International Transport Forum

IRTAD
International Traffic Safety Data and Analysis Group

OECD

Designing a composite index for road safety

SUNflowerNext. Chapter 3

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4th IRTAD CONFERENCE
Road safety data: collection and analysis for target setting and monitoring performances and progress

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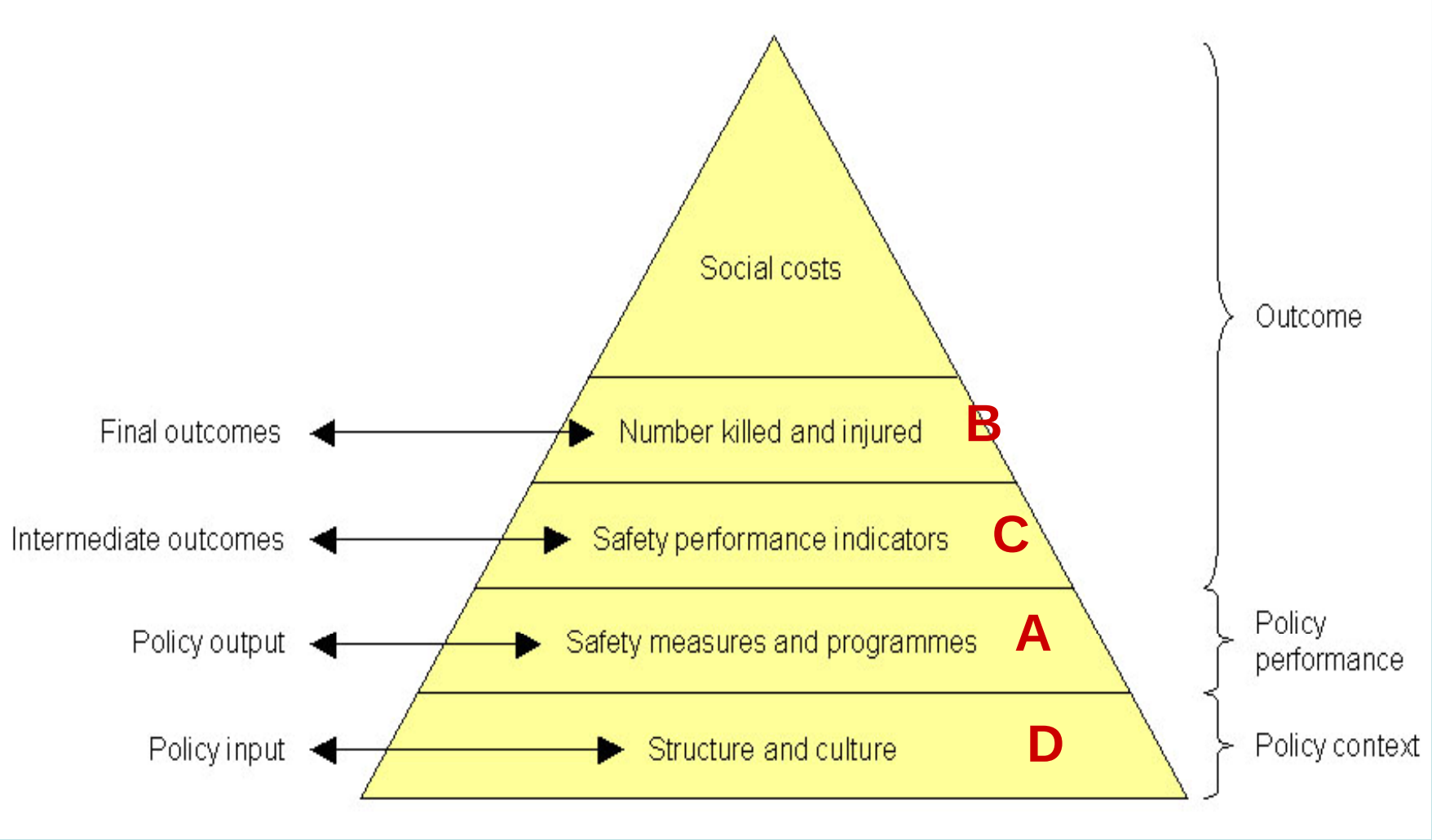
Road safety pyramid: layers for composite index



Basic indicators: A-group
Characteristics of national safety programmes

Indicators	Possible values
A1 Safety targets	a. Ambitious b. Available but not ambitious c. Not available
A2 Selection of interventions	a. Sound analysis preceded the programme b. Some analysis was performed c. Arbitrary selection
A3 Economic evaluation	a. Sound economic evaluation preceded … b. Some economic evaluation performed c. not performed
A4 Monitoring the programme's performance	a. Systematic monitoring takes place b. A need for monitoring is stated … c. no evidence
A5 Programme's stakeholders	a. Commitment was stated on the governmental level … d. No authority has clear responsibility

Basic indicators: B-group - final outcomes

Issues	Indicators defined
Personal risk	B1 Fatalities per million inhabitants
Traffic risk	B2 Fatalities per million passenger cars B3 Fatalities per 10 billion passenger-km travelled
Scope of traffic injury	B4 Injury accidents per fatality
Scope of the problem of vulnerable road users	B5 Share of pedestrian fatalities out of the total fatalities B6 Share of bicyclist fatalities out of the total fatalities B7 Share of motorcyclist fatalities out of the total fatalities

Basic indicators: C-group
Intermediate outcomes, SPIs

Safety areas	Indicators defined
Alcohol-impaired driving	C1 Share of total for fatalities in drink-driving accidents
Use of protective systems in cars	C2 Daytime wearing rates of seat belts in the front seats C3 Daytime wearing rates of seat belts in the rear seats
Vehicles: Crashworthiness of the passenger car fleet	C4 Average EuroNCAP score of passenger car fleet C5 Median age of the passenger car fleet
Vehicle fleet composition	C6 Share of motorcycles in the vehicle fleet C7 Share of heavy goods vehicles (HGV) in the vehicle fleet

Basic indicators: D-group
Background characteristics

Characteristic	Indicators defined
Motorization level	D1 Number of passenger cars per 1000 inhabitants
Population density	D2 Population per 1 km^2 of country's territory

Data sources:

OECD, EC, ERSO, ETSC-PIN, UNECE, SafetyNet-SPIs, for 2006

21 indicators X 27 European countries

Method of analysis

a. Data imputations

b. **P**rincipal **C**omponent **A**nalysis and Common **F**actor **A**nalysis

5 trials:

1. **PCA-all** - all the basic indicators analysed together
2. **PCA-groups** – each group of basic indicators (A, B, C, D) first analysed separately
3. **FA-4Factors** – four factors' solution
4. **FA-2Factors-noC4** - two factors' solution, C4 (’average EuroNCAP’ score) excluded
5. **FA-2factors** - two factors' solution

Results of separate trials

Each trial produced:

- a composite safety indicator (WF – weighted factor) for each country
- an insight into the behaviour of basic indicators
- a classification tree of countries, using the WF and a WARD clustering procedure

Example – PCA-all – 5 factors fitted:

Factor 1 ~ the road safety outcomes, car fleet's age and seatbelt use

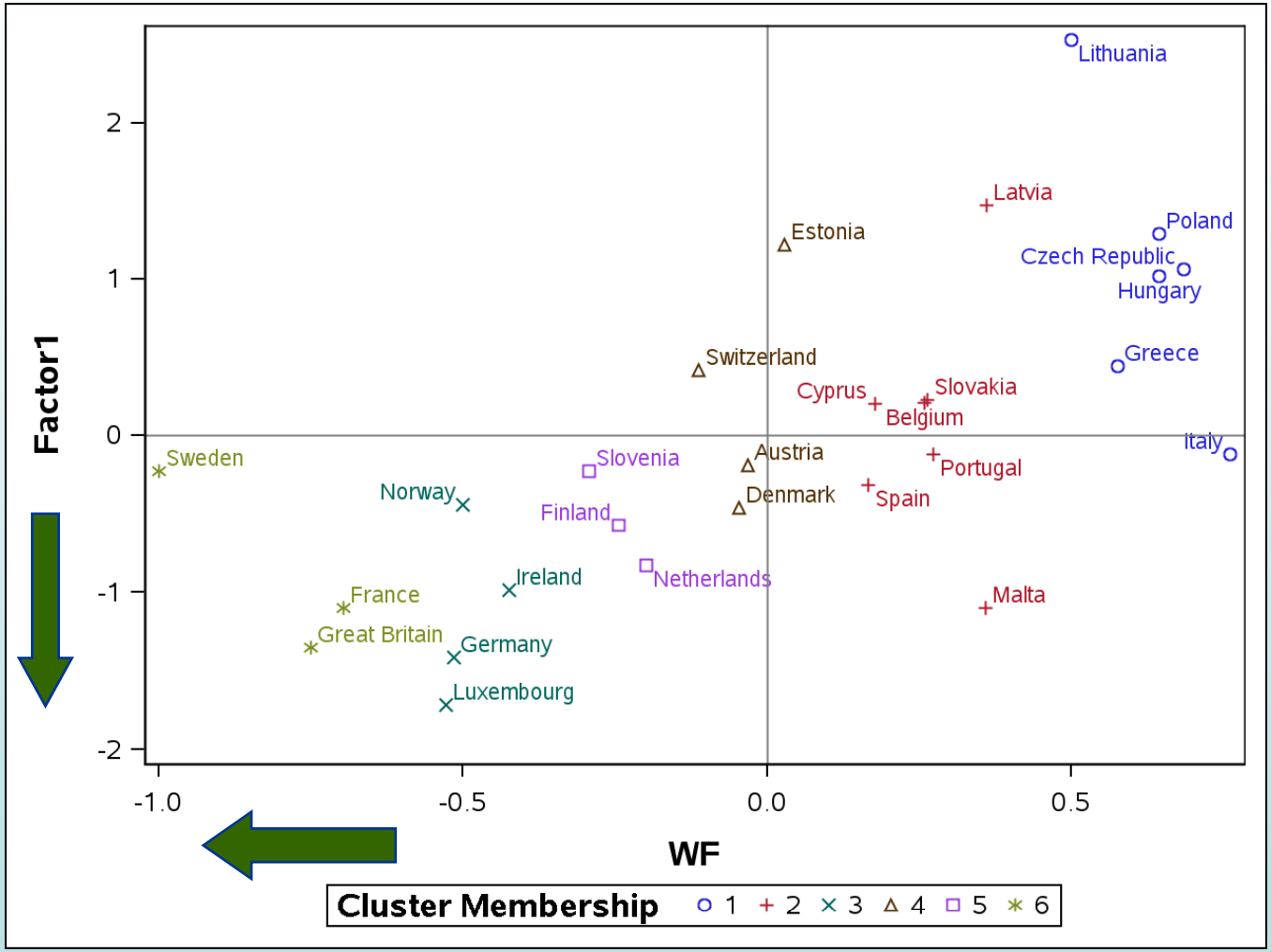
Factor 2 ~ the policy performance indicators but a negative correlation with C1 (share of drink-driving accidents)

Factor 3 ~ the share of bicyclist fatalities, EuroNCAP scores and population density

Factor 4 ~ the share of motorcycles in the fleet and the share of motorcyclist fatalities

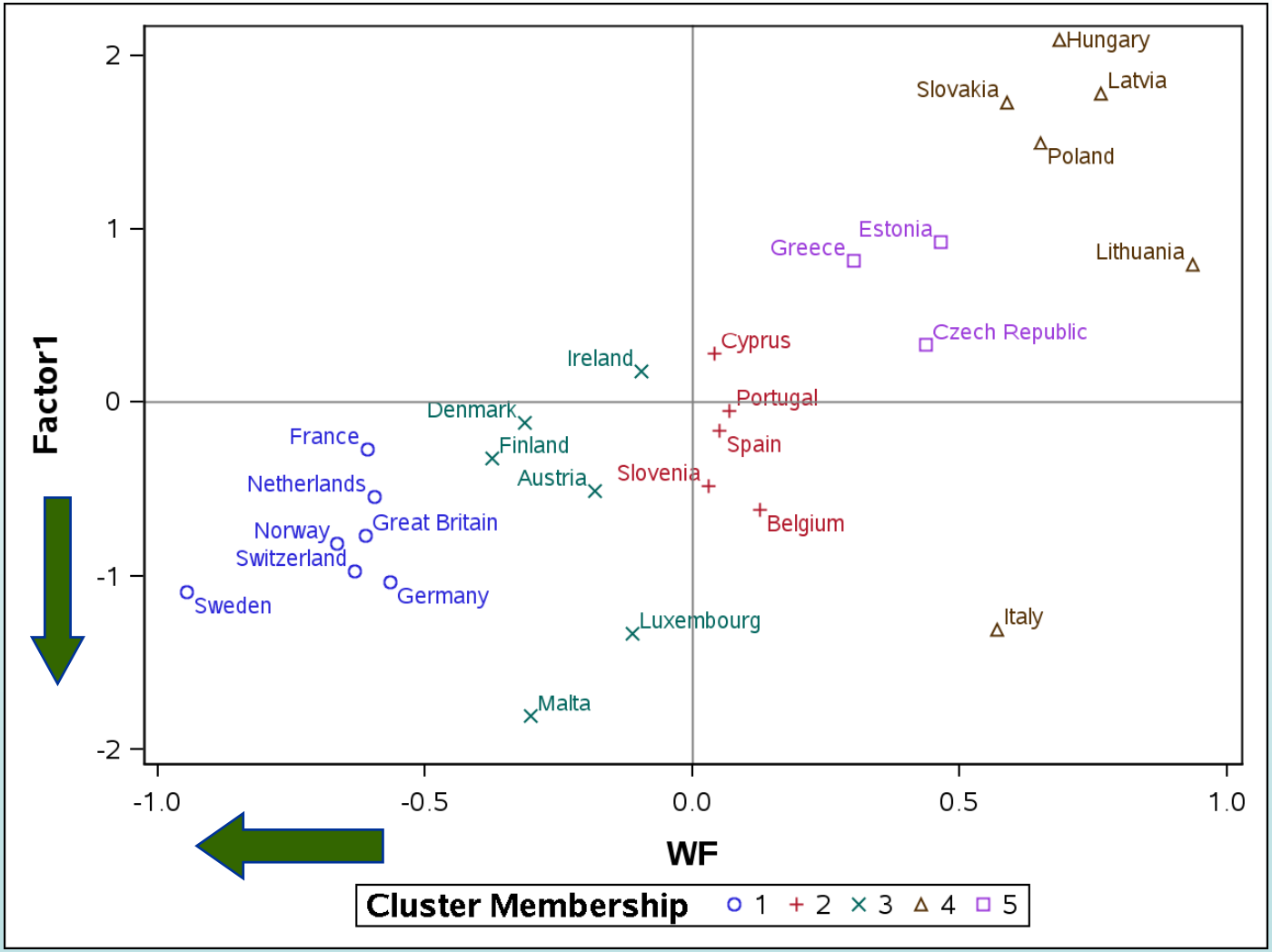
Factor 5 ~ the share of HGV in the fleet, the number of injury accidents per fatality and the motorization level of a country

PCA-all analysis: Countries plotted using the composite indicator (WF) and Factor 1 values



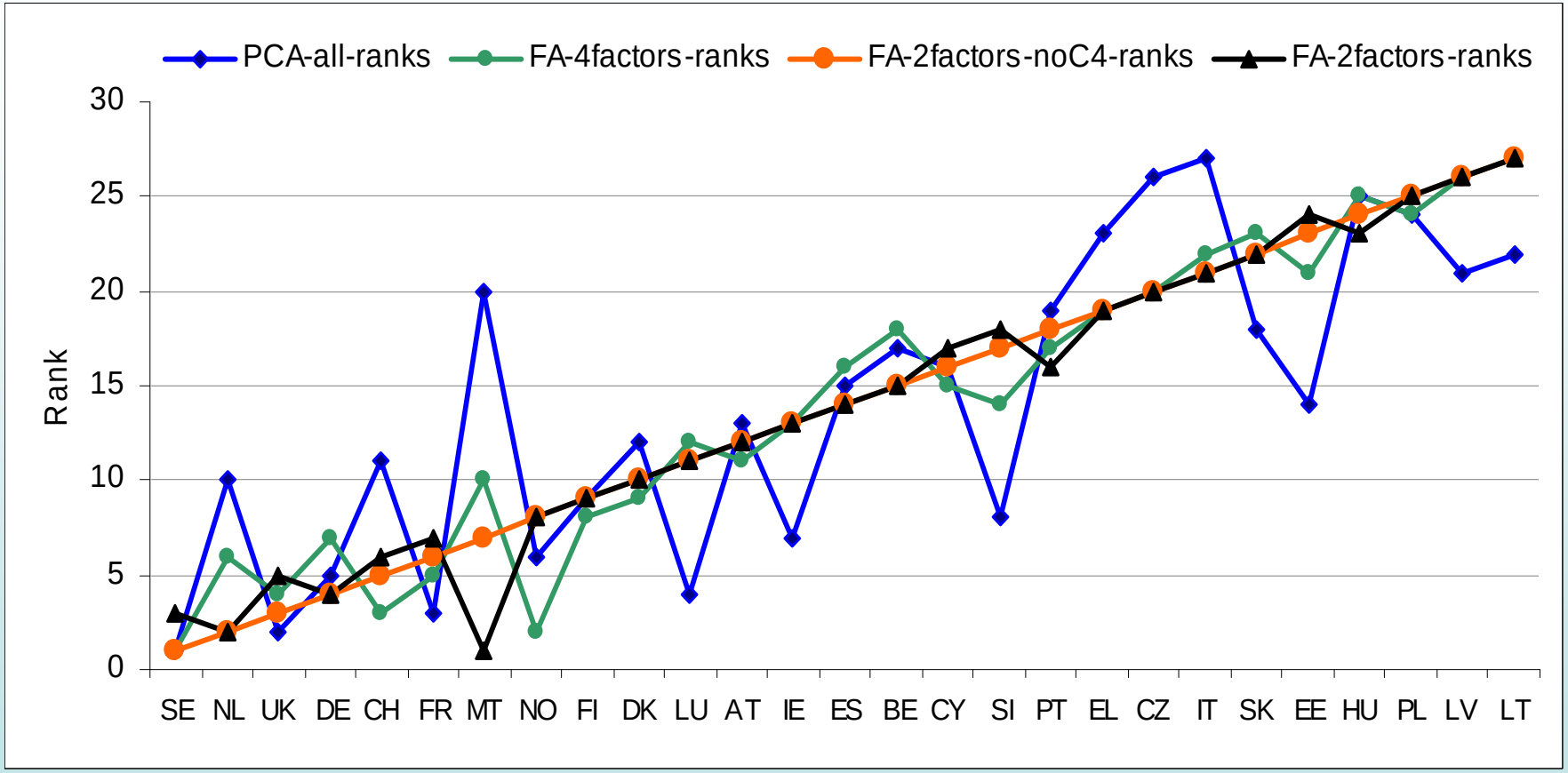
Best safety level

FA-4factors analysis: Countries plotted using the composite indicator (WF) and Factor 1 values



Best safety level

Comparisons of countries' rankings



Country	FA-4factors	FA-2factors-noC4	FA-2factors	PCA-all	Final group: based on four analyses
SE	1	1	1	1	**1**
NO	1	1	1	2	**1**
FR	1	1	1	1	**1**
UK	1	1	1	1	**1**
DE	1	1	1	2	**1**
CH	1	1	1	3	**2**
NL	1	1	1	3	**2**
FI	2	2	2	3	**2**
DK	2	2	2	3	**2**
IE	2	2	2	2	**2**
AT	2	2	2	3	**2**
LU	2	2	2	2	**2**
MT	2	1	1	4	**2**
CY	3	3	3	4	**3**
SI	3	3	3	3	**3**
PT	3	3	3	4	**3**
BE	3	3	3	4	**3**
ES	3	3	3	4	**3**
EE	4	4	4	3	**4**
SK	5	4	4	4	**4**
EL	4	4	4	5	**4**
CZ	4	4	4	5	**4**
LV	5	5	5	4	**5**
HU	5	4	4	5	**5**
PL	5	4	4	5	**5**
LT	5	5	5	5	**5**
IT	5	4	4	5	**5**

Identification of groups of countries

Conclusions

- ✓ It is **realistic and meaningful** to design a composite road safety indicator in which information from the different components of the road safety pyramid is captured and weighted

- ✓ **Grouping countries** in this process is promising and seems to be preferable to simply ranking countries

- ✓ **'Core set of basic indicators'** recommended for future uses:

  B1-B2-B3 (fatality rates), B5 (share of pedestrian fatalities),

  A1-A2-A3-A4-A5 (quality of national safety programmes),

  C2-C3 (wearing rates of safety belts) and C5 (median age of cars)