Testing of KPIs for the enforcement of traffic regulations

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Abstract. Key Performance Indicators (KPIs) may concern any of the steps of the penal procedure that constitutes enforcement of traffic regulations. Available data on relevant procedures and results vary widely among EU Member States. In order to select appropriate and useful KPIs on traffic enforcement, key road safety problems in each country should be considered and focus should be on particular road safety offences, groups of road users or types of roads that relate to these key problems. This paper describes the framework for the selection and the results of the pilot application of appropriate KPIs on enforcement of traffic regulations within the Trendline research project. Selected KPIs, concerned:
- the number of police controls/violation/population
- the number of tickets /violation/population
- the number of urban red light cameras/ network km or population or population/km2
- the number of fixed speed cameras or section control stretches per km of network or population or population/km2.
Pilot KPIs in three countries revealed that close cooperation with the Traffic Police and other authorities is needed to obtain data on enforcement procedures and results not freely available. Specific traffic violations seem of more interest e.g. speeding and drink-driving. Different approaches concerning driver awareness about enforcement actions were also identified.

Keywords: enforcement, KPI, Trendline, pilot.

1 Introduction

Worldwide, the intensification of road safety enforcement is proven to be the primary measure which can lead to an immediate improvement of the behaviour of road users and to the subsequent significant reduction of road crashes [1].

Enforcement is part of the Vision Zero philosophy and the Safe System approach as set out in the EU Road Safety Strategy [2]: 'The core elements are ensuring safe vehicles, safe infrastructure, safe road use (speed, sober driving, wearing safety belts and helmets) and better post-crash care'. A part of the 'shared responsibility' in reaching road safety goals of the EU Road Safety Strategy and Safe System approach is that law enforcement officers and the justice system need to work together to increase compliance with road safety law [3].

In the framework of the EU co-funded project "Trendline" [4], methodological guidelines for data collection, data analysis and delivery of road safety Key Performance Indicators (KPIs) were developed. These KPIs will be used within road safety policies to further support evidence-based decision making. KPIs included the eight basic ones listed in the EU road safety policy framework 2021-2030 as well as additional ones. The latter were selected using a structured process that included consultation with the Member States (MS) and application of selection criteria such as (national) policy relevance, (expected) feasibility and (likely) international comparability. One of the additional KPIs concerned the enforcement of traffic regulations [5].

The KPI on enforcement of traffic regulations was examined by a Key Expert Group (KEG) comprising experts from seven MS [5]. Following extensive exchange of valuable knowledge and experiences in different road transport systems the KEG concluded on potential options for the specific KPI, analysis of data needed for each option, data availability and alternative data sources. All these results were presented in the respective Trendline methodological guidelines [5] that can be a useful tool for the development of the KPI enforcement.

EU DIR 2004/345/EC on enforcement in the field of road safety requires that every two years Member States communicate to the Commission information on its implementation and developments in the fields in question. Specifically, information on enforcement in the field of speeding, drink-driving and seat belt and child restraint use is requested. Some of the information required by DIR 2004/345/EC is also necessary for the development of the proposed KPI enforcement of traffic regulations.

The objective of this paper is to present the framework for the selection and the results of the pilot application of appropriate KPIs on enforcement of traffic regulations within the Trendline research project.

2 KPI Enforcement of Traffic Regulations

Enforcement needs to be systematic and targeted in space and time, with particular emphasis on the key dangerous behaviors of road users. KPIs may concern any of the steps of the penal procedure that constitutes enforcement of traffic regulations [6], [7], [8], [1], [9], [10].

However, methods and procedures for the enforcement of traffic regulations vary widely among the Member States. Subsequently available data on relevant procedures and results may be substantially different among countries. Furthermore, it is essential to consider the key road safety problems in each country and to focus on KPIs that are related to specific road safety offences, road user groups, or roads types associated with

these key problems. Therefore, within Trendline, it was suggested that each Member State chooses to calculate the most appropriate and useful KPI on enforcement of traffic rules based on applicability and availability of data as well as on the particular needs in the respective country.

Based on the above, no single definition for the KPI enforcement of traffic regulations was provided within Trendline. Instead, the minimum methodological requirements to qualify for a KPI enforcement of traffic regulations selected from a proposed list of alternative options were defined. The proposed alternatives were identified in the relevant international literature [7], [2], [12], [3], [13], [14], [10] and relate to different aspects of enforcement:

Option 1: Number of police controls per infringement (speeding, seat-belt use, helmet use, distraction, drink-driving, red light driving) and per population

Option 2: Number of tickets per infringement (speeding, seat-belt use, helmet use, distraction, drink-driving, red light driving) and per population

Option 3: Number of red light cameras on the urban network per population

Option 4: Number of fixed speed enforcement cameras or section control stretches per population

It is noted that Option 1 and Option 2 refer to enforcement activities taken up by Police officers in certain periods and locations. Continuous enforcement using fixed cameras is not taken into account for this KPI.

Option 1 provides a good measurement of the effort dedicated to enforcement in a country and of the importance given to specific infringements. In combination with an analysis of key road safety problems in a country, this indicator can be very useful for the identification of enforcement gaps. Data on police controls for speeding, seat belt and helmet use and drink-driving are available in many countries worldwide. On the other hand, police controls for distracted driving are focused on driving while using a mobile phone and all other distraction factors are less examined. Data on red light running controls are also limited.

Option 2 reflects the effectiveness of enforcement activities in terms of identifying violators. Additionally, Option 2 in combination with Option 1 may provide useful insight as for the effectiveness of enforcement as a preventive measure. Similarly to Option 1, in most countries, the number of tickets is available for specific infringements. In this case too, data are limited concerning distraction factors other than driving while using a mobile phone and red light running. ETSC PIN Flash Report 42 [2] presents the most recent available data from European countries.

Option 3 is a measure of the level of enforcement at sites where traffic violations might be frequent and indicates potential gaps. Apart from official sources, data on red light cameras are also available in open databases which are regularly updated by anonymous users.

Option 4 is related to speeding which has been highlighted as one of the key road safety issues worldwide. Therefore, the importance of this indicator is undoubtable. Similarly to Option 3, data on the number of speed cameras are available from both official and non-official sources, covering both mobile speed cameras used by the police and the fixed speed cameras throughout the road infrastructure.

Data needed for the proposed KPIs could be available through Traffic Police in each Member State. In many Member States data on traffic regulations enforcement activities and the respective results are published and are freely available. This is done either by the Traffic Police directly or through other public authorities such as the competent Ministry or the national statistical body. In case the needed data are not freely available, they should be requested by the competent Authority using a comprehensive questionnaire to cover all aspects of the selected KPI.

Options 3 and 4 need data from official sources. Data from non-official sources should be considered only in case of total lack of an official response to the relevant request and should be treated as approximate or indicative information.

For Options 1-4, Member States may also choose different measurement units e.g. per km of network OR per population OR per population/km2 OR per traffic volume based on the available data and particular interests.

Table 1. Overview of minimum requirements for KPI enforcement of traffic regulations.

	Minimum requirement	Optional
KPI	One of the four suggested Options Option 1: Number of police controls per infringement (speeding, seat-belt, helmet, distraction, drink-driving, red lights) and per population Option 2: Number of tickets per infringement (speeding, seat-belt, helmet, distraction, drink-driving, red lights) and per population Option 3: Number of red light cameras on the urban network (per population) Option 4: Number of fixed speed cameras or section control stretches (per population) Options 1 and 2: minimum three different infringements considered	Additional Options on KPI Additional infringements Additional versions of Options 1-4 using different measurement units e.g. per km of network OR per population OR per population/km2 OR per traffic volume based on available data and particular interests of Member States.
Road type (if relevant)		Motorway Expressway including urban express roads Rural road Urban road (or road inside urban areas)
Vehicle type (if relevant)		Passenger cars / taxis Motorcycles Light goods vehicle Heavy goods vehicle Buses / coaches
Time period (if relevant)		Weekdays / Weekend Daylight / Night-time hours Special days
Sample size	Representative at national level	

3 Pilots on enforcement of traffic regulations

Pilot calculation of KPI enforcement of traffic regulations was conducted in three Member States, namely Finland, Poland and Portugal. All pilots were completed between autumn 2024 and spring 2025. Each Member State chose which option(s) for the KPI to calculate based on the available data and resources. An overview of the pilot calculations of KPI enforcement of traffic regulations is presented in Table 2.

Table 2. Overview of pilots on KPI enforcement of traffic regulations.

KPI	Finland	Poland	Portugal
Number of police controls per infringement and per population	Number of police controls for drink driving (NO other substances besides alcohol)	Number of police controls for drunk driving (OR under the influence of other substances)	-
Number of tickets per infringement and per population	Number of fines and traffic penalty fees (TPF) per infringement (speeding, seat belt, helmet, distraction, drink-driving, red lights) and per population in the last 3 years	Number of tickets per infringement (speeding, driver seat belt, helmet, distraction, drink- driving, red lights) per vehicle type, day, time of the day, population, 18+ population, number of driving licenses	-
Number of red light cameras on the urban network	Not available	Red light cameras on the urban network per 1000 km of network, 1 mln total population, 1 mln population in urban areas, population/km²	-
Number of fixed speed enforcement cameras or section control stretches	Speed enforcement cameras/ population	Fixed speed cameras Section control stretches per 1000 km of network, 1 mln total population, population/km²	Fixed speed cameras Speed control locations per population

4 Pilot results

Based on the results of the pilots in the different Member States, some conclusions were drawn concerning the feasibility, the usefulness and the applicability of the suggested options for the KPI enforcement of traffic regulations. Pilot results per Member State and selected options are presented below.

4.1 Finland

All four options were examined in Finland. Concerning Option 1 (effort) it was found that the number of police controls is only available for drink-driving.

Option 2 (effectiveness) seems more challenging as a two-tiered system for "tickets" is implemented i.e. fines and traffic penalty fees are given for the infringements. Fines for each infringement are clearly marked, but traffic penalty fees may appear in hundreds of potential categories, and one infringement can be assigned several traffic penalty fees.

Option 3 (enforcement level) requires cooperation with cities and municipalities since they hold the information on red light cameras.

Concerning Option 4 (speeding), cameras are geographically distributed, but it is not possible to determine their number per urban/rural areas based on police records so to not reveal the exact locations of speed enforcement cameras.

4.2 Poland

In Poland, Options 1, 3 and 4 were considered. Concerning Option 1 (effort), the number of controls is available only for drink-driving. Still, no distinction per vehicle type is made. The number of controls is available, however without any distinction per infringement, instead per vehicle type.

The number of red light cameras, fixed speed cameras and section control stretches Options 3, 4 (enforcement level, speeding) are available only centrally i.e. through the Centre for Automatic Enforcement of Road Traffic within the General Inspectorate for Road Transport.

4.3 Portugal

In Portugal, Options 1-3 (effort, effectiveness, enforcement level) were not calculated either due to the lack of the necessary data or because they were not preferred by the competent authorities.

Concerning Option 4 (speeding), data before and after radars' activation reveal 36% reduction in accidents involving injuries, 74% decrease in fatalities, 44% reduction in serious injuries, and 36% decrease in slight injuries. In Portugal, speed enforcement is totally visible and communicated as all speed control locations are clearly indicated on roads through traffic signs, listed on a website and integrated in an application.

5 Conclusions and recommendations

KPI enforcement may concern any step of the penal procedure comprising the enforcement of traffic regulations. The proposed options for the KPI on the enforcement of traffic regulations concern procedures (i.e. controls) and respective results (i.e. tickets) as well as the use of technical equipment (red light or speed cameras). For all four proposed options, data collection does not require on-site measurements. Instead of that, a solid, unhindered cooperation with competent road authorities is necessary. Close cooperation with the Traffic Police and other Authorities is needed to obtain data on enforcement procedures and results that are not freely available. This may be considered a drawback in some cases.

In several Member States, specific traffic infringements are of more interest i.e. speeding and drink-driving. Still other infringements that are often listed among the main killers on the road e.g. talking on a mobile phone while driving or not using a helmet as a rider should not be overlooked when enforcement methods and results are explored. Methods and procedures for the enforcement of traffic regulations and available data on procedures and results are substantially different among countries. In addition, key road safety problems in each country and associated road safety offences, road user groups, or roads types must be considered for the selection of useful KPIs. Therefore, each Member State should choose the most appropriate and useful KPI enforcement based on the applicability and the availability of data as well as on the particular needs in the respective country.

Based on the above, no single definition for the KPI enforcement of traffic regulations is provided in the respective methodological guidelines [13]. However, minimum methodological requirements for alternative KPI enforcement options that relate to different aspects of enforcement are set.

Further research on enforcement practices and needs in order to better specify appropriate KPIs, could address the possibility to improve data availability on enforcement effort and effectiveness (i.e. by supporting Traffic Police improve recording of conducted checks and results), the question of drivers being (fully) aware of enforcement systems (e.g. location of speed cameras) or not and the need for a centralized system that will include all information on enforcement of traffic regulations procedures, equipment, activities and results from all responsible stakeholders (e.g. Traffic Police, local and regional authorities, road operators).

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