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The Baseline project: Key Performance Indicators for Road Safety in EU countries, based on a common methodology for data collection and analysis

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Abstract

The European Commission has made grants available for supporting the collection of road safety performance indicators (called 'KPIs') within the EU. 18 EU Member States are participating in this project. For each of the eight KPIs considered, a common methodology for data collection and analysis has been developed by European experts; the methodological guidelines are available at the Baseline website (baseline.vias.be). Data collection and analysis is currently being finalized; the KPIs will be available in October 2022. They will constitute the basis for monitoring road safety progress at national and EU level, will facilitate the formulation of targets at European an national level, and will support decision makers on the most appropriate measures to be taken to improve road safety. Several EU countries have already integrated the monitoring of the KPIs in their road safety strategy.

Peer-review under responsibility of the scientific committee of the Transport Research Arena (TRA) Conference

Keywords: Key Performance Indicators; KPIs; Safety Performance Indicators; SPIs; Road safety, European Union.

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1. Introduction

The Communication of the European Commission "Europe on the Move – Sustainable Mobility for Europe: safe, connected and clean" of the 13th of May 2018 confirmed the EU's long-term goal of moving close to zero fatalities in road transport by 2050 and added that the same should be achieved for serious injuries (European Commission, 2018). It also proposed new interim targets of reducing the number of road deaths by 50% between 2020 and 2030 as well as reducing the number of serious injuries by 50% in the same period. It should be recalled, however, that over the previous decade (2010-2020), the number of road deaths were reduced by only 36%, with the EU not reaching the target of 50% set for that decade (European Commission, 2021). It is essential, thus, that road crashes are investigated and continuously monitored, allowing for a better understanding of road fatalities characteristics and the implementation of the appropriate accident mitigation measures.

To measure progress, basic indicators are the numbers of road crash deaths and serious injuries. However, trends in these figures do not explain the relative importance of the different causes of road crashes and to what extent remedial actions and countermeasures have been successful. In order to gain a better understanding of the different factors that influence overall safety performance, the Commission has elaborated, in cooperation with Member State experts, a set of European road safety performance indicators, called 'KPIs' (Key Performance Indicators). The list of the KPIs is given in Table 1. These indicators are directly related to the prevention of road accident fatalities and serious injuries. The minimum requirements for these KPIs are described in a document of the European Commission (European Commission, 2019).

Within this context, the EC funded project 'Baseline' aims to assist EU Member States' authorities in the collection and harmonised reporting of the road safety KPIs and to contribute to building the capacity of those Member States which have not yet collected the relevant data for the KPIs. Eighteen EU Member States participate in the project: Belgium (coordinator), Austria, Bulgaria, Cyprus, Czech Republic, Finland, Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Spain, and Sweden. Data collection is currently going on and will be completed in July 2022. Member States participating in the project are required to deliver at least 5 of the 8 KPIs. At the time of drafting this paper, the final results of the project were not yet available; however, they will be presented during the TRA conference.

Table 1. List of European KPIs for road safety

KPI area	KPI definition
Speed	Percentage of vehicles travelling within the speed limit
Safety belt	Percentage of vehicle occupants using the safety belt or child restraint system correctly
Protective equipment	Percentage of riders of PTWs and bicycles wearing a protective helmet
Alcohol	Percentage of drivers driving within the legal limit for blood alcohol content (BAC)
Distraction	Percentage of drivers not using a handheld mobile device
Vehicle safety	Percentage of passenger cars with a Euro NCAP safety rating equal or above a threshold
Infrastructure	Percentage of distance driven over roads with a rating above an agreed threshold
Post-crash care	Time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services

Table 2 shows the KPI values that will be delivered by each of the participating EU Member States. These KPI values, and their different breakdowns, will be integrated in a common database. The data collection for some of these KPIs is entirely funded by the Member States themselves. Some other European countries that are not formally part of the project (France, Italy, Serbia) have already announced their willingness to contribute their KPI values to the European database; other countries are also considering to participate in the next round of data collection, currently scheduled for the autumn d of 2023 and the spring of 2024.

Table 2. Provision list of KPIs that will be included in the European database

Country	Speed	Safety belt	Protective equipment	Alcohol	Distraction	Vehicle safety	Infrastructure	Post-crash care
Austria	x	x	x	x	x	x		x
Belgium	x	x	x	x	x	x		x
Bulgaria	x	x	x	x	x	x		
Cyprus	x	x	x	x	x	x	x	x
Czech Republic	x	x	x	x	x	x		x
Finland	x			x	x	x	x	x
Germany	x	x	x	x	x	x		x
Greece	x	x	x	x	x	x		x
Ireland	x	x	x	x	x	x		
Latvia	x	x	x	x	x	x	x	x
Lithuania	x	x			x	x	x	x
Luxembourg				x				
Malta	x		x		x	x		x
Poland	x	x	x	x	x			
Portugal	x	x	x	x	x	x	x	x
Spain	x	x	x	x	x	x		
Sweden	x	x	x	x	x	x	x	x
The Netherlands	x	x	x	x	x	x	x	x
	16	15	15	16	17	15	7	13

2. Methodology

2.1. Organisation of the project

Figure 1 gives a schematic overview of the organisation of the project. Vias institute from Belgium is the project coordinator, supported by SWOV (The Netherlands) and NTUA (Greece). Four types of activities can be identified: (1) Strategy: the European Commission and the General Assembly of Member States; (2) Coordination: the Coordination Team, the Project Manager and the Technical Committee; (3) Support and monitoring: the Project Coordinator team, the KEGs: and (4) Operations: the national project teams in the Member States (Beneficiaries / Implementing Bodies / subcontractors / etc.).

The representatives of the Member States that are part of the consortium constitute the 'General Assembly' (GA) for the project. The main purposes of the GA are:

- to ensure that important considerations and needs of Member States are taken into account
- to allow Member States to monitor the progress of the project
- to share experiences and good practices across Member States
- to discuss issues that are relevant for several Member States
- to take decisions on strategic issues and priorities, for instance, if there would be a need to modify the consortium agreement or a need to amend the contract between the Commission and the coordinator
- to agree on recommendations for the future.

The Technical Committee (TC) consists of experts from the participating Member States. These experts' combined expertise covers all 8 KPIs. They are familiar with the different processes and methods that are needed for road safety KPIs. The main role of the TC is to

- ensure consistency in the development of methodological guidelines and guidance to participating Member States
- monitor the methods used for data collection and processing in the Member States
- ensure consistency in the interpretation of the KPI data provided by Member States.

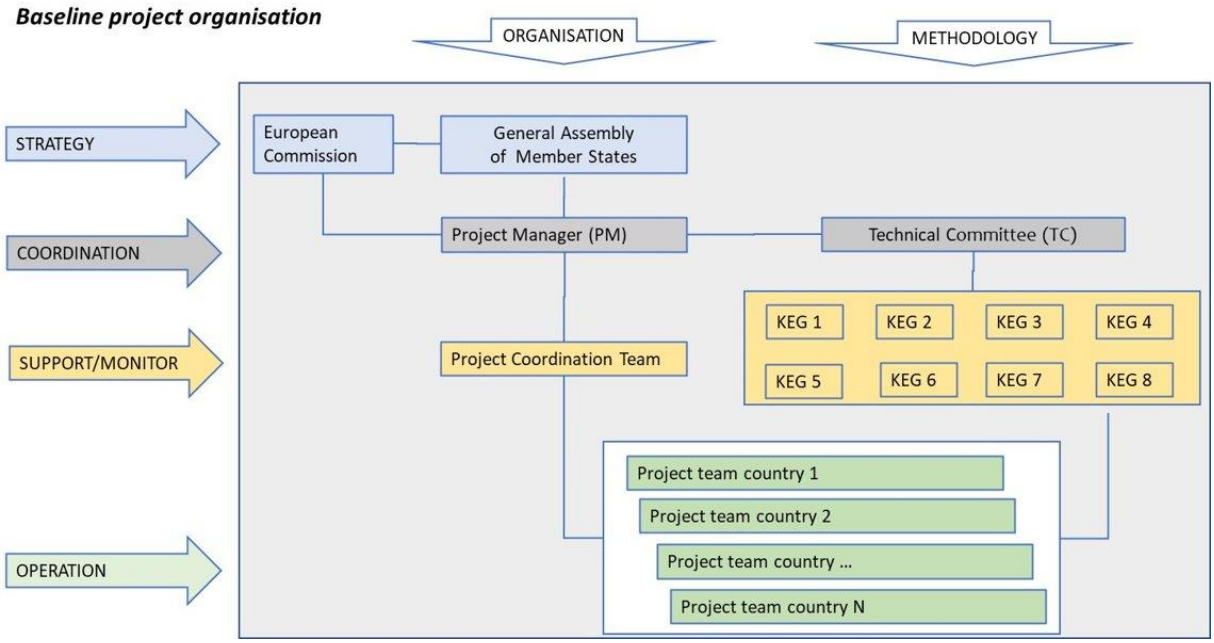

Figure 1. Organisation of the Baseline project

For each KPI a 'KPI Expert Group' (KEG) has been established. Each KEG consist of a few experts and is coordinated by a staff member of Vias institute. The role of the KEG is to

- develop methodological guidelines (sample size, observation locations, observation methods, other data collection methods, data processing, data weighting and aggregation, types of indicators, …)
- give advice to Member States on scientific, technical and practical issues that may arise in relation to the design and implementation of the data collection processes, on the data processing and its interpretation.

The Project Coordinator is the intermediary between the Member States and the European Commission. The Coordinator is responsible for overall project management, administrative and financial management, methodological coordination, support to Member States, data management and dissemination of results.

In every Member State the Baseline project is organised in a somewhat different way, yet there are some similarities. There are usually one or two main contact persons for the national part of the project, and sometimes additional contact persons for specific KPIs.

Table 3 lists the types of activities that are being undertaken within the project. A distinction is made between the activities mainly or exclusively undertaken at Member State level, and activities that are undertaken mainly or exclusively at the level of the coordinator.

Table 3. Main activities undertaken at Member State and at Coordinator level

Phase	Activity type	Activities by Member States	Activities at Coordinator level
Continuous	Management and coordination	National project management Technical and scientific coordination at Member State level Participation in the creation of the website content Participation in liaison with relevant related initiatives Financial management at Member State level	Technical and scientific coordination Administrative management and coordination File sharing Project website Financial management and control Provision of administrative and financial guidelines and templates to Member States Organisation of meetings Reporting to the Commission Liaison with relevant related initiatives
Phase 1	Preparation and methodological support	Choice of KPIs Fine-tuning methodologies Train staff Subcontracting of fieldwork Preparation of the methodologies	Design of the KPI database and interface Development of methodological guidelines for each KPI Methodological advice to Member States
Phase 2	Data collection	Undertake the fieldwork Monitor the fieldwork	Provide technical assistance to Member States
Phase 3	Calculation of KPIs	Cleaning, weighing and aggregating data to calculate the KPIs Analyse the results	Provides technical assistance to ensure data collection and reporting meets the minimum methodological requirements
Phase 4	Reporting	Deliver KPI values to the coordinator Deliver financial and administrative information to the coordinator Contribute to the draft report on the project process and outcomes, including recommendations	Review the Member States' clearing, weighting, aggregating and disaggregating of the KPI data Import KPI values in the KPI database Provide the KPI database and statistics to the Commission Report the KPIs at the lowest level of disaggregation available Draft report on the project process and outcomes, including recommendations
Phase 5	Dissemination	Promote the use of KPIs at national level	Assist the Commission in the publication and dissemination of the data Undertake activities to share the results and methodologies of the project

2.2. Development process for the common methodology

Several EU Member States have already considerable experience in collecting road safety performance indicators for their national policies, in order to measure progress and to assess the effectiveness of road safety initiatives. Such indicators contribute to the understanding of the different issues that influence overall road safety performances and they help to underpin road safety policies. However, for other EU Member States the systematic collection and analysis of data for such safety performance indicators had not yet started. In order to understand the level of expertise available in each Member State as well as their need for methodological support, a survey was conducted to get insights in the existing data collection methods already used for the estimation of KPIs. The results of this survey, alongside with international guidelines and methodologies available in the literature, led to the preparation of the methodological guidelines for each KPI for the Member States.

For the development of the final methodological guidelines, KPI Expert Groups (KEG) were established (cf. Section 2.1). The methodological guidelines for each KPI include recommendations concerning the data collection

(sample size, observation locations, observation methods, use of existing data sources, etc.), as well as the statistical analysis of the data for the calculation of the KPIs (data processing, weighting, aggregation, types of indicators, etc.). The definitions and the minimum data requirements set by the European Commission for the calculation of the KPIs, as described in a Commission Staff Working Document (European Commission, 2019) have been taken as basis for the development of the methodological guidelines. The best national practices observed in the EU and existing documents (e.g. Hakkert, A.S. & Gitelman, 2007, Schulze, H. et al., 2012, European Commission, 2017, Vollrath, M. et al., 2019, Van den Berghe, W. et al., 2020) were considered when drafting the guidelines. Specific guidelines and templates have been developed for data reporting, weighting of observations and data quality assurance. Draft versions of the guidelines were submitted to the participating Member States for feedback, in particular in relation to clarity and feasibility; this feedback has been incorporated in the final version of the guidelines. The methodological guidelines for each KPI are available on the Baseline website (baseline.vias.be) and are listed under the References. The guidelines will be updated at the end of the project, reflecting practices adopted by Member States during the project.

The Baseline project coordination team received numerous questions from Member States in relation to the methodological approaches to be conducted. These questions often were related to particular situations in Member States and/or demands to deviate somewhat from the common methodology. In as far as possible, reactions were sent within a few days after the question had arisen. However, for several demands, further consultation was needed within the KEG Teams, the Technical Committee or with the European Commission; so in those cases it took longer to answer. Many answers to the questions that had been raised before the Methodological Guidelines (see below) were finalised were actually incorporated in the Methodological Guidelines. Consultations were held with the Commission on the deviations of the minimum methodological requirements that could be accepted under certain circumstances.

2.3. Example 1: methodological requirements for the KPI "Driving under the influence of alcohol"

The KPI for driving under the influence (DUI) of alcohol (Boets et al., 2021b) is defined as the *"percentage of drivers driving within the legal limit for blood alcohol content (BAC)"*. For the data collection, three possible types of measurement method are considered:

- Random breath testing, i.e. roadside breath testing of randomly selected drivers
- Breath testing results from enforcement actions (even if not random)
- Self-reported behaviour through anonymous surveys

The EC expresses a clear preference for a KPI based on random breath testing, as this is generally considered to deliver an accurate picture of the situation. However, as random testing is not allowed in some Member States, breath testing results from enforcement actions is considered the second best option. If neither of these two options is feasible, data from self-reported behaviour based on anonymous surveys is also accepted by the EC.

Information of random breath testing is gathered by means of roadside surveys in cooperation with the police. During a roadside survey, drivers are randomly selected and stopped. The alcohol level of each of these stopped drivers is assessed by means of alcohol breath testing. Some basic information about the driver (e.g. age, gender) and the trip (e.g. length, motive) can optionally be observed or asked. Drivers need to be sampled randomly, meaning that the selection of drivers is irrespective of possible suspicion for DUI. The minimum requirement for vehicle types is the inclusion of passenger cars. Goods vehicles, buses and motorcycles are optional supplementary vehicle categories.

The roadside survey should provide a representative sample of all traffic in the study region. This covers in most countries three main road types: motorways, rural non-motorway roads (defined as roads outside built-up area) and urban roads (defined as roads inside built-up areas). The selection of locations should be as random as possible, covering the geographical area of the country. Separate results are also required for night hours and day time hours as well as for weekdays and weekend days. Data collection should also be carried out during late spring or early autumn.

The national KPIs on alcohol are expected to be estimated separately according to the following minimally required parameters:

- Road type (3 levels: motorways (only for motorcycles), rural roads, urban roads)
- Time Period (4 levels: night/day x week/weekend).

2.4. Example 2: methodological requirements for the KPI "Vehicle Safety"

The KPI for vehicle safety (Van den Berghe et al., 2021b) is defined as the *"percentage of new passenger cars with a Euro NCAP safety rating equal or above a predefined threshold"*. Euro NCAP ratings are the vehicle safety ratings assigned by Euro NCAP to new car models appearing on the European market, which are valid for six full years after the year of test. The overall rating is based on a 5 star scale, with 5 stars being the highest safety rating.

As to the safety threshold, two thresholds are to be used:

- a 'soft' threshold, corresponding with a 4-star rating
- a 'strong' threshold corresponding with a 5-star rating.

For the calculation of the KPI data on all newly registered passenger cars in a particular year should be collected from the national vehicle registries. The principal data element for the calculation of the indicator is the distribution of the newly registered passenger cars by make and model.

Alternative indicators have also been considered for the EU Member States that are not able to calculate the Euro NCAP score for their fleet. These indicators are defined as "the average age of the total fleet of car passengers" and "the percentage of the passenger cars that are roadworthy". For these indicators, the whole fleet of passenger cars needs to be considered.

3. Results

Mainly because of the COVID-pandemic, data collection for the KPIs was delayed in most Member States; most roadside surveys and other data collection process for the KPIs took place in autumn 2021 and spring 2022. The results will be available in October and will be reported at the TRA Conference.

4. Conclusion and next steps

Continuous and systematic monitoring of road safety performance will allow for a better understanding of road crash causes and the implementation of the proper measures and policies in order to prevent these causes. To measure progress, the most basic and important indicators are the numbers of road crash deaths and serious injuries. However, in order to gain a better understanding of the different factors that contribute to overall road safety performance, KPIs which refer to main road safety challenges are crucial. The Baseline project allows the collection of representative and comparable KPIs among EU countries, which will constitute the basis for monitoring and evaluating the road safety progress at national and EU level over the decade 2021-2030, will facilitate the formulation of targets at European an national level, and will support decision makers in deciding on the most appropriate measures to be taken to improve road safety. Several EU countries (e.g. Austria, Belgium, Greece, Latvia, Sweden, …) have integrated the monitoring of the KPIs in their road safety strategy; for some of them this was a direct result of the involvement in the Baseline project. The scope of Baseline 1 did not include the evaluation of the impact of each KPI on the percentage of deaths and serious injuries. These evaluations would require individual studies which could not be combined with the difficult task to develop and execute a common methodology across the different Member States for 8 KPIs.

A successor project has been announced by the European Commission, to monitor progress in road safety performance in the areas covered by the KPIs. Data collection is intended to take place in autumn 2023 and spring 2024. It is hoped that even more countries will join in this second project, and that also experience and data will be shared with countries outside the EU.

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