage** Classified by Road Network or Vehicles
  - **Passenger Mileage** by Transport Mode
  - **Seat Belt Wearing Rates** of Car Drivers by Road Network
- Data concern **55 countries**



DaCoTA, an EC-DG Move Project

- The purpose of the project was to develop and implement new approaches to **gather, structure and apply policy-related safety data** in order to be incorporated within the European Road Safety Observatory (ERSO).
- The DaCoTA EU Project Team gathered and analysed data from **30 European countries** on a wide range of road safety topics.
- Creation of **Master Data Tables**, which were filled in for each European country for the period 1975-2010, containing
  - Road accident data
  - Risk exposure data
  - Safety Performance Indicators (SPIs)
  - Under-reporting of crashes
  - Country characteristics
  - Social Costs
  - Traffic Laws and Measures

DaCoTA
Road Safety Data, Collection, Transfer and Analysis



Time Series Road Safety Data (1975 -2010)																				Belgium
Number of persons killed	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1 Total figures	1.873	1.671	1.660	1.692	1.449	1.356	1.364	1.500	1.397	1.470	1.486	1.306	1.213	1.162	1.089	1.089	1.071	944	942	840	850
2 drivers killed*	1.235	1.107	1.134	1.187	1.028	959	990	1.039	1.006	1.068	1.054	962	930	906	809	805	834	692	701	596	
3 passengers killed	356	331	327	308	271	242	231	297	237	259	274	216	170	159	173	141	132	151	140	136	
4 pedestrians killed	280	233	199	197	149	154	142	162	154	142	158	127	113	101	108	122	104	99	101	108	
5 age group 0-14 (children)	31	39	14	21	15	14	17	16	14	13	16	10	11	7	9	6	7	7	5	11	
6 age group 15-17	11	7	5	4	7	7	5	3	5	4	2	3	4	3	4	4	3	6	4	3	
7 age group 18-24	17	13	10	18	8	9	8	6	7	7	9	6	4	3	5	8	8	8	6	12	
8 age group 25-49	46	49	43	47	36	27	20	40	40	32	32	32	18	22	21	35	18	23	18	22	
9 age group 50-64	46	36	27	35	22	24	29	29	25	21	32	20	22	17	14	17	23	21	21	17	
10 age group 65+	126	86	98	69	58	71	60	63	60	62	66	54	52	49	54	52	43	34	47	40	
11 unknown	3	4	5	3	3	2	3	5	3	1	2	2	2	1	1	0	2	0	0	1	
12 Total vehicle occupants killed*	1.590	1.438	1.461	1.495	1.299	1.201	1.221	1.336	1.243	1.327	1.328	1.178	1.100	1.061	981	946	966	843	841	732	
13 vehicle age < 1 year																					
14 vehicle age 1-2 years																					
15 vehicle age 3-5 years																					
16 vehicle age 6-10 years																					
17 vehicle age 11-15 years																					
18 vehicle age >15 years																					
19 unknown	1.590	1.438	1.461	1.495	1.299	1.201	1.221	1.336	1.243	1.327	1.328	1.178	1.100	1.061	981	946	966	843	841	732	
20 passenger car occupants*	1.100	999	999	1.019	885	813	753	897	787	874	823	714	617	569	571	521	485	405	404	443	
21 vehicle age < 1 year																					
22 vehicle age 1-2 years																					
23 vehicle age 3-5 years																					
24 vehicle age 6-10 years																					
25 vehicle age 11-15 years																					
26 vehicle age >15 years																					
27 unknown	1.100	999	999	1.019	885	813	753	897	787	874	823	714	617	569	571	521	485	405	395	443	
28 motorcyclists killed*	114	92	147	141	116	107	125	121	142	118	147	158	124	120	123	130	139	108	137	102	
29 vehicle age < 1 year																					
30 vehicle age 1-2 years																					
31 vehicle age 3-5 years																					
32 vehicle age 6-10 years																					
33 vehicle age 11-15 years																					
34 vehicle age >15 years																					
35 unknown	114	92	147	141	116	107	125	121	142	118	147	158	124	120	123	130	139	108	137	102	
36 moped riders killed*	101	98	87	93	71	67	68	78	56	66	63	68	45	33	30	36	26	32	25	22	
37 cyclists killed*	166	147	137	151	126	126	122	135	122	134	126	105	106	76	71	91	90	80	87	71	
38 Buses or coaches occupants killed	6	7	13	4	3	9	10	7	4	8	9	9	1	5	0	0	4	2	1	1	
39 lorries or trucks occupants killed*	44	39	25	37	34	30	33	47	47	56	54	45	28	39	47	38	61	56	53	39	
40 killed in accidents with HGV*	23	15	11	18	14	14	19	15	20	20	28	15	15	18	16	16	29	25	26		
41 females killed	492	445	423	422	364	336	345	419	376	367	384	341	299	250	260	248	215	221	234	193	
42 age group 0-14 (children)	25	33	24	25	26	17	25	41	27	24	28	20	18	10	13	13	11	12	7	10	
43 age group 15-17	18	19	14	19	12	13	22	9	13	18	11	7	8	7	8	8	3	14	6	8	
44 age group 18-24	75	86	61	68	61	46	52	58	68	84	59	55	41	33	29	27	26	33	25	33	
45 age group 25-49	156	138	133	132	121	119	105	132	112	115	140	124	99	98	80	82	76	70	56	62	
46 age group 50-64	78	64	84	64	44	42	57	60	58	41	46	52	48	35	40	39	37	38	35	30	
47 age group 65+	140	105	104	111	87	96	84	108	97	83	97	83	82	66	84	79	62	54	60	63	
48 uknown	0	0	3	3	1	3	0	6	1	2	3	0	3	1	0	0	0	0	4	0	
49 males killed	1.380	1.225	1.237	1.270	1.094	1.020	1.018	1.080	1.021	1.102	1.102	962	911	908	823	818	850	717	705	629	
50 age group 0-14 (children)	44	57	39	42	49	36	29	46	38	28	35	16	14	16	24	18	19	23	9	12	
51 age group 15-17	55	49	41	34	43	41	27	40	26	37	33	40	31	25	23	13	24	14	19	13	
52 age group 18-24	346	306	302	317	227	215	200	239	218	243	222	206	200	206	167	168	168	144	122	137	
53 age group 25-49	568	499	522	544	479	431	473	478	468	493	492	444	384	410	393	400	388	340	299	281	
54 age group 50-64	148	132	153	147	134	120	126	120	131	135	146	119	118	114	113	102	121	101	119	93	
55 age group 65+	207	172	173	178	148	171	153	152	136	158	167	126	158	135	102	114	106	95	103	93	
56 uknown	12	10	7	7	13	6	10	5	3	11	5	11	6	2	1	3	2	0	42	0	
57 young drivers killed (18-24)*	293	266	295	284	216	191	184	208	216	232	206	200	189	192	144	147	168	127	126	109	
58 young riders killed (15-24)*	49	39	52	47	28	28	29	34	24	25	34	25	21	18	14	27	24	16	17	16	
59 older drivers killed (65+)*	172	156	145	164	141	160	142	154	130	153	158	115	162	137	107	120	116	101	110	100	
60 children killed (0-14)	69	90	63	67	77	53	54	87	65	52	63	36	32	26	37	32	30	35	22	23	
61 men drivers killed*	1.044	932	951	996	890	796	821	849	824	863	866	804	773	765	671	668	711	586	588	484	
62 women drivers killed*	191	174	183	191	171	163	169	190	162	184	188	155	153	138	136	136	123	105	113	111	
63 non national drivers killed																					
64 non national riders killed																					
65 inside built up areas	624	567	481	474	411	368	408	410	409	403	453	353	350	299	255	269	279	274	257	248	
66 in junctions	455	374	364	437	328	292	309	321	302	334	357	315	272	221	210	207	199	167	164	158	
67 outside built up areas	1.241	1.103	1.178	1.218	1.037	988	996	1.090	988	1.067	1.033	953	798	765	778	764	744	617	633	555	
68 on motorways	202	200	217	201	209	201	182	223	213	238	196	172	140	125	161	164	153	139	150	106	
69 when raining	251	275	279	253	218	146	199	270	216	269	252	180	198	87	109	94	97	97	93	87	
70 during daylight	881	768	772	847	690	683	691	741	716	696	729	706	630	565	525	489	516	490	478	431	
71 during nightime	890	831	794	752	668	597	596	659	588	682	663	525	490	483	491	528	465	375	374	343	
72 killed in single vehicle accidents	925	871	861	846	718	697	669	750	711	725	750	647	623	663	590	587	563	516	422	359	
73 killed in alcohol related accidents	135	97	108	111	99	91	94	131	90	75	109	88	73	35	36	53	60	54	44		
Under-reporting of casualties	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
74 Under-reporting of fatalities - % of reported killed																94	100	100			
75 Hospitalised traffic participants																					
Country characteristics	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
76 Area - km2	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	30.300	
77 Amount of unused land - % of total area																				0,8%	
78 Average winter temperature of the c	4,9	5,2	5,9	7,2	7,1	6,3	5,9	7,4	7,6	6,3	6,1	5,9	4,7	5,2	5,2	7,1	6,2	6,3	6,3	5,1	
79 Average summer temperature of t	14,9	15,2	14,5	15,2	14,1	14,3	14,7	14,4	15,6	14,4	14,5	15,4	14,8	14,7	15,2	15,4	15,2	14,2	14,9	13,7	
80 Annual precipitation level for the ca	769,8	581,1	918,9	786,1	695,2	560,4	625,9	673,1	864,1	847,4		836,8	792,1		751,1	713,2	646,1	611,9	729,8		
81 Population density - inhabitants per km2					331,8			336,4	336,8	338,0	339,2	340,7	342,1	343,6	345,0	347,8	350,4	353,1	356,0	358,1	
82 Population living in urban areas (communities > 10.000 pop or > 500 adresses/km2), million									54%	54%	54%	55%	54%	54%	54%	53%	58%	56%	55%	55%	

NTUA Road Safety Observatory

- **An international reference website** - information system of road safety data and knowledge: www.nrso.ntua.gr
- **More than 1.200 items since 2007, more than 500 scientific publications**
- All important **road safety news** in Greece, in Europe and worldwide
- Updated **reports** covering all modern road safety issues
- Latest available **road safety data** for Greece and the European Union
- Scientific **road safety conferences** in Greece and worldwide
- Links to dozens of road safety **resources worldwide**

Road Safety Decision Support Systems

SafetyCube, EC Horizons 2020 Project (1/2)

SafetyCube DSS **aims** to provide the European and Global road safety community **a user friendly, web-based, interactive Decision Support Tool**.

SafetyCube DSS **combines** existing with novel road safety knowledge using scientific studies as basis.

The **main contents** of the SafetyCube DSS concern:

- road accident risk factors and problems
- road safety measures
- best estimate of effectiveness
- cost-benefit evaluation
- all related analytic background

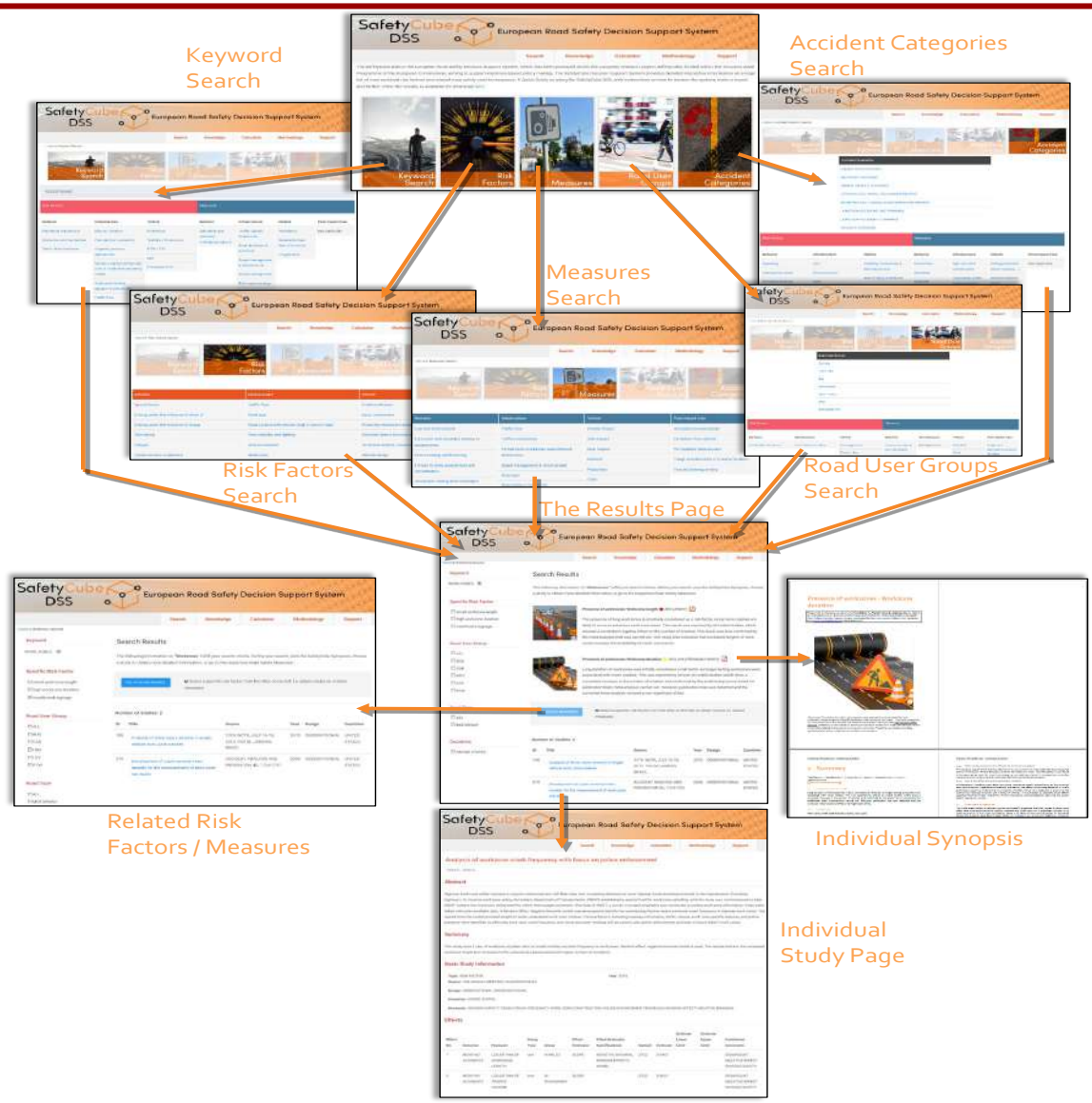
Special focus on linking road safety problems with related measures.

SafetyCube, EC Horizons 2020 Project (2/2)

The **SafetyCube DSS** contains:

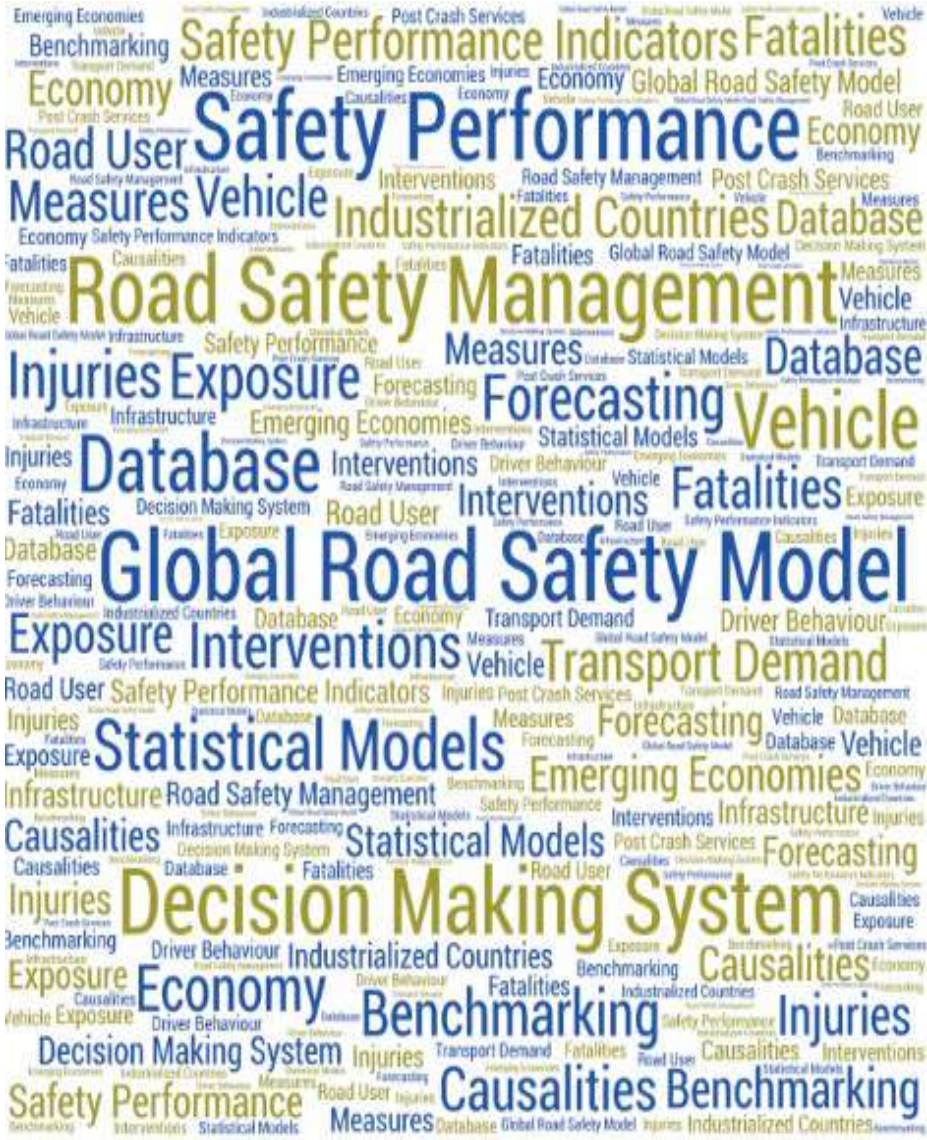
- more than 1,250 **scientific studies**,
- with more than 7,500 **estimates** of risks/measure effects on
- **4 Categories**: road user, infrastructure, vehicle, post impact care
- **38 risks, 50 measures** (88 in total) e.g. distraction, roadside factors,
- **120 specific risks, 193 specific measures** (313 in total) e.g. mobile phone use,
- **211 Synopses**
- **36 cost-benefit analyses** (adjustable)

All available at: www.roadsafety-dss.eu/



SafeFITS Global Model, UNECE (1/2)

- A **macroscopic road safety decision making tool** to aid stakeholders in developed and developing countries, decide the most appropriate road safety policies - measures to achieve tangible results.
- **Based on the related scientific knowledge available worldwide**, with emphasis on recent academic research and project results.
- Developed within 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).



SafeFITS layers

1. Economy and Management
2. Transport Demand & 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

SafeFITS Global Model, UNECE (2/2)

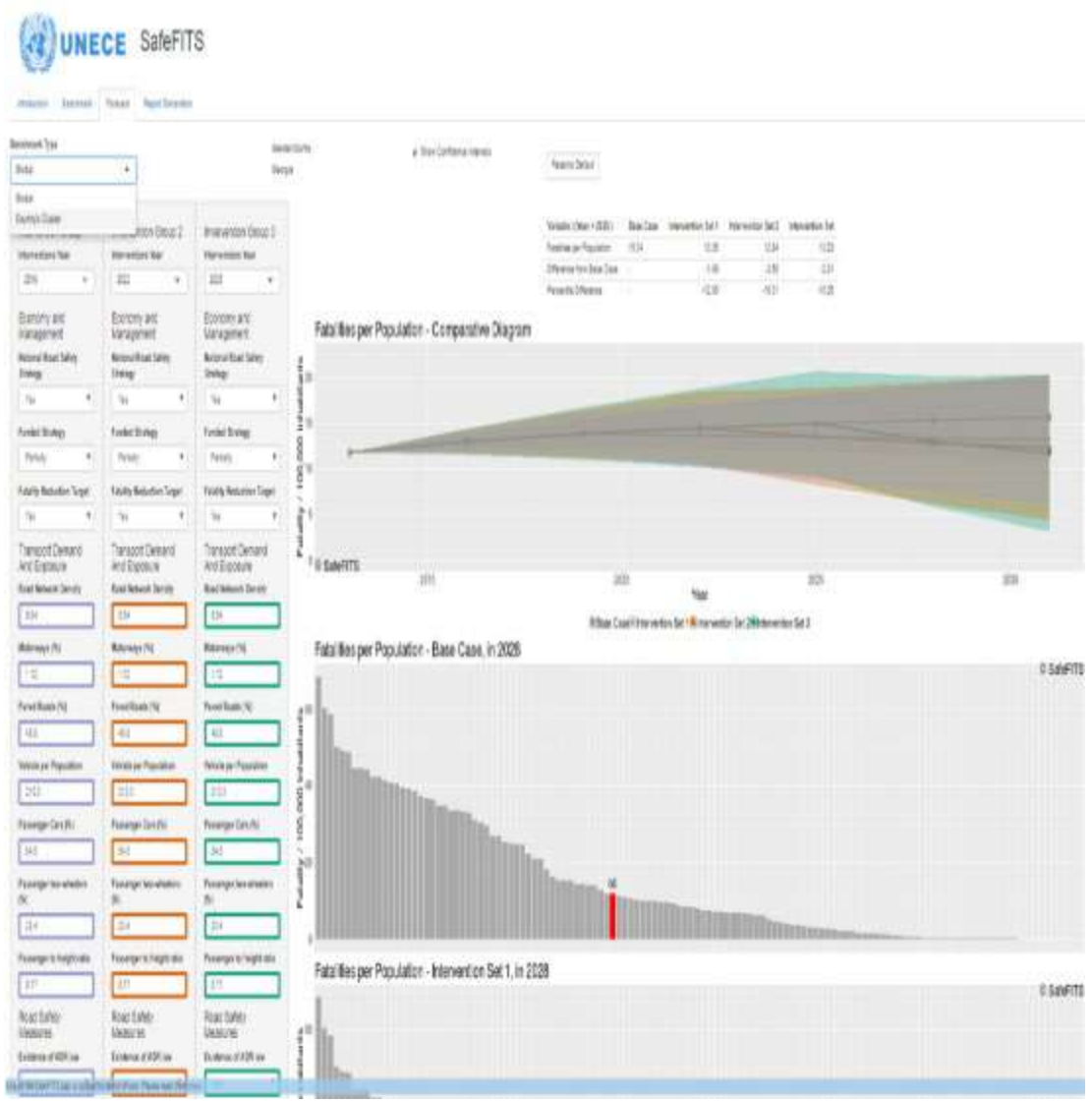
The SafeFITS Tool consists of **two background components**:

- **SafeFITS database** with data on indicators from all layers of road safety management system for 130 countries worldwide
- **SafeFITS set of statistical models** of global causalities, estimated on the basis of the database

The SafeFITS Tool is composed by **three complementary modules**:

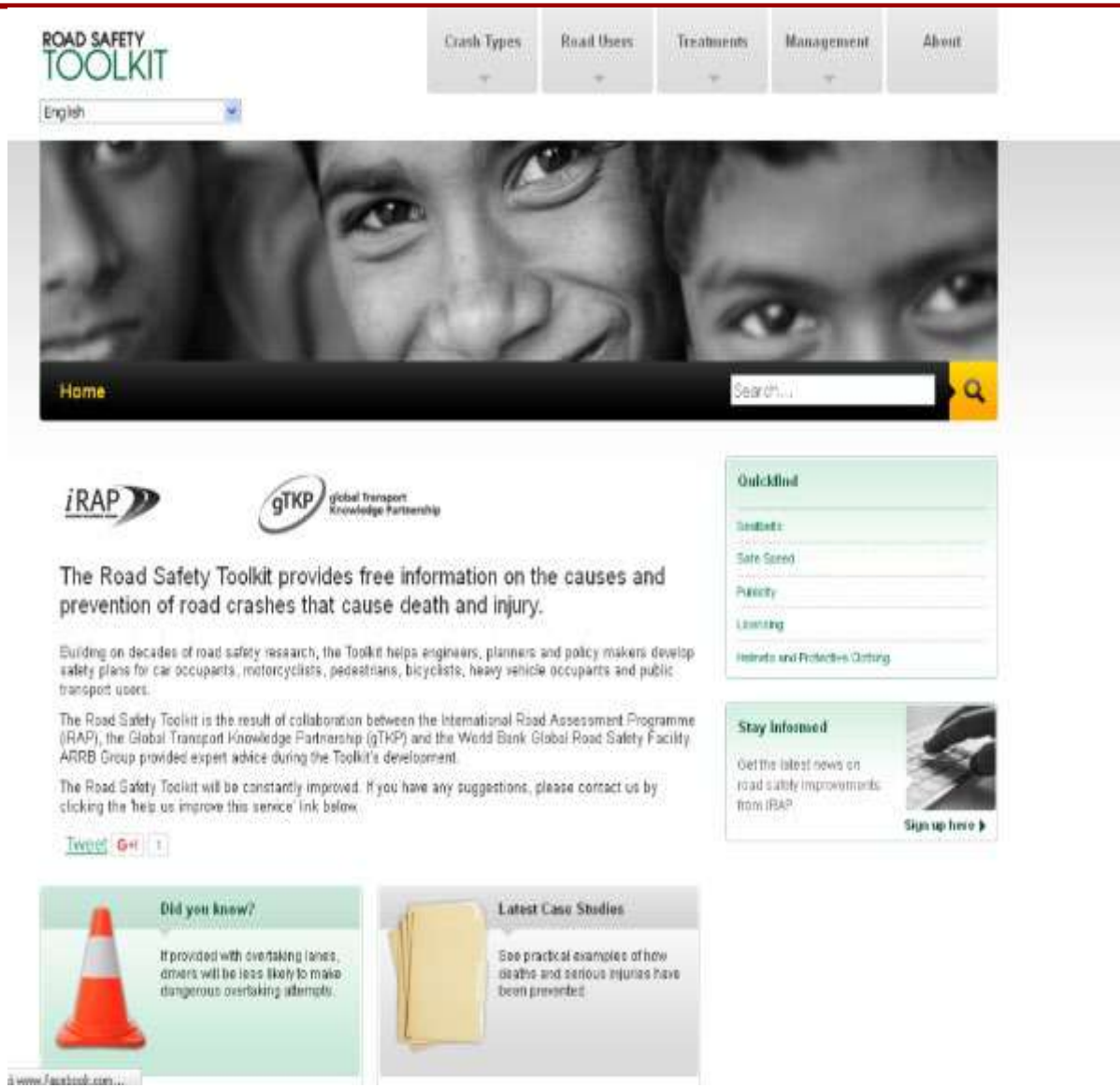
- **Intervention analysis:** allows the user to examine the effects of single interventions at national or country cluster level
- **Forecasting analysis:** allows the user to define own scenarios of measures (or combinations of measures) in a country and obtain medium/long term forecasts of each scenario
- **Benchmarking analysis:** allows the user to benchmark a country against a group of countries (e.g. all countries, countries of similar economic or road safety performance)

Available at: https://unecetrans.shinyapps.io/safefits/



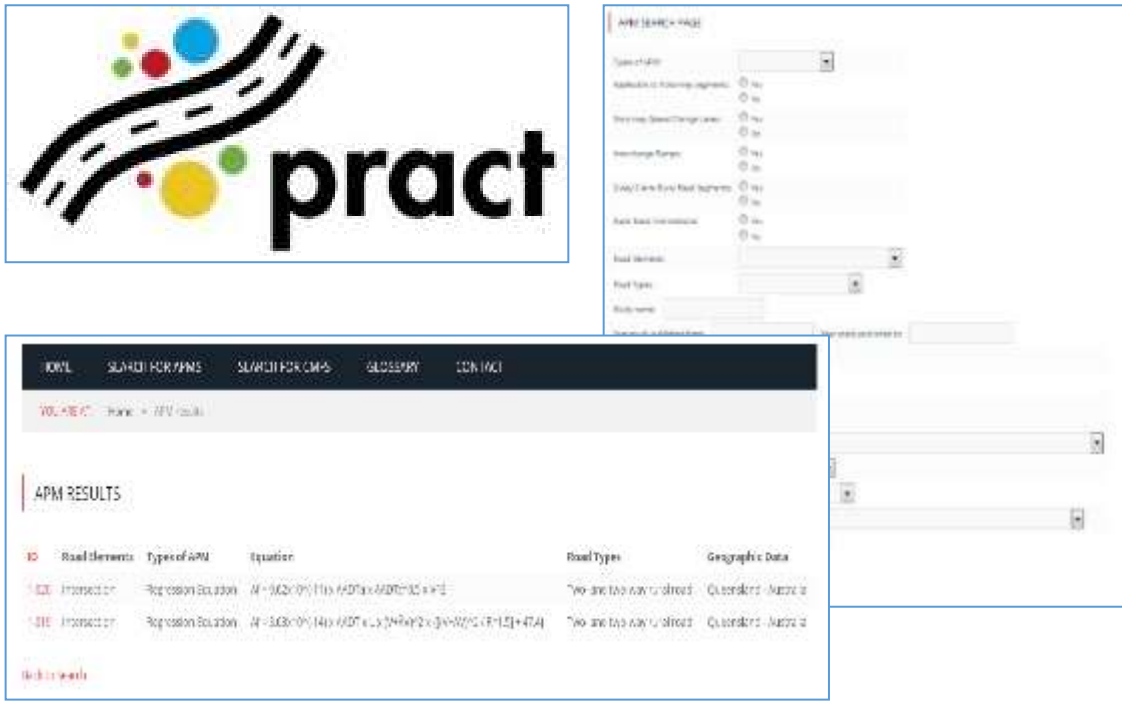
iRAP Road Safety Toolkit

- Includes 58 **treatments** (infrastructure, vehicle & user related)
- **No CMF**s included
- Rough assessment of each treatment's **effectiveness** using a four scale system (0-10%, 10-25%, 25-40%, 60% or more)
- Is available online: http://toolkit.irap.org/



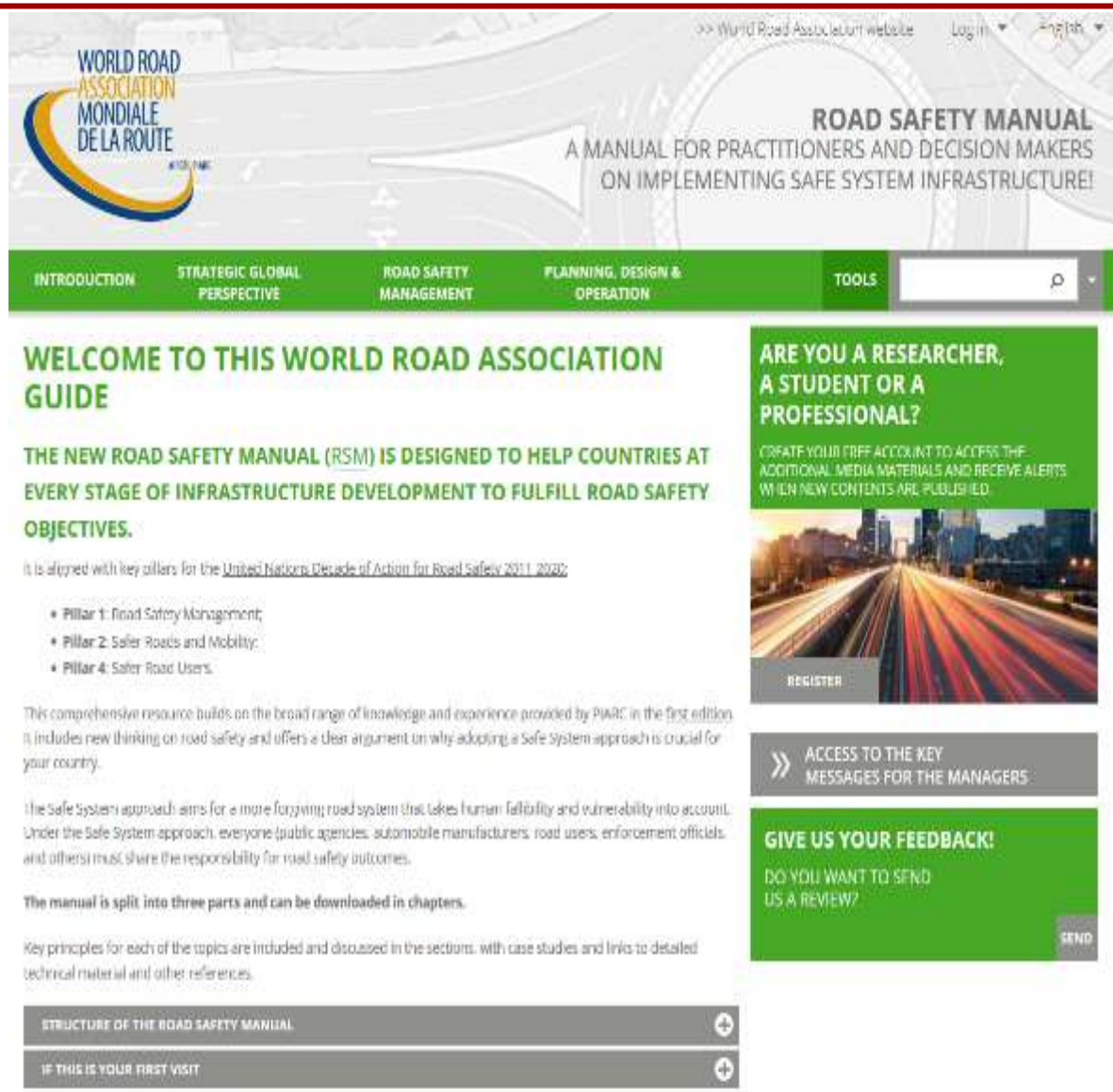
PRACT APM and CMF Repository, CEDR

- A **Trans-European Accident Prediction Model** with a single structure and different parameters for different countries. The model has been fitted to data from 5 Countries (Italy, UK, Greece, Netherlands, Germany).
- A **user friendly tool** to assist in the application of APMs according to data availability and local conditions. Enables **Search for APMs and CMFs.**
- All **types of data** required in accident prediction are available (CMFs, SPFs, and Regression Equation APMs).
- The quality of included CMFs has been verified through an **evaluation process**.
- A procedure to check the **transferability of CMFs**, incorporated in the tool.
- A **CMF and APM Repository** has been developed and is freely available online: www.pract-repository.eu



PIARC - WRA Road Safety Manual

- The **PIARC Road Safety Manual** is intended to provide clear and accessible information on the effective management of road safety infrastructure.
- Includes **15 case studies**, with the possibility of additions and updates.
- Estimates of **high/medium/low cost** for up to **35** Treatments
- Categorized for **3 effectiveness categories** and for up to **6 accident types**.
- Organization of the Manual is in **three Parts**:
  - Part I "Strategic Global Perspective"
  - Part II "Road Safety Management"
  - Part III "Planning, Design & Operation"
- Available online: https://roadsafety.piarc.org/en

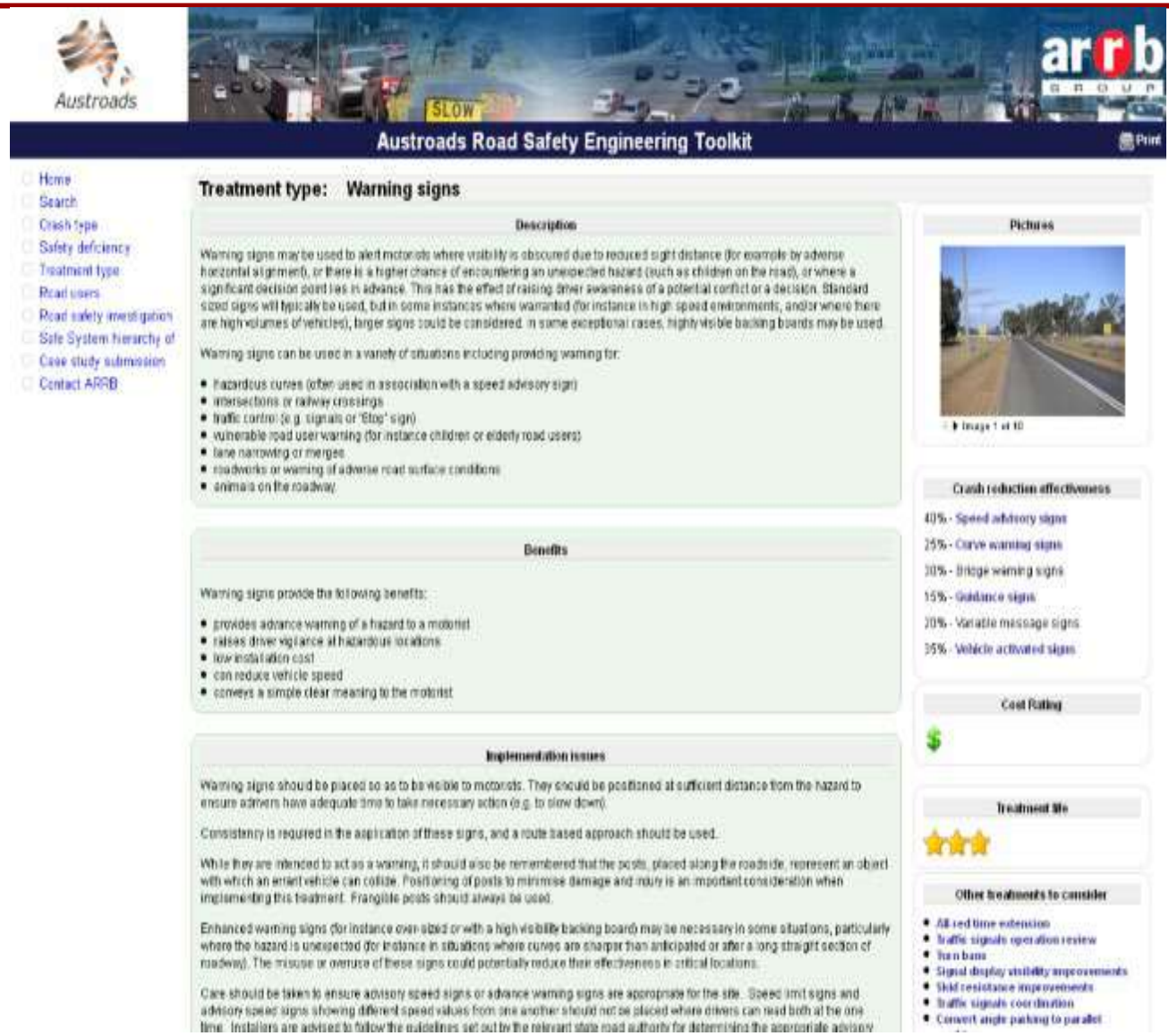


US NHTSA/FHWA CMF Clearinghouse

- **Directly related** to the Highway Safety Manual (AASHTO, 2010)
- Includes **5,378 CMFs** on road infrastructure
- **Detailed background information** on presented CMFs is available
- Is available online: http://www.cmfclearinghouse.org

AustRoads Road Safety Engineering Toolkit

- **67 treatments** are included
- **Searchable database** according to:
  - Treatment type/name,
  - Crash type,
  - Safety issue,
  - Road user group
- **Detailed background information** on included CMFs generally not available
- Is available online: http://www.engtoolkit.com.au



In Synopsis

- During the last 15 years, several Road Safety Observatories and Decision Support Systems have been developed, **adding significant value** to the quest for safer roads worldwide.

- The more developed Information Systems are associated with Countries and Regions with higher road safety performance and are a direct sign of **advanced road safety culture**.

- Road Safety Information Systems are key management tools for **developing road safety capacity** and engaging stakeholders (not only for providing scientific evidence but also for monitoring efforts)

Future Challenges

- The current **great potential** of current Road Safety Systems should be multiplied with:
  - more data and knowledge
  - broader geographical coverage

- **Upgraded usefulness** of the Systems entail:
  - more accurate road accident data (LMIC Counties)
  - exposure data and performance indicators
  - measures and policies effectiveness evaluation

- **Global impact will be optimized** through:
  - a network of Regional Observatories (Global coverage)
  - standardisation of data, processes and systems
  - evidence-based & customized best practice guidelines

The Digitalisation Challenges

- **Digitalization** opens great new data possibilities for evidence based road safety decision making at all levels
- New great potential for **seamless data driven procedures** from safety problems identification to selection and implementation of optimal solutions
- New increased **net present value of road safety data**, available for early problem detection and prompt and customised decision support

In Conclusion

- Data, knowledge and systems require **serious effort with equivalent budget**, which however are highly profitable in terms of return of investment:
  - with thousands of lives and injuries saved and
  - road safety investments properly exploited

- The **deployment** of national, regional and international road safety observatories and decision support systems, should be:
  - progressive
  - inter connected
  - properly funded

- **Regional and Global coordination** and funding are current key challenges for the serious upgrade of the current systems

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Road Safety Data, Knowledge and Decision Support Systems Global Challenges in the Digital Era

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