Improved Signage for Better Roads

An ERF Position Paper towards improving Traffic Signs in European Roads

Table of Contents

1. Executive Summary

Vertical signage (commonly referred to as traffic signs) is an essential element of a modern and well maintained road infrastructure. It helps regulate traffic, provide crucial visual guidance, can alert drivers to potential hazards on the road and give drivers important preview time during night-time conditions.

The functionality of traffic signs depends on their visibility and recognisibility during daytime and night-time. During the day this requires that the sign face and symbol colors are not faded in such a way that it becomes impossible to recognise the message that the sign is trying to deliver. Additionally, during night-time, the sign should be able to reflect the light from the headlights of an approaching vehicle back to the driver of that vehicle. This requires that traffic signs are maintained on a regular basis and replaced either once their visual performance begins to fall below the desired level or in case of damage to the signs (e.g. vandalism).

However, as a result of cut-backs in public spending, there is an increasingly large backlog in traffic sign maintenance. For example, Germany has 25 million traffic signs of which 33% are considered non-readable and 25% being older than 15 years. In practice, this means that many traffic signs fail to perform their basic function, thus creating an increasingly hazardous road environment for all users and especially for drivers unfamiliar with the road.

As Europe's population is ageing, it is important to ensure that road infrastructure adapts to the needs of an increasingly important segment of road users who display reduced visual abilities and slower reaction times. At the same time, as European cross-border traffic increases, it is advisable that authorities strive to reach a greater degree of harmonisation on European roads, where significant differences exist even though traffic signs across Europe are governed by the Vienna Convention. This will not only generate an increasingly familiar driving environment for drivers across Europe, moreover, it will maximise the safety potential emanating from the Traffic Sign Recognition systems that are present in modern vehicles.

In brief, this position paper advocates for:

- Authorities to tackle phenomena of unnecessary traffic signs proliferation and ensure that, when deployed, they provide a clear and unambiguous message to road users
- The need, on behalf of road authorities, to urgently prioritise road sign maintenance by first, establishing an inventory of signs under their jurisdiction, second, assess their retro-reflectivity and establish a work plan for the replacement of non-performing signs
- The necessity to adapt traffic signs to the needs of an increasingly ageing driver population by ensuring that safety critical signs are sufficiently visible for the reduced visual abilities of such drivers
- A greater harmonisation of traffic signs across Europe to cater for a growing percentage of cross-border traffic and maximise the safety benefits that can arise by the gradual introduction of Traffic Sign Recognition Systems in new vehicles.

2. Introduction

In 2011, the European Commission unveiled its 4th Road Safety Action Programme, which set a highly ambitious target of reducing fatalities across the EU by 50% by 2020 compared to 2010. In other words, this means decreasing the number of people killed on Europe's roads by 7,5% every year.

The latest figures unveiled this year show that, despite significant progress achieved during the last four years (18% between 2010 and 2014[1]), the target set in 2010 will not be met should the current trend persist. At the same time, almost 1.5 million peple are injured on EU roads every year, 1/6 of which are estimated to be serious[2]. In brief, the fact is that 70 people die and more than 650 are seriously injured every day on Europe's road.

Even if Europe is experiencing difficult economic times, cutting down on Road Safety related expenses is a short-sighted remedy. These accidents, apart from the immeasurable human suffering, are estimated to cost the EU €300 billion a year, a colossal amount which is larger than the GDP of many EU countries and represent approximately 2% of EU GDP. Now more than ever, it is imperative to reduce this huge haemorrhage of public resources and ensure that this money is used to stimulate investment in growth and jobs which Europe so badly needs.

Given that reducing fatalities gets disproportionately harder the more the numbers go down, it is essential that policymakers consider solutions that are readily available and which are cost-effective. As an association that advocates for improvements in road infrastructure, the ERF will keep on defending cost-effective solutions that make a difference on our roads today.

This position paper is dedicated to the importance of vertical signage as an essential road infrastructure element.

3. The importance of a well maintained infrastructure and traffic signs

3.1 Disparities between trends in road maintenance and road safety objectives

Europe's roads cannot be safe in the long-term unless its governments ensure sustainable sources of revenue for road maintenance. Investments in road infrastructure during the past decades, coupled with improvement in vehicle technology and enhanced enforcement and driver training, have meant that the number of fatalities on Europe's roads have fallen by more than 50% [3].

Figure 1 – Trends in EU Road Fatalities since 2010

Since 2009, and largely as a result of the significant spending cuts in public spending resulting from the financial crisis, maintenance budgets have been reduced significantly. According to the International Transport Forum, investment in road maintenance has been declining as a share of total road spending especially over the last couple of years.

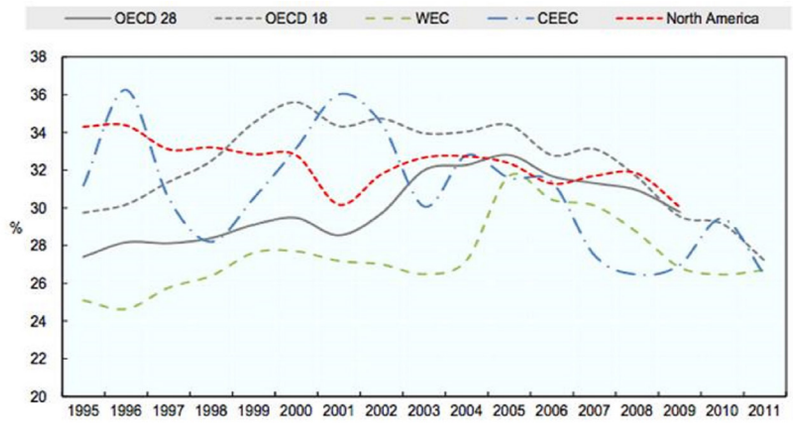


Figure 2 – Public road maintenance share of total road expenditure 2011

As shown in Figure 2, the percentage of funds allocated to road maintenance has fallen to below 30% of total road expenditure, from high of to 36% in the early 2000's[4] .

This decline in the share of expenditures devoted to road maintenance becomes even more alarming when put within this the context of a total decrease in the absolute numbers invested for roads as a share of infrastructure spending. As can be seen in Figure 3, the share of investment dedicated to roads in the European Union compared to railways has declined slowly but steadily since 2008 resulting in what can be coined as a double dip of investment in road maintenance.

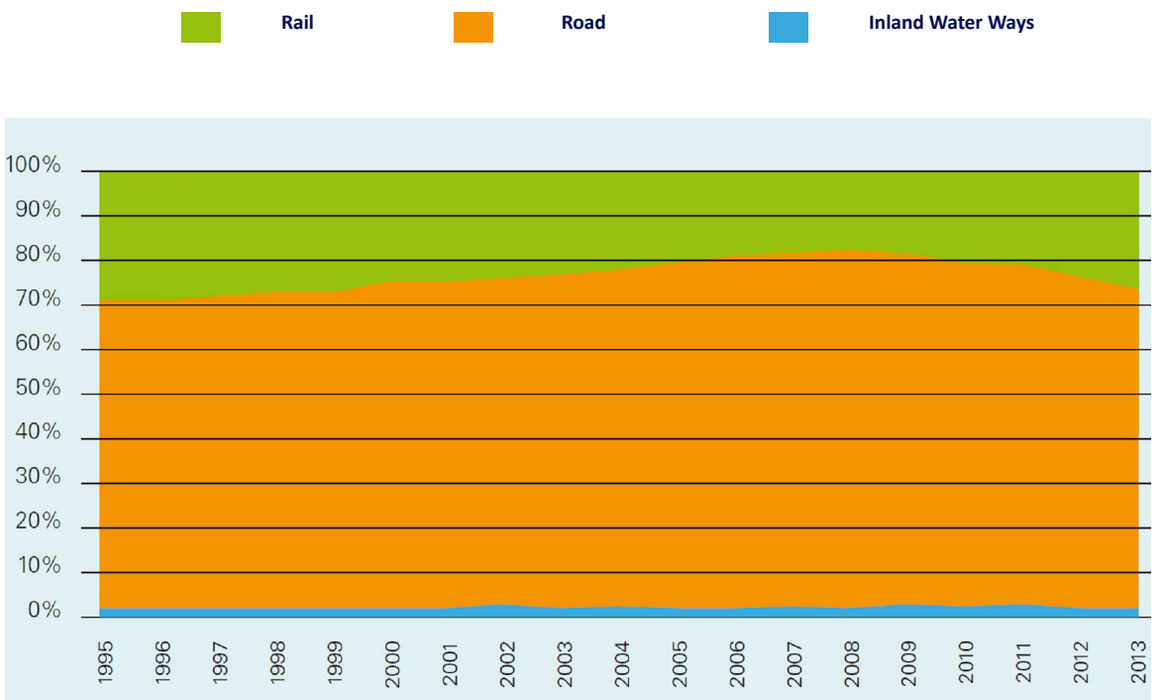


Figure 3 – Distribution of Infrastructure Investment between modes in European Union (€) 1995-2013

3.2 Current trends in traffic signs maintenance

This downward trends in road maintenance have naturally had an impact on traffic signs maintenance, with signs not being replaced when needed and some of them ultimately becoming unreadable.

The Federal Republic of Germany has a total of 25 million traffic signs. Due to a chronic lack of maintenance, it is estimated that approximately 8 million traffic signs (33% of total signage) in Germany are unfit for purpose, with 25% being older than 15 years. The desired performance level of traffic signs drops, thus rendering them practically redundant and reasulting in a comparatively more confusing environment for the road user.

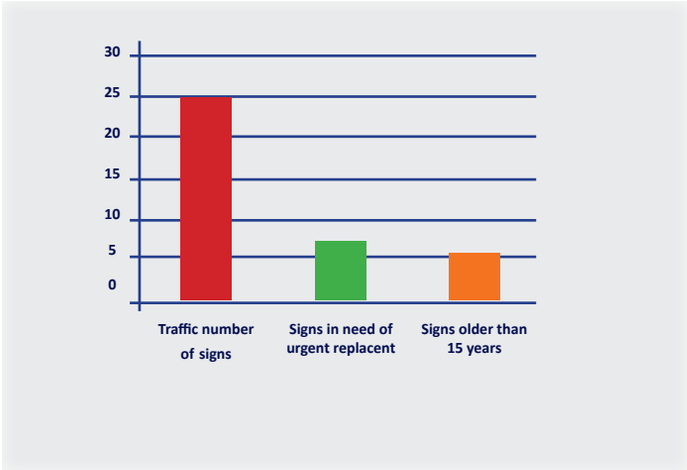


Figure 4 - Traffic signs in Germany (millions)

For example, in Croatia, an extensive survey for traffic signs took place in 2014 to assess the condition of traffic signs on the network by assessing first their retro-reflectivity, second their technical condition and third, whether they conform with national regulations in place. A total of 11717 signs were assessed over 625km performing manual measurements [5].

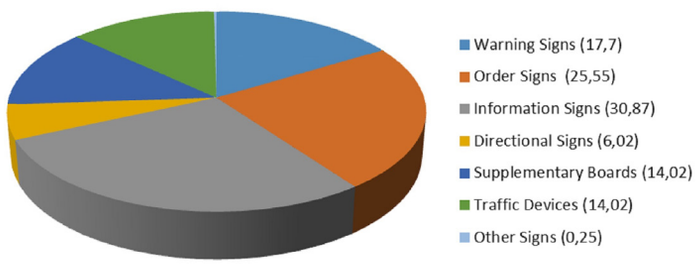


Figure 5 – Signs inspected by category (%)

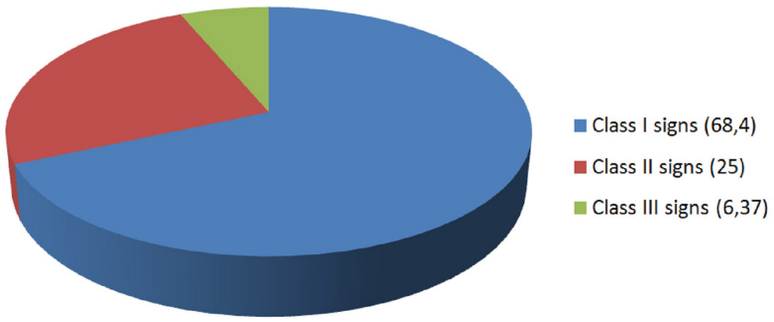


Figure 6 – Grouped by reflective performance class

According to the survey's conclusions, 20% or 2370 signs failed to meet basic retro-reflectivity requirements, which is practice means that they provide little or no value to users in terms of road functionality. The average life of signs was 11 years. An additional 12% or 1385 signs failed due to other parameters, bringing thus the total percentage of non-compliant signs to 32%!

In France, the average age of traffic signs is approximately 17 years, while their performance has an average life of between 8-12 years. As a result, is estimated that 40-50% of all traffic signs have outlived their life-time performance and no longer comply with the national regulatory requirements for the products' performances [6].

3.3 The importance of investing in traffic signs and infrastructure

Until now, the lack of investment in road maintenance has fortunately not had an impact on overall levels of road safety at EU levels. As explained in the introduction of this position paper, road fatalities reached an all-time low in 2013. The existence of a sufficiently well maintained infrastructure until 2008, combined with technological advances in vehicle and more strict enforcement have proved adequate to bring down the number of fatalities in Europe.

To this, one should also add the impact of the financial crisis on traffic volumes and the positive impact this has on road safety levels. Generally speaking, there is a positive correlation between the number of users driving on the roads and fatalities. In other words, the higher the number of users, the higher the exposure of drivers to the risk of an accident. As a result of the economic crisis that has engulfed Europe since 2008, traffic volumes in many countries have decreased significantly especially in the Southern European countries.

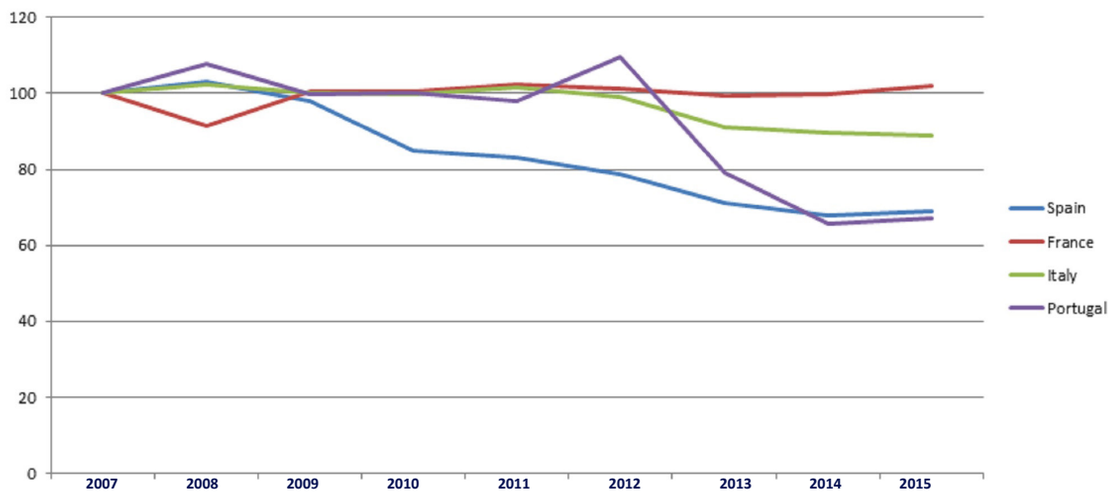


Figure 7 – Increase/ Decrease in Traffic Volumes (%)

While it is impossible to quantify the impact this has had in road safety levels, it can be assumed beyond any reasonable doubt that the economic crisis has provided a 'positive externality' to road safety levels given that the exposure rate has fallen.

It is obvious that if current patterns of underinvestment in road maintenance persist, the safety of road users and the efficiency of the road network will be affected. And, as the European economy gradually picks up, traffic volumes will begin rising once again. Thus, it is imperative for governments to change track and put road maintenance once again at the top of the priority list.

Investing in road infrastructure in fact is one of the most cost-effective measure a public authority can make. Apart from the indirect benefits that a good road infrastructure brings (e.g. enhanced mobility and trade, increased connectivity), investing in simple road infrastructure measures can often bring impressive rates of return in terms of reduced fatalities and injuries.

Traffic signs are an essential element of a modern and safe road infrastructure. They represent simple and cost-effective interventions that can yield impressive rate of return in terms of road safety and thus, reducing the socio-economic consequences.

3.3.1 Case Study - UK

In 2013, the Road Safety Foundation in the UK published a report entitled 'Measuring to manage: 'Tracking the Safety of Britain's major road network. Taking the period 2002-2006 and '2007-2011' as a reference, the report published the results of a before-after analysis of certain road sections which had shown the largest safety improvements during these two periods. The analysis demonstrated that traffic signs, either in the form of an improvement of existing signage or the installation of new signs, was one of the contributing factors in a 7 out of 10 road stretches examined, which led to overall impressive decreases in fatalities of up to 87%.

Figure 8 - Examples of traffic sign interventions

Road no.	From - to description	Region/country	Length (km)	Road type[1]	No. F&S crashes (2002-06)	EuroRAP Risk Rating (2002 06)[2]	No. F&S crashes (2007-11)	EuroRAP Risk Rating (2007-11)[2]	% decrease in no. F&S crashes	Measures implemented include:
A4128*	High Wycombe - A413 (Great Missenden)	SE	11	Single	31	132.0	4	20.9	-87%	Speed limit review, improved directional and warning signs, improved road markings, intelligent road studs, traffic calming measures, upgrading pedestrian crossing facilities in villages
M6	M6 J44 (Carlisle) - A74(M) Gretna	NW	10	Motorway	24	38.7	5	7.1	-79%	Upgrade from 2-lane dual carriageway to 3-lane motorway, 3m hard shoulder, junction improvements, local access road provided adjacent to route
A435*	Cheltenham - A46 (Tewkesbury)	SW	12	Single	25	81.3	7	22.8	-72%	Junction improvements including widening, signing and lining, interactive signs, resurfacing, traffic calming, speed limit changes, toucan crossing
A418	Thame - Aylesbury	SE	13	Single	24	44.6	7	13.4	-71%	Resurfacing, speed limit changes, red surface treatment and renewed cross hatching at high risk junction
A120	Puckeridge - Braintree	E	40	Mixed	58	38.2	19	8.8	-67%	Kerb re-alignment, additional warning signs, high friction surfacing, speed limit changes, road marking improvements
A34	Stafford - Stoke-on-Trent	WM	21	Dual	30	33.9	10	11.4	-67%	Mobile camera enforcement, resurfacing, signing improvements, speed limit changes, pedestrian facilities
A41	A1 (Edgware) - M1 J5 (Watford)	E/London	10	Mixed	45	84.3	15	26.3	-67%	Signing and lining improvements, high friction surfacing, central island alterations, coloured surfacing
A52	Nottingham RR - Bingham	EM	13	Mixed	33	39.4	11	13.7	-67%	Average speed cameras, consistency of signing and markings, 50mph buffer zones between 40mph/NSL, central safety barriers
A1066	Thetford - Diss	E	31	Single	38	90.1	13	32.5	-66%	Centre hatching markings on non-overtaking sections, improved edge definition markings on lay-bys, vegetation clearance, signing improvements
A21	Pembury - A229 (Hurst Green)	SE	21	Single	49	65.8	19	27.2	-61%	Drainage, lighting, signing, lining and junction improvements, traffic calming, speed limit review

Figure 9 – Britain's most improved roads

3.3.2 Case Study - Norway

In 2002, and in view of the preparation of the government next 10 year transport plan for 2006-2015, Elvik and Rydningen published a report entitled 'Effectiveness of traffic safety mesures', where it made an assessment of low-cost traffic cost treatments that have been introduced in Norway in recent years in terms of cost-benefit. The report found that signing hazardous curves was the most affordable road safety counter measure with an average cost of intervention of € 8,000 and outweighed the costs by a factor 3,5:1 [7, 8].

Treatment	Mean cost (NOK)	Mean AADT	Cost-benefit ratio
Pedestrian bridge or underpass	5,990,000	8,765	1:2.5
Converting 3-leg junction to roundabout	5,790,000	9,094	1:1.6
Converting 4-leg junction to roundabout	4,160,000	10,432	1:2.2
Removal of roadside obstacles	310,000	20,133	1:19.3
Minor improvements (miscellaneous)	5,640,000	3,269	1:1.5
Guard rail along roadside	860,000	10,947	1:10.4
Median guard rail	1,880,000	42,753	1:10.3
Signing of hazardous curves	60,000	1,169	1:3.5
Road lighting	650,000	8,179	1:10.7
Upgrading marked pedestrian crossings	390,000	10,484	1:14.0

1 NOK = 0.138 Euro (December 2002)

Figure 10 - Cost benefit ratio of of different traffic safety measures

3.3.3 Case Study – Australia

In Australia, the Ministry of Transport carried out in 2012 an ex-post analysis of its National Black Spot programme. The evaluation covered 1599 black spot projects approved during the seven-year period 1996–97 to 2002–03. In total, the programme is estimated to have reduced fatal and casualty crashes at the treated sites by 30% and property damage only (PDO) crashes by 26%. Of the different traffic measures implemented, the report identified traffic sign interventions as the one with the best cost-benefit ratio. More specifically, priority signs and altering traffic directions were found to have an estimated cost-benefit ratio ranging between 15:1 and 20:1 depending on the financial hypothesis made on the project. Other sign treatments that were found to have a high rate of return were the installation of warning signs and modifying signals that were found to have a cost-benefit ratio of 14 or 9 at the respective discount rates [9].

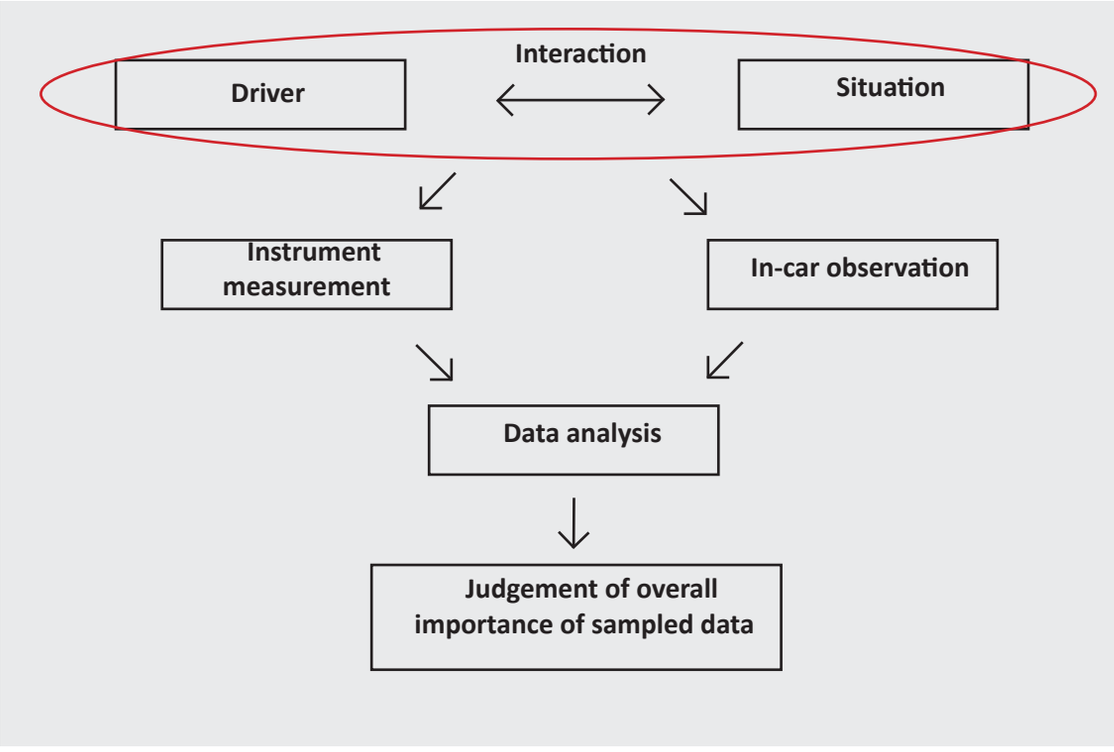
3.3.4 Case Study - Analysis of the eye movement characteristics at different laminated retro-reflective traffic signs

The aim of this field study was to analyse several eye movement characteristics at different laminated retro-reflective traffic signs, through the analysis of eye movement characteristics in real night-time driving circumstances.

During the test drive, subjects had to look at specific targets inside the vehicle and had to find their way through the test route, only relying on traffic signs and on rather vague instructions from a co-driver.

The system consisted of a gaze-tracking device with 2 cameras, an infrared camera which recorded one of the subjects' pupils and a second one that captured the same section of environment that subjects saw in their visual field.

The conclusions of this study stressed out the significance of the overall effect of retro-reflective traffic signs on eye movement characteristics. Most importantly, as drivers are able to read the text from larger distances, the displayed information is perceived in due time, hence providing them potentially more time to set their visual focus and thus their concentration on other relevant stimuli in road traffic.[10]



4. Future Challenges

According to the definitions in CIE Publication No. 74 entitled "Roadsigns", there are 4 basic requirements for road signs[11]:

→ **Conspicuity - Signs need to attract attention, so that they are noticed**

→ **Legible and recognisability: the message displayed must be legible (for directional signs) or recognisable (symbols) from the distance the sign must be seen**

→ **Comprehensibility: The message displayed must be easily understood and the response required by the message must be clearly conveyed**

→ **Credibility: The road user should believe the message and act upon it**

Dr. Rune Elvik, "General overview on Road Safety", 1999, has interpreted these basic requirements and related them to the main goal of road safety, namely to reduce accidents. All the above requirements should be interpreted as a sequence; all 4 requirements must be met, in a cascading flow, in order for the road sign to be effective.

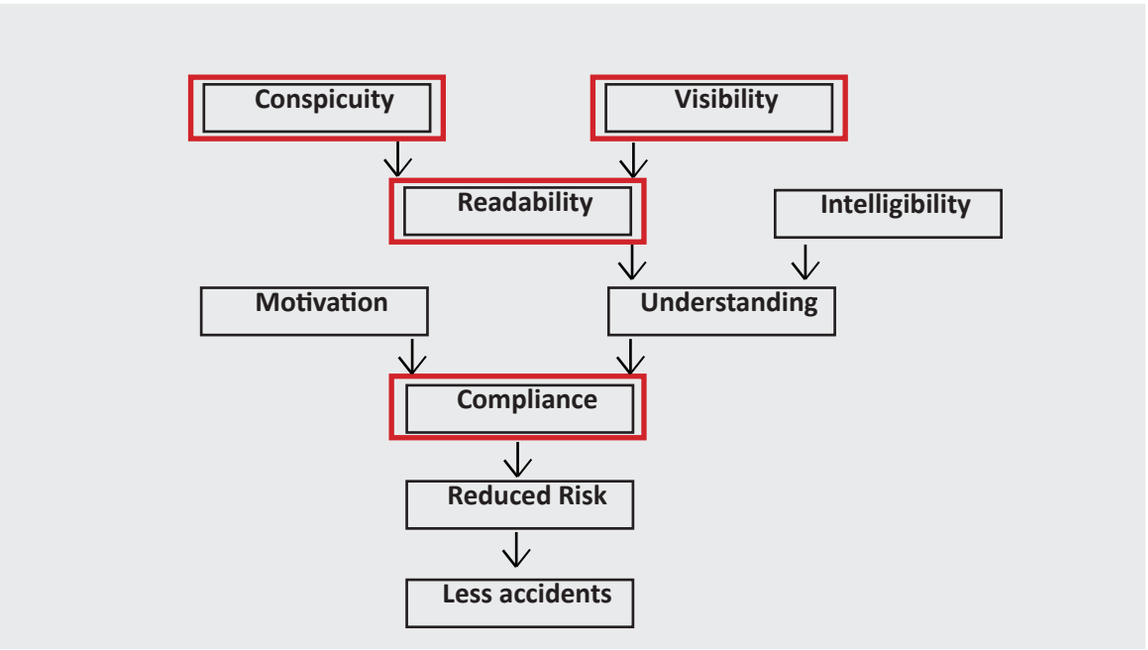


Figure 11 - A general model of factors that affect the effects of traffic signs on road safety

In this light, the ERF is making the following strategic recommendations.

4.1 Ensuring clarity of signs and avoiding over-population

Appropriately designed, operated, and maintained traffic signs can ensure the smooth flow of traffic along streets and highways at defined speeds, thereby reducing congestion. Poor traffic flow can have both a rational and emotional impact. For the majority of road users the biggest impact of bad traffic flow is the inconvenience and wasted time while the emotional impact is also significant with a lack of consistency and predictability resulting in stressful and uncomfortable journeys.

According to a report published by the City of London, anything which facilitates consistency and predictability would result in smoother traffic flow. The same report indicated that drivers in central London feel particularly strongly that existing signage is inadequate and does not help them to navigate. This has a detrimental impact on consistency because people who are having difficulty finding their way will often be travelling more slowly. Respectively, a large number of traffic signs can result in the same problem[12].

As such, it is essential that, when installing traffic signs, road authorities at any level make sure that the signage provides a service to the user and does not gerenate unnecessary confusion. This means first and foremost, avoiding an 'over-population' of traffic signs which, apart from confusing users, is also an ineffective use of public resources.

Figure 12 - Example of unecessary multiple use of the same traffic signs

Figure 13 - Example of traffic sign overpopulation

4.2 Road Asset Management - Stepping up maintenance of traffic signs and ensure timely replacement

For traffic signs to play their essential role for road users, they must remain first and foremost visible. As a result of cutbacks in public spending, there is an increasing backlog in the maintenance of traffic signs which means that many signs on the road have faded colors, insufficient contrast between sign face and symbols or no longer retain sufficient retro-reflective properties to remain clearly visible to users during both daytime as during the night. As a result, it is imperative that authorities begin a programme of replacement of old traffic signs with a view to reducing the maintenance backlog over a 5 year period.

The way of implementing this can be two-fold. A first course of action could be the strategy of replacing traffic signs at fixed time intervals in line with the guarantee provided by the manufacturer as is practised for example in the Netherlands.

Another course can be the **'road asset management'** approach whereby authorities can perform an assessment of the actual condition of traffic signs on their respective networks, so as authorities avoid spending further financial resources . This would imply a two-step parallel approach in line with the principle of road asset management:

→ Establish nationwide inventories of traffic signs
→ Perform surveys of traffic signs to assess the degree of compliance with national standards

Modern technologies exist today, with further scope for development, allowing road authorities to measure the condition of their traffic signs in quick, safe and cost-effective manner. In recent years, dynamic vehicle –mounted methodologies for monitoring traffic signs have been developed replacing traditional manual inspection techniques, thus allowing authorities to obtain a clear picture of the condition of their network.

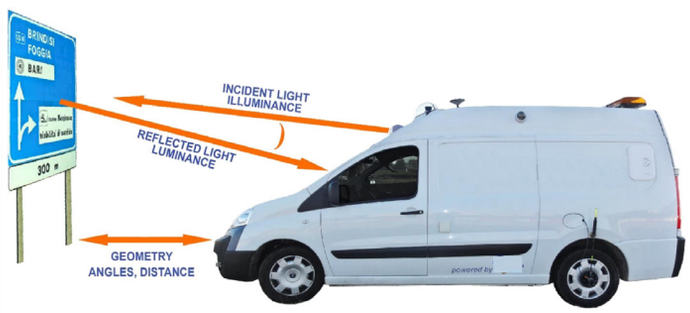


Figure 14 - Example of dynamic sign measurement system

In addition, bottom-up initiatives such as Schilderüberwachungsverein[13] in Germany can also assist authorities in obtaining a better knowledge of the state of their traffic signs and prioritise maintenance. Established in 2014, Schilderüberwachungsverein is an association whose objective is to promote road safety in Germany by improving the condition of existing traffic signs. To assist road authorities, the association has set a smart-phone based application which allows road users to upload traffic signs in need to replacement, which subsequently is communicated to the relevant authorities. To date more than 1000 traffic signs have been identified for replacement by users.

Figure 15 - Number of reported defective signs in Germany via Schilderüberwachungsverein

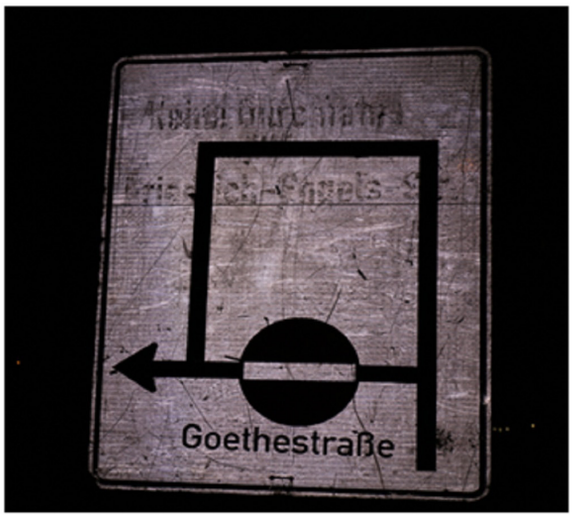


Figure 16 & 17 - Examples of defective signs via Schilderüberwachungsverein

4.3 Ensure that traffic signs correspond to the needs of an ageing population

As Europe's population is ageing, the presence of well-maintained traffic signs on Europe's roads is actually becoming ever more important.

It is estimated that the percentage of older drivers, i.e. above 65 will increase from 17,5 % of the overall population in 2011 to 23,6 % in 2020 progressively raising to 28,6 % by 2050 where it is expected to stabilise.

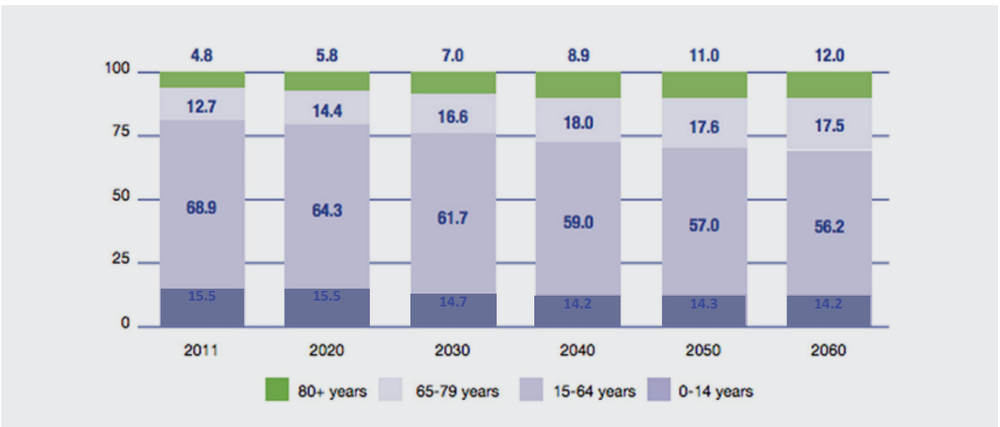
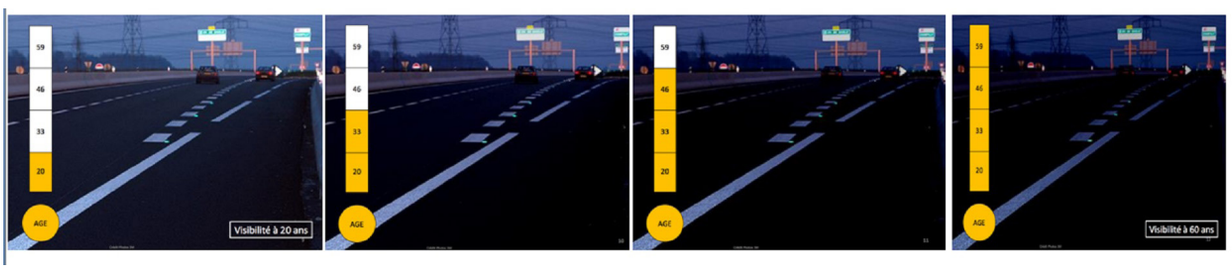


Figure 18 - Demographic Projection for Europe (2011 - 2060)

As a general rule, drivers over 60 tend to display a lower reactivity times compared to their younger counterparts as a result of a gradual loss of visual accuracy, difficulty in close vision, changes in colour perception, problems seeing in low light or night time conditions etc. The following graphical sequence clearly illustrates the effect.



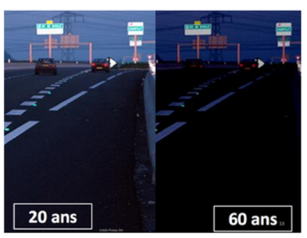


Figure 19 - Comparison in visual accuracy between different age groups

In Japan, which has the most rapidly ageing population worldwide, authorities adopted in 2004 a White Paper on Traffic Safety which put special emphasis on elderly people, given that represented the highest fatality ratio of the total population.[14]

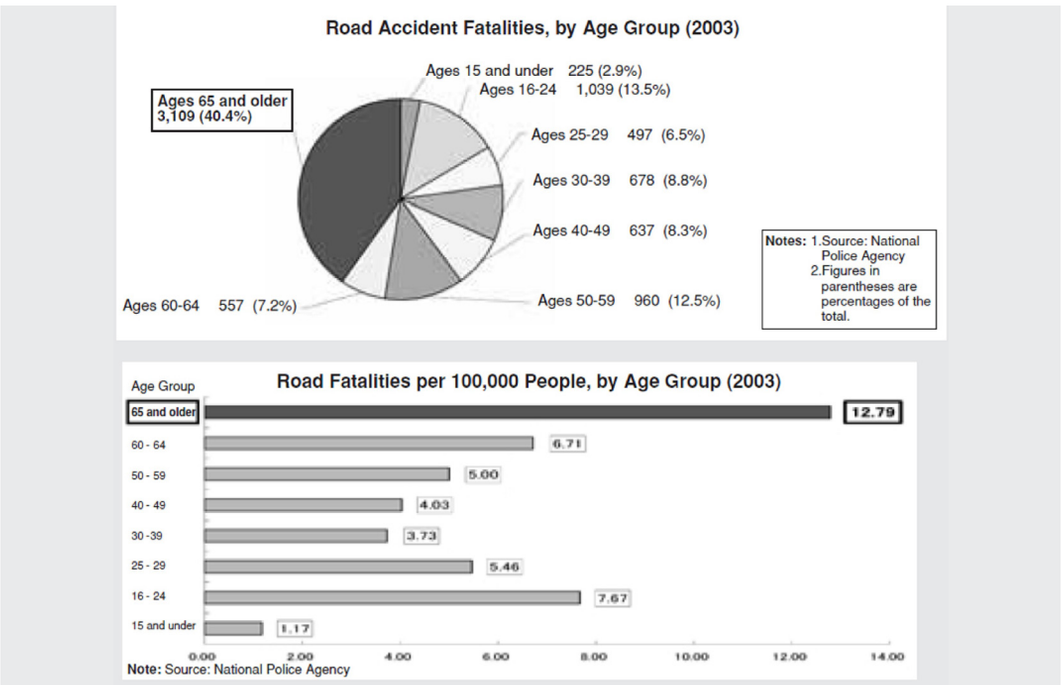
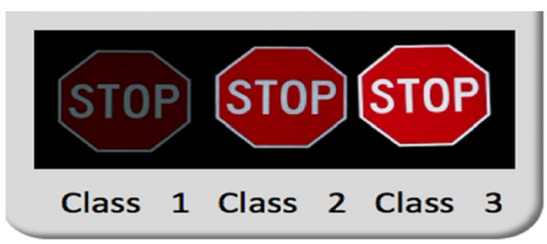


Figure 20 - Road accident fatalities by age group in Japan (2003)



Class 1 - Low Retroreflectivity
Class 2 - Medium Retroreflectivity
Class 3 - High Retroreflectivity

One of the traffic measures recommended for night-time driving was the deployment of larger and brighter road signs as a means of providing elderly drivers with more time to react.

In light of the reasons above, the ERF recommends the upgrade of safety critical signs within the Vienna Convention, i.e. categories A (Danger warning signs), B (Priority signs), C (Prohibitory or restrictive sign) to minimum Class 2. This is something which is already stipulated in the use tables of many countries with high levels of safety.

The Convention on Road Signs and Signals, commonly known as the Vienna Convention on Road Signs and Signals, is a multilateral treaty designed to increase road safety and aid international road traffic by standardising the signing system for road traffic (road signs, traffic lights and road markings) in use internationally.

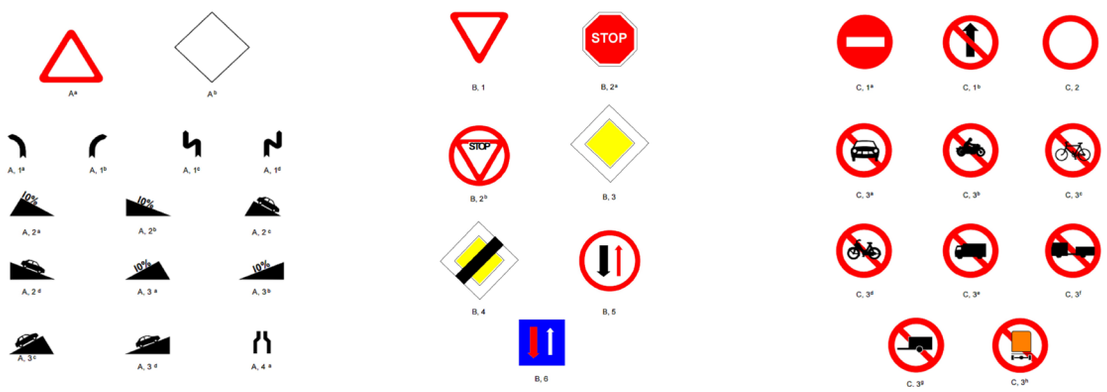


Figure 21 - Category A (Danger), B (Priority) and C (Prohibitions or Restrictions) road signs respectively

4.4 Greater harmonisation of traffic signs across Europe / Interaction with the intelligent vehicle

Despite the existence of the Vienna Convention, which has been ratified by most EU countries, there are still marked differences between many countries with respect to basic traffic signs.

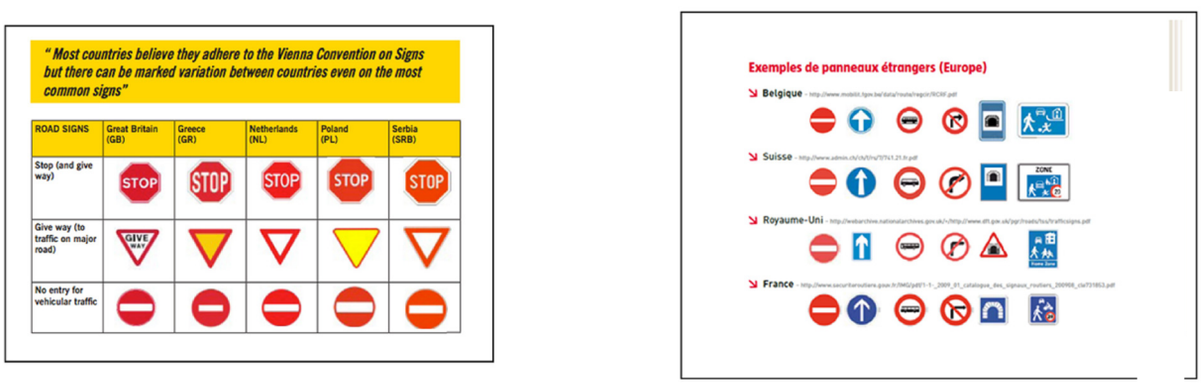


Figure 22 - Despite the Vienna Convention there are significant differencies in sign indifferent counties

As cross-border traffic across the EU becomes more common, especially with respect to freight transport, it is advisable to try to ensure a greater harmonisation of traffic signs (e.g. size of signs, letter format etc). In this respect, the United Nations Economic Cooperation for Europe has launched a dedicated expert group that will look into compliance with the Vienna Convention at EU level and propose means of ensuring greater coherence for traffic signs across Europe. The ERF fully supports this process, as in its opinion, it would help increase road safety on Europe's road in multiple ways:

First of all, it would lead to the creation of a more familiar driving environment for drivers crossing border and thus, avoid the potential safety risks often associated with the inability of users to properly understand traffic signs on the road.

Second, it would help optimise the interaction between traffic signs and ADAS (Advanced Driver Assistance Systems) in vehicles that are gradually entering the market. While full road automation may be a long-term goal for policy makers and vehicle manufacturers, the reality is that the short-to-medium future will see the introduction of partial automation (Levels 1 and 2), where ADAS interact with the physical infrastructure and when vehicle technologies will assist the driver in avoiding errors that pose a safety hazard. According to the Roads that Cars can Read Report published by EuroRAP and EuroNCAP, at least half the vehicle travelling on Europe's roads by 2025 will be equipped with ADAS technologies that allow cars to read traffic signs (Traffic Signs Recognition - TSR).

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/ Deceleration	*Monitoring* of Driving Environment	Fallback Performance of *Dynamic Driving Task*	System Capability *(Driving Modes)*
***Human driver* monitors the driving environment**						
0	**No Automation**	the full-time performance by the *human driver* of all aspects of the *dynamic driving task*, even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	**Driver Assistance**	the *driving mode*-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	Human driver and system	Human driver	Human driver	Some driving modes
2	**Partial Automation**	the *driving mode*-specific execution by one or more driver assistance systems of both steering and acceleration/ deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	**System**	Human driver	Human driver	Some driving modes
***Automated driving system* ("system") monitors the driving environment**						
3	**Conditional Automation**	the *driving mode*-specific performance by an *automated driving system* of all aspects of the dynamic driving task with the expectation that the *human driver* will respond appropriately to a *request to intervene*	System	**System**	Human driver	Some driving modes
4	**High Automation**	the *driving mode*-specific performance by an automated driving system of all aspects of the *dynamic driving task*, even if a *human driver* does not respond appropriately to a *request to intervene*	System	System	**System**	Some driving modes
5	**Full Automation**	the full-time performance by an *automated driving system* of all aspects of the *dynamic driving task* under all roadway and environmental conditions that can be managed by a *human driver*	System	System	System	**All driving modes**

Figure 23 - Five levels of road automation

With the aim to reduce the frequency of exceeding speed limits, TSR systems are often combined with Intelligent Speed Adaptation (ISA) systems, i.e. are not only indicating the applicable speed limit but also putting it into relation to the speed currently driven. Therefore, apart from just displaying the identified traffic sign to the driver, additional strategies can influence the effectiveness in improving safety, either by warning the driver that the speed limit is exceeded (open ISA) or controling automatically the speed of the vehicle (closed ISA).

A recent report published by TRL on the benefits of new vehicle technologies found that ISA is one of the most promising technologies in terms of potential safety benefits that should be considered for a possible pan-European legislative proposal.

Code	Measure	Feasible?	BCR	Legislate?	Recommendations/Notes
ISA	Speed limiters controlled by road speed limit (speed assist, intelligent speed adaptation)	✓	>1	●	BCR>1 for 6 Member States, for voluntary activation (switched on/off by the driver) and mandatory activation, and public acceptability of the systems considered to be growing. BCR higher for mandatory activation system, but both have positive BCR

This position has been echoed by the European Transport Safety Council which has proposed that all new commercial and passenger vehicles are fitted with an overridable assisting Intelligent Speed Assistance (ISA) system as a means of reducing fatalities on Europe's road in cost-effective manner. Endorsing these latest findings, the Belgian Federal Government recently presented to the parliament an action plan for the possible widespread introduction of ISA in the country[15, 16].

Infrastructure changes are not required for TSR/ ISA systems, what is however needed is that traffic signs are visible and that divergences between countries are minimised. In this sense, a greater harmonisation of traffic signs across Europe, in addition to creating a more familiar environment for drivers, would also maximise the safety benefit of these new technologies that are gradually entering the market.

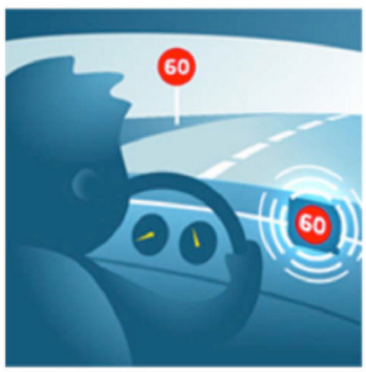


Figure 24 - Example of ISA System

Third, it would allow for the introduction and rationalisation of new signs into the Vienna Convention, which are currently not formally part of the convention but have been introduced by national authorities. A good example is the traffic signs meant to indicate a 'black spot', i.e. an area which has experienced in the past a high accident frequency. Currently, there is a no traffic sign for 'black spots' in the Vienna Convention which has meant that Member States have had to develop their own vision of what such a sign could look like.

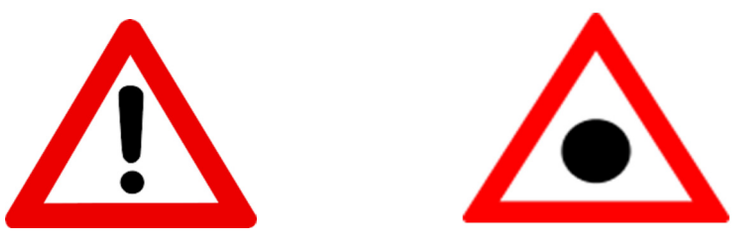


Figure 25 - Examples of comprehensible (left) and non comprehensible (right) traffic signs

Summary of ERF Recommendations

1. Calls authorities to avoid 'over - population' of traffic signs and ensure that, when deployed, they provide a clear and unambiguous message to road users, in order to get the right combination between good use of public resources, better levels of road safety and smoother traffic flow

2. Urges authorities to implement a multiannual maintenance action plan to rectify the maintenance backlog of a growing number of non-perfoming traffic signs on Europe's road network. This can either be achieved through a comprehensive Asset Management plan or the replacement of traffic signs at fixed time intervals.

3. Encourages authorities to adopt a minimum Class 2 performance for safety critical signs (Class A, B, C of the Vienna Convention) in order to meet the needs of a growing number of older drivers on Europe's roads.

4. Fully supports the ongoing work of UNECE working group on road signs and signals to achieve a greater degree of compliance of EU Member states with the Vienna convention ; highlights the important safety benefits that can arise from a greater use Intelligent Speed Adaptation systems through interaction with the existing traffic sign infrastructure.

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