CEDR

Conférence Européenne
des Directeurs des Routes

Conference of European
Directors of Roads

CEDR Call 2016 Safety
End of Programme Report

July 2022

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CEDR Contractor Report 2022-06

By

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Appendix: Final Conference Report

By

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CEDR Call 2016 Safety End of Programme Report is an output from the CEDR Transnational Road Research Programme Call 2016 Safety.

The research was funded by the CEDR members of the Netherlands, United Kingdom, Ireland, Belgium (Flanders), Sweden and Slovenia.

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Abbreviations

ADVERTS	Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage
CEDR	Conference of European Road Directors
IRIS	Incursion Reduction to Increase Safety at road work zones
ISHGD	International Symposium on Highway Geometric Design
NRA	National Road Administration
PEB	Project Executive Board
PIARC	World Road Association
PROGRESS	Provision of Guidelines on Road Side Safety
RISM-II	Road Infrastructure Safety Management II
RSA	Road Safety Audit
RSI	Road Safety Inspection
SANA-4U	Safety at Non-Urban Areas for all road Users
SWOV	The Institute for Road Safety Research
TII	Transport Infrastructure Ireland
TRA	Transport Research Arena
TRL	Transport Research Laboratory
TTM	Temporary Traffic Management
WP	Work Package

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Executive Summary

The aim of the Transnational Research Programme Call Safety 2016 was to conduct road safety research and produce results that would improve the knowledge and experience of National Road Administrations (NRA's) in Europe. This programme was based on four different safety themes and a project was funded under four sub-themes:

A. *Driver Distraction – (Digital) Billboards*
   Project: ADVERTS (Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage)

B. *Safety for both Road Worker and Road Users - reduce incursions in to work zones*
   Project: IRIS (Incursion Reduction to Increase Safety at road work zones)

C. *Guidance for Safe Road Sides*
   Project: PROGRESS (Provision of Guidelines on Road Side Safety)

D. *Self-explaining systems for VRU safety in non-urban areas*
   Project: SANA-4U (Safety At Non-urban locations for All road users)

In addition to providing NRA's with usable outputs to improve their own procedures, this Safety Call put a greater emphasis on the formation of a sound dissemination strategy within each project. It was a key priority for CEDR to ensure that each project was implementable and had added value for authorities. NRA's are continually engaging in efforts to enhance the safety of their network and reduce the severity and frequency of collisions. CEDR has commissioned a number of Safety Calls over the years to support these goals, and in this call the IRIS project and PROGRESS project in particular have looked to build on the outcomes of past research.

The ADVERTS project focused on the relatively new issue of driver distraction from digital billboards. This project looked to minimise the distraction from digital roadside advertising. The objective of the project was to compile a set of evidence-based recommendations for roads authorities on how to reduce the negative safety effects from roadside advertising distraction. The research summarised the evidence around driver distraction and engaged with CEDR member states to record an inventory of current practices. The outcomes were workshopped to produce a final set of guidance recommendations for authorities when assessing planning requests for roadside advertising.

The IRIS project looked to build on existing CEDR research to further investigate incursions into road work zones and identify practicable recommendations that would ensure a safer system for road workers and road users. IRIS shared the basic principles of safe work zones and best-practice guidance on improving road safety management at work zones. These measures covered processes from regulatory frameworks through to design, planning and operation. Project outputs encompassed checklists and tools to improve safety procedures at road work zones including audits and inspections.

The PROGRESS project focused on developing recommendations for a standard approach to safe roadside design across Europe. The project aimed to provide a comprehensive understanding on how to provide safe and efficient roadsides. In addition to the development of a set of recommendations, the research team generated a technical decision-making tool, which can allow NRA's to pinpoint areas of improvement in their wider organisation, as well as identify optimal solutions for site-specific locations.

SANA-4U looked to promote safety for vulnerable road users outside of urban areas. The project team acknowledged that existing processes are typically focused on new infrastructure or urban areas. The intention was to establish best-practice guidelines for the design and delivery of self-explaining road systems in non-urban areas. The recommendations produced are the output of a theoretical review of the standards, interviews with member states and three practical worked examples of schemes for VRU's.

This report provides an overview of the four projects and their findings. Each project is looked at in terms of the objectives, approach taken and the main findings and conclusions. The report details how the projects have built on historic CEDR research where applicable and maps out the dissemination events, both planned and undertaken. It looks at the implementation prospects for the projects and details some examples of early implementation by member states.

Based on the workshops, dissemination events and results of the projects, some overall observations and recommendations were made, including:

- Limitations exist as to the ability of some member states to implement research results. High level engagement between members of the Governing Board to demonstrate the benefits of implementation may foster change in countries where implementation is difficult to achieve due to the existing governance structures.

- The development of technical tools is an important aspect of the research and have proved useful for NRA's historically. Experience would suggest that ongoing technical support is required for excel and web-based tools to provide support when issues arise.

- Dissemination should not end when the project ends. CEDR member states and members of the PEB should continue to disseminate and implement the results of all CEDR projects going forward to ensure the outputs of the projects are continually endorsed by NRA's.

- Future research may consider selecting one common theme to aid in the dissemination and implementation phases, as this would allow for greater dissemination opportunities for the PEB to promote all research projects together.

- To ensure research remains relevant, consider introducing follow-up surveys for NRA's to understand how significant the problem is in each member state.

- A low uptake to questionnaires and interviews was noted throughout this Safety call. Proposals to improve engagement between stakeholders and researchers should be considered for future Safety calls, including shortened questionnaires to improve the response rate.

There are early indications that the findings from the four research projects are being applied by European road authorities. The use of tools and outputs to improve guidelines and standards in member states will increase safety across Europe and raise better awareness amongst practitioners of common safety issues. Furthermore, the research projects undertaken throughout this Call will assist authorities in the implementation of the revised European Road Infrastructure Safety Management Directive (RISM-II). The recent amendments to RISM-II Directive aim to reduce fatal and serious injury collisions as well as improve safety for vulnerable road users, areas which have been addressed throughout this Call.

1 Introduction

CEDR is an organisation of European National Road Administrations that promotes Excellence in the Management of Roads. It also provides a platform for European National Road Administrations to join and create a collaborative research effort to further develop the safety and efficiency of European road networks. The 2016 Safety Call was launched with the overarching aim of sharing and improving - knowledge and experience, and providing NRA's with the practical tools to increase safety, and to present the information in such a way that member states are able to update and develop their own national standards and guidelines.

CEDR Safety has been very active in research and have been involved in research from the first call ERAnet 2009 Transitional Research Call, which focused on 'Safety at the heart of Road Design'. The funding partners for the first call were the National Road Administrations (NRAs) of Austria, Belgium, Finland, Hungary, Germany, Ireland, Netherlands, Norway, Slovenia, Sweden and United Kingdom and five projects were funded , namely:

- ERASER: Evaluations to Realise a common Approach to Self-Explaining European Roads
- EURSI: European Road Safety Inspection
- IRDES: Improving Roadside Design to Forgive Human Error
- RISMET: Road infrastructure Safety management Evaluation Tools
- SPACE: Speed adaption Control by Self-Explaining Roads

In 2012, CEDR became directly involved in the research programmes, and WG Road Safety was again involved in a call looking at vehicle restraint systems and also road worker safety. The funding partners for the this call were the National Road Administrations (NRAs) of Belgium (Flanders), Ireland, Norway, Sweden, Germany and the United Kingdom and three projects were funded , namely:

- ASAP: Appropriate Speed Saves All People - Speed management within work zones, consistent controls features across Europe to protect road worker and road user.
- BROWSER: Baselining Road Works Safety on European Roads – Developed a EuRoWCas: European Road Worker Casualty database
- SAVER:. Selection of Appropriate Vehicle Restraint Systems - VRS guidance document and web-based tool to allow designers select the most appropriate VRS solutions in different road and traffic configurations

CEDR Safety was again involved in a research call in 2013. The funding road administrations under the safety theme were Germany, Ireland, Netherlands and UK. And again three projects were funded:

- ESRET. European Safety Review Tool - Develop practical tools to assist road authorities in undertaking route based site visits and assessments following the identification of high risk locations as part of a Road Authority's Network Safety Management (NSM) activity.
- EUSight. Stopping Sight Distance and its role and impact on highway geometric -Conduct a detailed examination on the subject of stopping sight distance (SSD) and its role and impact on highway geometric design, taking into account differences (and similarities) between EU Member States. This research considers stopping sight distance from different (related) approaches: human factors ('the driver'), road characteristics, vehicle characteristics and conditions (like wet conditions, darkness or tunnels)

- PRACT. Predicting Road Accidents -The PRACT Project (Predicting Road ACcidents - a Transferable methodology across Europe) aims at developing a European accident prediction model structure that can be applied to different European road networks with proper calibration.

This end of programme report is supplemented by a story map created in ArcGIS Online providing an overview of the four 2016 Safety Call projects and their key recommendations. This story map can be viewed at:
https://storymaps.arcgis.com/stories/fd2dIParag8a54fd0d4145a85018538d131976.

The 2016 Call was funded by six countries – Belgium (Flanders), Ireland, the Netherlands, Slovenia, Sweden and the United Kingdom. The themes for the programme were selected following consultation with CEDR members on areas that are considered demanding in terms of providing safe and efficient roads. The themes developed researched concepts around incursions at road work zones, driver distraction, safe roadsides, and vulnerable road users.

The programme intended to provide authorities with outputs that could be effectively implemented to improve road safety in these areas by adapting their guidelines and standards and improving other safety processes.

Following an evaluation by the Project Executive Board, four projects were selected for the research call:

1. ADVERTS (Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage)

2. IRIS (Incursion Reduction to Increase Safety at Road Work Zones)

3. PROGRESS (Provision of Guidelines for Road Side Safety)

4. SANA-4U (Safety for Vulnerable Road Users in Non-Urban Areas)

The four projects each relate to a different sub theme that were identified by the PEB as noteworthy challenges facing road safety practitioners today. The research projects are presented in Chapter 2 with sub-sections for each project. These sections are based on the research conducted and various outputs from the projects, and this chapter summarises the key findings of the projects.

Chapter 3 maps out the dissemination activity for the project, and highlights feedback from completed events to date. This chapter also sets the background for the implementation phase of the CEDR Safety Call 2016 programme. It documents some examples of implemented research from members of the Project Executive Board.

Recommendations for future research are presented in Chapter 4. These recommendations are informed from the knowledge gaps identified throughout the research projects, and final overview and conclusions of all projects is detailed in Chapter 5.

2 Project Descriptions

This section details the background to the four projects in the 2016 safety call with an overview of the methodology taken by research teams and the main findings from each of the projects.

2.1 ADVERTS

Name:	**ADVERTS (Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage)**
Budget:	**€180,148**
PEB Coordinator:	**Desmond O'Connor (TII)**
Partners:	**SWOV Institute for Road Safety Research (Netherlands), Transport Research Laboratory (United Kingdom), Vias institute (Belgium)**
Website:	**https://www.cedr-adverts.eu/**

Advertising is a vast industry and has been continuously growing in recent years. To maximise their marketing exposure, advertisements are often located at urbanised locations, and roads with high traffic volumes. Establishing a true link between digital advertising and road traffic collisions has been difficult due to the low numbers of collisions, however there is growing evidence that extended looks at objects outside the vehicle significantly increase the risk of a collision occurring. (Dingus et al., 2016).

Although driver distraction can come from multiple sources, the primary focus of the ADVERTS project was the growing industry of roadside advertising, in particular digital billboards. ADVERTS set out to review the existing knowledge base surrounding roadside advertising and its safety impact, and develop a set of guidelines from the research to provide road authorities with an evidence-based work package that would help in decision making and concentrate on practical means of improving safety around digital billboards.

ADVERTS consisted of three Work Packages (WP) as detailed below:

- WP1: Scientific literature review to consolidate the existing knowledge and practices.
- WP2: Development of best-practice guidelines for roads authorities.
- WP3: Producing recommendations and dissemination of project results.

The ADVERTS project started with a literature review as part of the first work package. The review summarise the findings of the existing scientific literature on the impact of roadside advertising on driver distraction. The SEEV (Salience, Effort, Expectancy and Value) framework model was utilised to review the literature with the added category of Luminance. This framework, by Wickens and colleagues, predicts how individuals will share their attention to an object guided by the factors listed. Figure 1 describes the factors associated in the SEEV framework, and how attention can be directed to roadside advertisement.

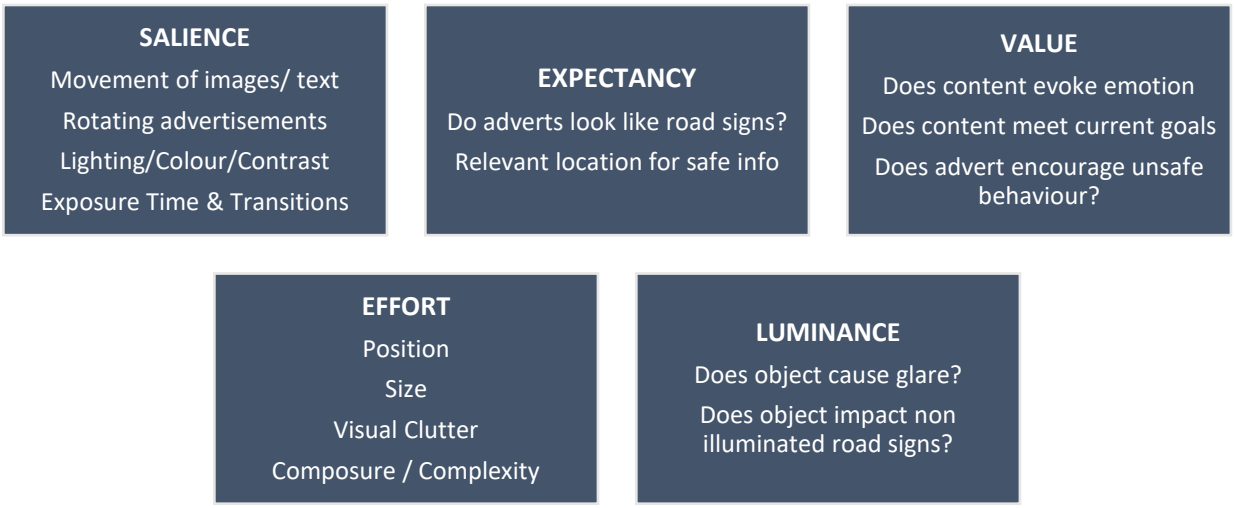

Figure 1 – SEEV Framework Model with added Luminance

Fifty studies were reviewed for the literature review, and five of these looked at the link between collisions and roadside billboards highlighting the lack of research in the area. The relationship between collisions and roadside advertising was found to be inconclusive, and so the ADVERTS focused on collating the evidence around safety performance indicators such as looking at driver's behaviour around roadside advertisements. A number of studies looked at the gaze behaviour of drivers, the effect billboards had on headways between cars and their speeds and what impact advertising content had on drivers.

The evidence indicates that half of drivers do not look at billboards when they pass them. However, where drivers do look at roadside advertising, there is a tendency to look more frequently and for longer at static digital billboards and more so for video billboards. There is strong evidence to suggest road users deviate from correct lane positioning when looking at billboards. Past research would indicate there is not a strong link to speed behaviour, nor does the content of the advertising impact on driver behaviour significantly. The less demanding the driving environment, the more likely road users are to view billboards. Simulator studies found that, the more light emitted by a billboard, the longer it took the driver to respond to the hazard.

Questionnaires were issued amongst twenty-six CEDR members to document the current guidelines in place with regards to roadside advertising, and to gain insights from different European road administrations in relation to roadside advertising. This information was supplemented with in-depth interviews with representatives of the six PEB countries to get more detailed understanding of the questionnaire responses and a discussion around future trends. Furthermore, Australia and New Zealand have well documented guidelines and legislation published in relation to roadside advertising, and as such it was decided to include this information as literature from outside of the European Union.

The outcomes of this work package highlight significant variations across countries in relation to legislation, guidelines and permission procedures for roadside advertisements. Commonalities for most countries include processes such as ensuring permissions are requested for advertisements on or within a short distance of the road network, however where an advertisement is off-road on private land, permissions are generally not required. The criteria varies across different member states, with some countries adopting a much stricter approach than others.

The key focus on guidelines and legislation have generally been around placement criteria, followed by design criteria. The principal features that underpin placement criteria generally cover lateral distance, longitudinal placement, and the road environment. From a design perspective, the main criteria assessed is colour, content, luminance, and dimensions. Whilst the overall concepts were broadly similar across different jurisdictions, the level of detail defined in the guidelines varied considerably.

Furthermore, to understand the evolvement of advertisement, ADVERTS attempted to engage with advertising industry professionals to gain insight into the emerging trends and the industries thoughts on existing guidelines and regulations. A lack of engagement and responses meant only one interview could be carried out and there are limitations to the findings without a broad spectrum of knowledge. The outcomes of the interview did indicate that advertising industries will likely focus more on 'Digital Out of Home' billboards going forward. These allow for a flexible approach using digital technology and allow for advertising to be centrally controlled. Advertising has evolved over time and has in recent years moved into a digital transformation offering a more flexible means of communicating with the client base.

As technology enhancements continue, so too have the regulations surrounding roadside advertising, and partnerships between advertisement agencies and road authorities are being established. It is important that road authorities take future trends into consideration when updating guidelines and legislation around roadside advertising to 'future-proof' the network. The benefits of roadside advertising were raised and their contribution to 'smart city' development; for example, advertisement boards can now integrate different sensors and collect information about the location around; pollution sensors, traffic monitoring etc. Billboards can also now be used to deliver services; they can provide free Wi-Fi, e-chargers and can be interactive. Whilst digital billboards will not fully replace traditional advertising, they will be more focused on urban centres and retail areas, and on high traffic volume roads which generally have low speeds. Concerns around legislation being too restrictive in some instances, and unclear guidelines around the maintenance of advertisements were also raised. The concept of a 'one size fits all' is considered unsuitable, and the industry would prefer guidelines to be dependent on the scenario.

A summary of regulations and guidelines currently in use (mainly in CEDR member countries) was also prepared, and a report on the knowledge gaps identified from the literature review and subsequent research. Research gaps have been categorised into three groupings; outcome metrics to examine the effects of roadside advertisements, effects of roadside advertisements on safety indicators, and criteria for optimal design, placement and operation of roadside advertisements. There are a number of areas detailed in the full report where further research would be beneficial, including alternative metrics to gaze behaviour to achieve brand awareness for advertisers, as well as a further examination into the effect roadside billboards have on road traffic collision rate.

The outputs of the literature review and inventory of current practices were workshopped with road safety experts, and the outputs of these were consolidated to produce a set of evidence-based recommendations. Whilst it is recognised that the removal of roadside advertising is the optimal solution in terms of road safety, the recommendations took cognisance of the economic benefits provided by billboard advertising and have produced a set of recommendations for road authorities that have some control over elements of roadside advertising. The ten main recommendations are split into fundamental recommendations whereby failure to implement could result in negative safety effects, and subsequent recommendations surrounding location, content and design that should be considered by road authorities on a case-by-case basis. These recommendations are presented below in Figure 2. Comprehensive detail on each recommendation is available to view in Deliverable 2.1 Minimising distraction from roadside advertising: Recommendations for road authorities.

Figure 2 – Ten Best-Practice Recommendations for Roads Authorities

2.2 IRIS

Name: **IRIS (Incursion Reduction to Increase Safety at road work zones)**
Budget: **€179,500**
PEB Coordinator: **Veerle Schoutteet**
Partners: **Lund University (Sweden), The Kuratorium für Verkehrssicherheit (Austria) and Vias Institute (Belgium).**
Website: **https://www.cedr-iris.eu/**

Despite the overall PROGRESS made by EU member states in improving road safety, incidents at road work zones remain a concern for many countries. The conditions in which road works are undertaken are generally high risk due to the limitations in space for road workers combined with the exposure to traffic. The IRIS project sought to build on past CEDR research including ASAP (Appropriate Speed saves All People) which researched methods of controlling speeds to reduce the risk to road workers, as well as the BROWSER (Baselining Roadworks Safety on European Roads) project which developed a European wide database targeted at improving data collection on incidents at road work zones.

The main objectives of the IRIS project were:

- To provide an overview of the best-practices in temporary traffic management.
- To provide an overview of the best-practices in Road Safety Audit and Road Safety Inspections at road work zones.
- To deliver practical recommendations and share information about best-practices in temporary traffic management for short, medium- and long-term road work zones.
- To provide information and tools for NRAs and enhance their practice so they will be able to improve their Strategy, Guidelines, Standards, and Procedure

The approach taken by the IRIS research team is outlined in Figure 3.

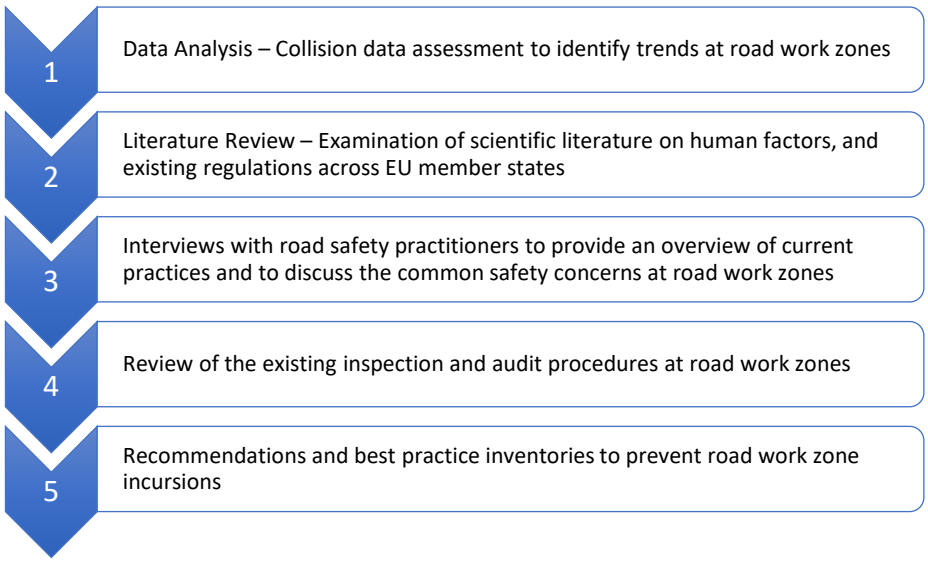

Figure 3 – Project Approach for IRIS research

The project began with an analysis of recorded collisions at, and around, road work zones. The team noted that the EuRoWCas (European Road Worker Casualty) database developed by BROWSER was not used by any member state to provide information on incidents at work zones, making the analysis of collisions more complex due to the different formats and data received. This analysis found that most of the fatal

collisions occurred at static road works. There was a large variation in collision types at these locations; rear end collisions, single vehicle collisions and collisions with safety devices were the most frequent.

A literature review was then carried out to examine the link between collisions and road work zones. Past studies suggest human factors have been found to play a critical role with driver health, distraction and confusion about the environment contributing to the relationship between collisions and road work zones. Road works are often seen as a 'latent danger' to users who may be surprised by unexpected events, for example, congestion. Road workers may also revert to unsafe behaviours in the work zone where they have become familiarised with the risk they face working near traffic. This effect is known as habituation and can cause road workers to underestimate a risk they are frequently exposed to. Moreover, workload pressures can cause an increased risk, where, for example, workers are under time constraints and may bypass safety procedures to finish earlier, thus appearing more competent to employers.

The fourteen interviews with road safety experts from eight member states were undertaken to discuss the safety issues at road work zones, as well as current practices in their member states. Common safety issues raised focused on road user behaviour, including speeding, driver distraction and lack of awareness. Issues that in relation to the road work zone noted deficiencies in signage and safety devices, and that problems appear greater in short term road works. It is recognised that establishment and de-establishment of work zones are the riskiest period due to the increased exposure to traffic for workers. Furthermore, it was noted that issues usually arise at the beginning of a road work zone.

Based on the data analysis, literature review and discussions with road safety authorities, it was proposed that PIARC's "Four C's" concept should be considered when planning and designing a safe and efficient road work zone. These principles consider the psychological behaviours of road users and road workers and should enable drivers to focus on the immediate task of successfully navigating road work zones. The principles are outlined as follows:

- Conspicuous – Ensure the driver can physically see upcoming work zones by making them obvious, noticeable and eye-catching to draw attention and encourage desired driving behaviour with regard to speed and vehicle positioning.
- Clear – Ensure the signage and guidance provided to road users is clear so they can be certain about what is expected of them to safely approach and pass the work zone.
- Consistent – Aim to provide consistent standards and layouts across all work zone sites to familiarise road users with what is ahead so they understand the driving tasks expectations.
- Credible – Ensure instructions and guidance is 'believable' so drivers can rely on information given and that works ahead are a true representation of what is ahead.

The road safety specialists who participated in the interview process also provided an overview to the research team of the current processes in relation to road safety audits and road safety inspections at work zones. Formal processes are rare across Europe for RSI and RSA at road work zones, although most countries have some guidelines for inspecting road works. Given the high risk nature of these environments, and the difficult tasks associated with the establishment and de-establishment of work zones, the research team think it prudent that member states introduce more formal procedures to audit and inspect road work zones.

Following the analysis and literature review, a workshop[1] was held with road safety practitioners to present preliminary findings and attain feedback to build on, and improve the recommendations developed from the early findings. These workshops intended to examine how recommendations would

[1] IRIS workshop, VIAS Institute, Brussels, October 11th 2018.

fit with current practices and what are the potential barriers and the likelihood of implementation on the ground. The assessment of best practices in relation to temporary traffic management considered the practicality of solutions, focusing on different solutions for short, medium- and long-term works.

Figure 4 presents some of these best-practice measures for improving road safety at road work zones. These measures are separated into four different categories to highlight the different measures available.

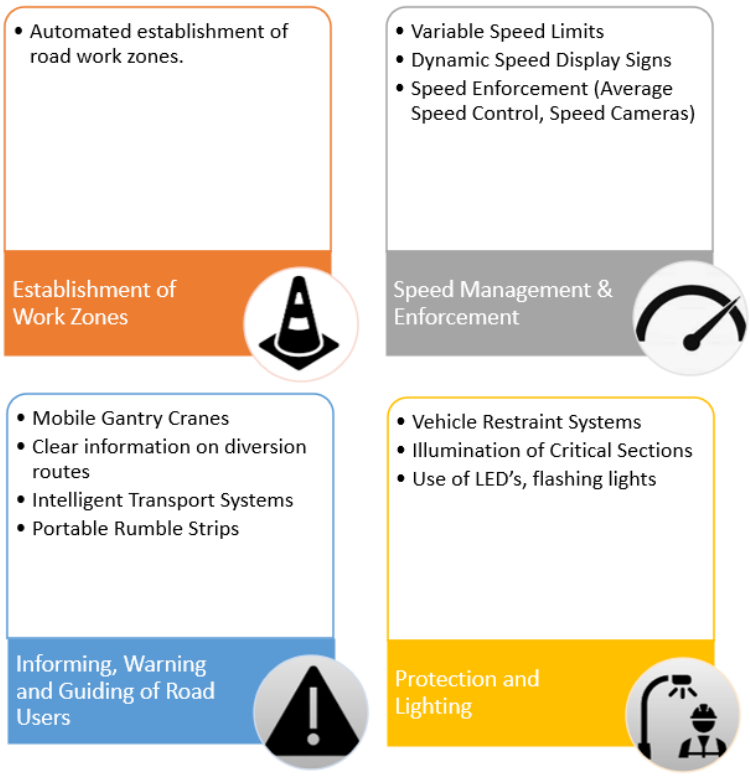

Figure 4 – Best-Practice Measures for improving safety at road work zones

Member states are aware of the high-risk problems around establishment and de-establishment of road work zones. Using automated technology to deploy traffic cones is one such innovative solution, currently used in the USA and being trialled in Germany and more recently in the United Kingdom. Ireland previously piloted a similar solution and found it to be unsuitable for their needs. With advances in technology, and the continuing challenges of road works establishment, improvements to this type of technology may prove successful in the future and reduce the presence of road workers at the establishment stage.

Providing clear information and advance warning to road users of upcoming works is of critical importance. It was found that intelligent transport systems can reduce frustrations on road users' part by informing them of delay times. Additionally, portable rumble strips are commonly used to alert drivers to incorrect driving behaviour, i.e., placement on the hard shoulder.

Forgiving roadsides are the ideal solution for both road users and road workers, but as most road work zones are limited with their capacity, physical segregation between road users and road workers is a beneficial solution for both. Segregation reduces the visual distraction for road users and the vehicle restraint systems, that have been successfully tested to European standards, offer better protection for road workers against road zone incursions.

Many of these innovative solutions are or have been trialled in EU member states, and it is important for authorities to ensure they stay up to date with ongoing research and best practice measures for work zones available. The approach for safety at work zones should be top-down and bottom-up, with all parties taking responsibility. The IRIS team provided some recommendations on road safety management at work zones to improve safety processes. These recommendations cover the process from regulatory frameworks through to design planning and operation.

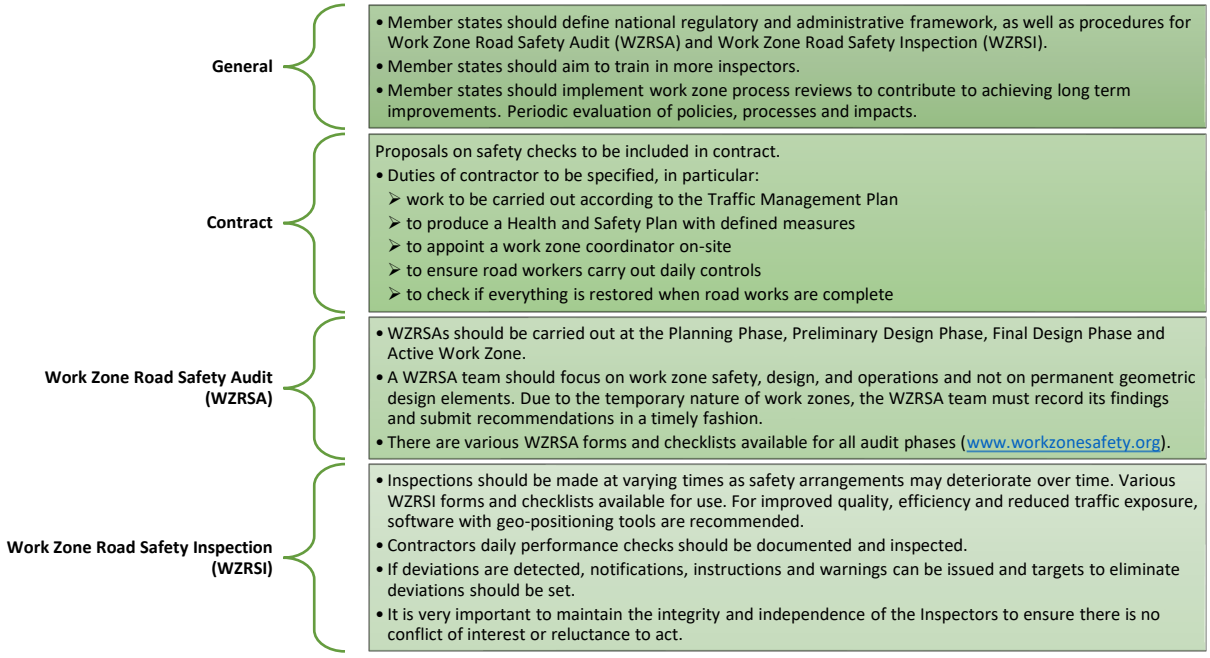

Figure 5 - Best practice recommendations for authorities on improving safety at road work zones

Many member states fulfil elements of the recommendations listed. Most countries have guidelines of some sort in place with regards to contractual obligations, and inspections of road work zones. The project team recommend that NRA's formalise their procedures for road safety audits and road safety inspections at work zones. A key focus of the recommendations is the 'work zone review process', whereby NRA's should take responsibility evaluating the performance of the processes in place. There should be feedback loops, reviews of procedures and lessons learned. It is important for all parties involved to feed into process reviews to ensure that meaningful changes can be implemented.

It is also recommended to standardise the design layout and work sequence to ensure a consistent approach for road works is taken. This would familiarise road users with the layout when approaching work zones, thus reducing the risk.

2.3 PROGRESS

Name:	**PROGRESS (Provision of Guidelines on Road Side Safety)**
Budget:	**€247,995**
PEB Coordinator:	**Gavin Williams – Highways England**
Partners:	**SWOV, TRL, ARUP, LNEC, Professor Weber (University of Applied Sciences Darmstadt)**
Website:	**www.cedrPROGRESS.eu**

The PROGRESS project set out to develop practical recommendations for safe roadside design that can be implemented by member states. Across Europe, there are still high numbers of single vehicle collisions, and the severity of these collisions is often impacted on by the roadside environment. Furthermore, PROGRESS research noted that 6 out of 27 countries (22%) did not take vulnerable road users including powered two-wheelers into consideration within their design standards.

Several European countries have specified within their guidelines that clear zones are the preferred solution to reduce the severity of run off road collisions. In practice, these clear zones can be challenging for road authorities to maintain given various party involvement and a dynamic road network. PROGRESS aims to build on the work of past research projects which has made strides in understanding more about the risk factors associated with single vehicle collisions and the effectiveness of different measures to mitigate the risks.

The main objectives of the PROGRESS project were:

- To review existing roadside safety design, maintenance, and operational requirements for clear (obstacle free) zones and for road restraint systems (as defined by EN 1317 – a six-part standard on road restraint systems).
- To determine to what extent National Road Authorities in Europe and their contractors are capable of implementing and maintaining compliance with the standards and guidelines throughout the life cycle of roads.
- To develop recommendations for safe roadside design and management ensuring broad acceptance among member National Road Authorities of CEDR

There were seven work packages (WP) in the PROGRESS project. These are outlined below and graphically displayed as to how they interlink.

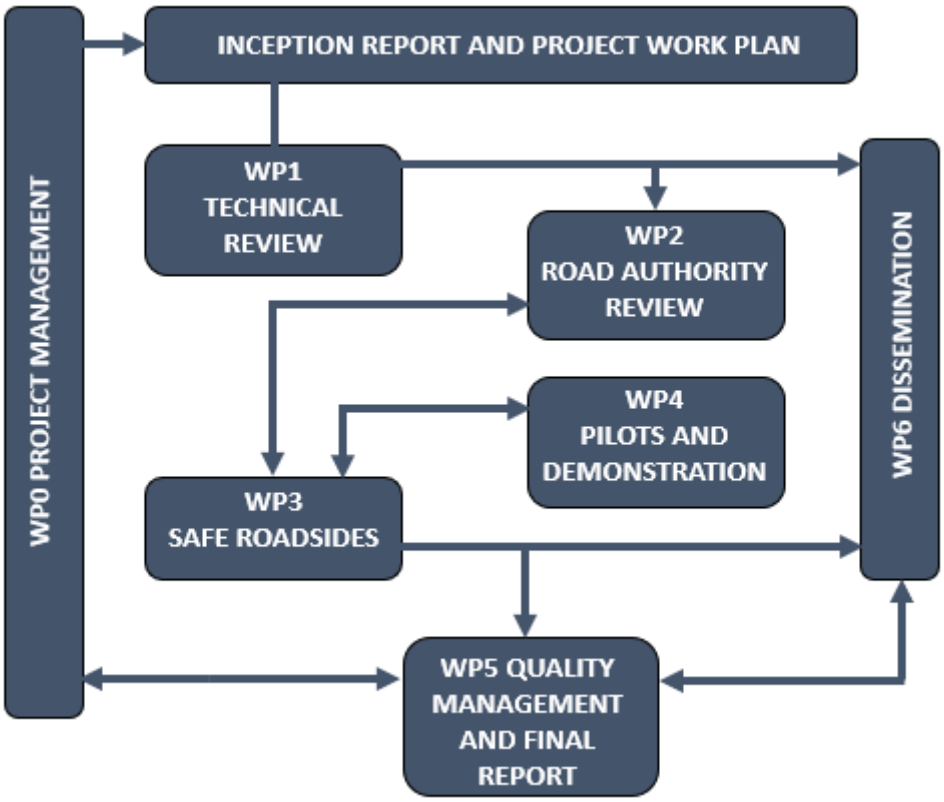

Figure 6 – Linkage between PROGRESS work packages

The project began with a technical review of the existing knowledge around roadside safety. A study of past literature found that the application of guidelines and standards on roadside safety has not been adequately studied, and a more systematic review of the relationship between existing European standards/guidelines and roadside design should be considered.

The technical review also encompassed past CEDR research into roadside safety and looked at the design and management of rural roads internationally. Historic CEDR research supports the premise that clear zones are the preferred solution to reduce the severity of roadside collisions. This is further substantiated by past EU research projects separate to CEDR; the RISER (Roadside Infrastructure for Safer EU Roads) project found that most collisions with roadside obstacles occur within ten metres of the road, and the risk drops substantially thereafter. The relationship between roadside elements and road safety was further investigated under the EU RISER and SaVeRS (Selection of Appropriate Vehicle Restraint Systems) projects.

The PROGRESS review focused on identifying design elements and parameters and their effect on the frequency and severity of collisions. A matrix was developed to identify the relationship between roadside elements and their effect on collisions. Roadside elements were grouped into one of three categories; likelihood of leaving the carriageway, likelihood of reaching a hazard and consequence of reaching a hazard. The matrix includes a range of roadside elements such as clear zones, passively safe poles, and drainage structures. Further details on the matrix and the effect each element has on the severity or frequency of collisions are presented in Deliverable 1.2 (WP1 Tech Review).

The second work package focused primarily on assessing the current work practices with respect to design and maintenance standards from the six funding countries. This was completed through a review of available literature, as well as interviews with experts. Experts from eight EU countries (the six funding countries plus Germany and Portugal) were interviewed to gather a more in-depth understanding of the processes in each jurisdiction. This was supplemented with an online based survey, which was issued to academics, contractors and other road safety professionals across Europe. The aim was to achieve a broader knowledge base, and to collate the experience of different personnel in relation to the application and use of standards and guidelines on rural roadsides.

The responses received, despite follow ups by the research team and the PEB, were much lower than anticipated, with submissions from only 15 of the 28 EU countries. Regardless, a number of common themes emerged. Forgiving roadsides are promoted within most countries, but the availability of land and funding to provide these clear zones can be challenging. In addition, compliance with the EU RISM Directive and national standards and guidelines is generally high, with road safety audits implemented on all TEN-T roads. Areas for improvement were identified as responses indicated that Road Safety Inspections (RSI) and Road Safety Impact Assessment (RSIA) are not implemented on all TEN-T roads at this time.

The feedback highlighted the importance of better dissemination of the projects as just 60% of road safety professionals were aware of past CEDR research. Moreover, the importance of ensuring outputs are practical and implementable is critical as although most respondents indicated the results useful, issues were raised in terms of the ability to integrate findings into national standards and guidelines. Respondents were also asked about typical roadside problems and information on single vehicle collisions in their jurisdiction. This information was further teased out through workshops. Contributory factors were categorised into four different phases; network monitoring, design phase, implementation phase and operational phase and subsequently illustrated through a fault map.

The recommendations developed from these early work packages looked at introducing processes at a network level with the aim of gaining a better understanding of the safety issues on the network through improved safety performance monitoring. This includes annual safety performance analysis and regular reviews of national guidelines and collision statistics. Furthermore, the outcomes identified some key recommendations to improve roadside safety at the design, implementation and operational phases. These are detailed below in Figure 7.

Design Phase Recommendations

- NRAs should regularly update their roadside design standards/guidelines and ensure their consistency with other design regulations. The regular updates should take all issues identified through the regular network safety performance monitoring into consideration.
- The solutions/countermeasures within roadside design standards/guidelines are clearly defined to minimize personal interpretation. The solutions/countermeasures should also include sufficient technical detail so that the constraint of the site, the VRS products and the needs of different road users can be taken into consideration.
- NRAs should implement processes for road safety audits during the design phase for all roads. In addition, it is recommended that guidelines for the RSAs take common issues relating to the latest roadside safety requirements specific to their country into consideration.
- NRAs should implement a process for regular register, review and analysis of the roadside safety related departures from standard. This way, the underlying reasons for the most common types of departures could be understood, and the necessary strategies to minimise the need for these departures could be put in place.

Implementation Phase Recommendations

- NRAs should put in place the processes to ensure VRS installers and inspectors are adequately trained, so that the risk of installation errors can be minimised.
- NRAs should put in place processes for road safety audits following the construction phase for all roads.
- NRAs consider processes to ensure the quality of VRS delivered and installed on site

Operational Phase Recommendations

- NRAs should put in place processes for regular RSIs, preventative maintenance and inspections.
- Guidelines for the RSIs take common issues relating to roadside safety requirements specific to that country into consideration.
- NRAs should put in place processes to monitor and assess the long-term effects of changes to road traffic and vehicle fleet on the safety of existing roadsides and foster greater intervention in coordinated decisions concerning future development in relevant truck and car making technical standards.

Figure 7 - Key Recommendations for Roadside Improvements at Design, Implementation and Operational Phases

These outputs formed the basis of the structure for the development of a decision-making tool, which can look to identify optimal solutions for site specific locations. The tool identifies the risks posed to road authorities, and proposes recommendations based on the inputs. Two pilot studies were conducted to test the practicality of the tool, ease of use, de-bugging and to identify areas of improvement. It was hoped greater feedback from the pilot studies would be received to ensure the tool is a valuable asset to road authorities. Although feedback was limited, it did allow the research team to make adjustments to the tool and commentary from the PEB have indicated the tool has provided added value to their organisations. It has been shown to allow NRA's to identify gaps in the availability of their own organisational guidelines.

2.4 SANA-4U

Name: **SANA-4U (Safety At Non-urban locations for All road users)**
Budget: **€180,000**
PEB Coordinator: **Alastair de Beer (TII)**
Partners: **Arup (Ireland), BRRC (Belgium), VTI (Sweden)**
Website: **www.cedr.eu**

The SANA-4U project was focused on enhancing safety for non-motorised users in non-urban areas. Increasing safety for VRU's is an issue that is frequently highlighted in European initiatives including the RISM Directive. The health and environmental benefits of active transport have been well documented, and ensuring a safe system for VRU's is a priority for most member states.

The project recognised that many of the existing standards and research are well developed for new infrastructure and within urban areas. Rural roads are increasingly being used as transport corridors for goods and services, as well as being used by local communities. As such, this research project is focused primarily on increasing the safety patterns for VRU's outside of urban areas.

SANA-4U is comprised of five work packages, with the overall aim of collating good examples for a best-practice guidance document, and is looking to identify areas of improvement within existing standards and guidelines that could PROGRESS the safety of vulnerable road users outside of urban areas.

- Work Package 1 (WP1) – Review of Vulnerable Road User Standards across CEDR member states
- Work Package 2 (WP2) – Compilation of good and less good examples of implemented cycle and pedestrian schemes for a Good Practice Guide
- Work Package 3 (WP3) – Worked Examples of Good Practice
- Work Package 4 (WP4) – Preparation of Guidelines for Selection of Design for VRU Infrastructure
- Work Package 5 (WP5) – Harmonisation of Work Packages 1 to 4 and Final Report

The approach taken by the research team looked to first review the vulnerable road user standards from CEDR member states. The research team focused on identifying which administrations have standards focusing on VRU's and where on the network these policies are directed. This was followed up by conducting interviews with participants from seven member states to provide an overview of guidelines for VRU's on inter-urban roads and identifying examples of good and less good road design. Three worked examples were explored, with the objective of testing the applicability of the good practice guidance on different road types in different member states. This information fed into the preparation of guidelines for selection of design of VRU Infrastructure. All the recommendations and best-practices identified throughout the research were then consolidated into one final report as a means of sharing information amongst all CEDR members.

It was found that the majority of countries have a combination of both standards (compulsory) and guidelines (voluntary). The initial review identified that speed is a key safety concern for road safety engineers, particularly where there are vulnerable road users present, and various measures have been implemented across different countries in an effort to reduce speed. The measures vary through changes to the geometry of the road, or the introduction of physical or technical devices. The researchers have indicated that an all-encompassing holistic approach to road design should be adopted, taking all road users into consideration at the planning and design phase. Systematic evaluations on the effectiveness of road designs are also advised to document the successes, failings and any lessons learned, however findings suggest these holistic approaches including documented evaluations are rarely pursued.

Examples of designs were received from each of the countries which brought to light both good and less good practices of road design. The benefits that cycle networks can bring to other VRU's was highlighted throughout, and a compilation of potential good-practice solutions as well as common pitfalls were documented. Recommendations for good practice guidance were sub-divided into topics on the main road design elements. Each topic is presented in the same manner detailing the guiding principles of the topic, followed by some design recommendations which are dependent on various thresholds such as speeds, AADT, HGV percentage and cycle traffic and a decision tree to illustrate recommended solutions for various scenarios. The key topics are presented in Figure 8 below with some of the key principles for each. Further information on the guiding principles and recommendations can be found in Deliverable 5.1 Guideline for Selection of VRU Infrastructure Design.

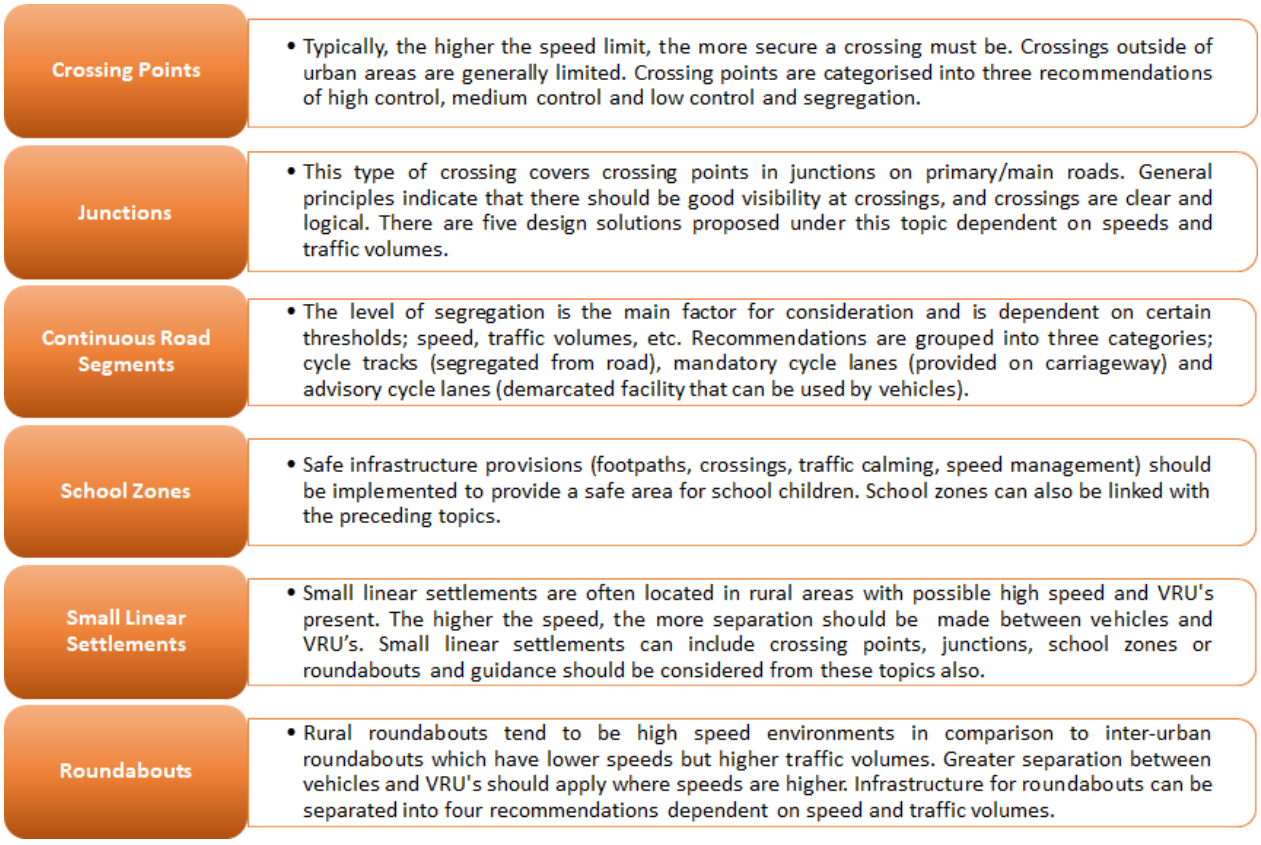

Figure 8 – Topics of Road Design Elements for consideration when designing VRU infrastructure

As part of the research, three worked examples were included to assess how well the recommendations under each topic applied in different scenarios. The locations identified include the N4 in Ireland which has no existing cycle facilities, the N9 in Flanders where cycle facilities were present but considered sub-standard and Route 293 in Sweden where cycle facilities were considered good practice.

Designs were drafted up based on the principles developed in the guidance document, and each scheme assessed to identify the existing issues for VRU's and identify practical solutions based on the guidance. Each design considered the following elements for each scheme: the linear alignment of the route, junctions, crossings, linear settlements, and roundabouts. The ease at which good practice could be implemented into the design was considered throughout and the challenges encountered when applying best practice were noted to further develop the guidance.

The Swedish cycle track aligned with the best practice guidance very well, and only minor proposals to improve signage and line markings were identified. The schemes in Ireland and Flanders both presented

some difficulties in successfully applying best-practice. Physical constraints were issues in both locations; the cross section was severely constrained by private properties in Ireland, and a canal was present along the roadside in Flanders which created difficulties with implementing physical separation of facilities. Providing adequate provision for cyclists at high speed roundabouts proved to be challenging.

Additional challenges on the schemes were raised to adequate provision for cyclists at high speed roundabouts was considered. These worked examples demonstrated that where best practice cannot be applied, designers need to make decisions on whether to compromise on best-practice or find an alternative proposal for the scheme. Furthermore, developing a consistent approach across Europe presents its complexities as each member state has their own legislations and it is recognised that road markings may mean different things in different member states.

3 Dissemination and Implementation

This chapter covers the dissemination throughout the lifecycle of each project, and the implementation plan to take the research outputs into practical application. Lessons learned from past research calls have highlighted the importance of dissemination to educate practitioners on the findings so that they can be properly utilised. A larger emphasis was placed on this phase for Call 2016 Safety to ensure the research demonstrated practical solutions to existing safety issues.

Information should be disseminated to interested parties in non-technical terms to ensure there is sufficient understanding of the project outputs. The programme specified a dedicated dissemination plan was required for each project. Whilst there has been ongoing dissemination throughout the development of the call, much of the planned dissemination events for 2020 have been put on hold due to the onset of the Covid-19 virus pandemic.

3.1 Project Dissemination

Each project was responsible for its own dissemination plan. The project teams arranged workshops and attended conference events as part of the research and dissemination phase of their programmes. The purpose of the workshops was to present the findings of the research and get feedback on preliminary and final recommendations. These workshops also served to distribute information and raise awareness of the projects. Events took place both during and at completion of the research and an emphasis was placed on delivering information online through dedicated websites, and social media platforms.

The projects in this safety call did not come together for one end of programme conference as the themes of the projects varied such that they would attract very different audiences. As an alternative, each project held their own events to inform and aid authorities on understanding and implementing the research. These events came in the form of presentations at large conferences, focused workshops, and online dissemination events such as webinars.

Figure 9 details a list of dissemination events to date. Attendance at a TRA event is compulsory for CEDR Safety research projects. IRIS and ADVERTS attended TRA 2018. All four research projects were due to attend the 2020 event, however this event has been postponed due to Covid-19. Further information on the dissemination events for each project are detailed in the following sub-sections.

Figure 9 – Dissemination Events for CEDR 2016 Safety Call

3.1.1 **ADVERTS Dissemination**

The ADVERTS research project looked to make the outputs available through various mediums. Preliminary findings were presented at an ADVERTS workshop[2] held in Brussels in 2018. This centred on presenting the main safety issues associated with digital billboards and the best-practice recommendations for road authorities. Following contributions from the attendees through polls and group discussions with a focused group of road safety professionals, a final set of practical best-practice recommendations was published.

ADVERTS also attended the TRA 2018 conference, the theme of which was focused on 'a digital era for transport'. Herein, ADVERTS highlighted the safety concerns around digital billboards, and showcased best-practice recommendations through posters and a short lunchtime presentation reaching a broader audience of researchers and academics, transport companies and road authorities working in the field of transport.

Focused dissemination events included presentations to the CEDR Technical Group in Warsaw, 2019. This event focused on providing a high-level information session to CEDR, demonstrating the final recommendations for member states, and advocating for recommended next steps on implementation. It included proposals for members to develop guidance on the best-practice recommendations and promote the research amongst stakeholders as well as supporting further research intended to address knowledge gaps.

The presentations were subsequently made available through social media platforms, the CEDR website and the dedicated ADVERTS website, where all published deliverables can be downloaded. Continued dissemination of ADVERTS was expected throughout 2020 with proposals for presentations at the ISHGD conference and TRA 2020, both of which were postponed due to the Covid-19 pandemic. Despite the

[2] ADVERTS workshop, VIAS Institute, Brussels, October 2018

cancellation of planned events, ADVERTS continued its dissemination through attendance at online conferences and webinars. The European Union Road Federation (ERF) hosted an online roadside safety event.[3] The event was well attended and prompted discussion from member states around the trade-off between advertising revenue and road safety. Furthermore, it initiated a conversation on potential future research on the variation of road safety effects between busy urban roads and major inter-urban routes.

These dissemination events focused on raising awareness of roads authorities to the safety impacts of digital billboards and sought to set out a path for roads authorities to implement best-practice guidelines for the provision of digital billboards.

3.1.2 IRIS Dissemination

The outputs of the IRIS project were disseminated through two key workshops, scientific papers and presentations and the dedicated IRIS website where deliverables and event information can be sourced.

IRIS held two workshops to distribute information on the research findings. Workshop 1[4] was held in Brussels in 2018, where road safety experts were informed about the findings of the research. The workshop facilitated discussions on two main themes: problems at work zones and road safety audits and inspections at work zones.

Common themes that emerged from the group discussion observed that enforcing speed limits at road work zones is a complex matter for contractors and authorities. Additionally, participants noted that it can be difficult to get the balance correct with signage; the aim is to ensure signage is informative and clearly understood by all road users and lastly, the cheapest solutions, although often favoured, are not necessarily the most appropriate.

Overall, the group discussions on work zone safety issues led to three new findings by the research team as follows:

- The understanding that safety can decrease over time in work zones
- Signs should be understandable by most people with harmonisation across different jurisdictions
- The importance of an established management process prior to the start of road works.

A second group discussed the implementation of Road Safety Audits and Road Safety Inspections at work zones. This led to concerns around the lack of the data collection and registration of incidents, and a dialogue on how the technical tools developed to report incidents from past CEDR project BROWSER is not commonly used. This issue was raised by IRIS throughout its research.

The opinion poll observed that most countries agreed there are credible options available to improve safety at work zones within their own country. Remarks highlighted that work zone designs are critical, and the importance of planning and design before the establishment of the work zone is key to improving safety.

Workshop 2[5] was held in Budapest in 2019 and was comprised of a series of presentations on road work zones followed by a questions and answers segment with the speakers. The presentations informed attendees of the best practice guidelines developed and finalised throughout the research. These guidelines are aimed at supporting authorities make decisions based on best-practice at road work zones.

[3] ADVERTS Presentation, ERF Webinar, December 15th 2020
[4] IRIS Workshop, VIAS Institute, Brussels, October 11th 2018
[5] IRIS Workshop, Budapest, September 25th 2019

Feedback from attendees made some observations on the presentations. Firstly, it was acknowledged, as per previous workshops, that advance planning is key to ensuring a safe work zone system. Attendees also highlighted that any traffic management plans should also consider the safety of any route diversions in place. Next, the topic of implementing a safety culture was raised, and how the promotion of a good safety culture from the top down can have a significant positive impact into how processes and procedures are carried out.

Furthermore, it was noted in the presentations that inspections at work zones are not mandatory in all member states, and this was queried at the workshop. The responses indicated that it is typically the responsibility of the authority to conduct inspections. Whilst the general consensus is that inspections are worthwhile and should be carried out, there can be barriers to implementation including a lack of inspectors, high costs and arduous processes. Final remarks drew attention to the importance of disseminating the message to both road workers and road users noting that safety measures are in place for both parties and discussing educational measures to raise awareness of this.

To further their dissemination of the project outputs, IRIS have produced a short demo video to raise awareness of the risks presented at work zones and put forward some key recommendations from the IRIS project. The team have also produced a webinar detailing the project description and best-practice recommendations, both of which are available on the IRIS website[6]. The IRIS team were due to present at TRA 2020 and ISHGD 2020 however these events have been rescheduled until 2021 due to the Covid-19 pandemic.

3.1.3 **PROGRESS Dissemination**

The PROGRESS project specified their contribution to dissemination through Work Package 4. It was the aim of the research team to disseminate the findings to road authorities across Europe and raise awareness around good road design from an early stage. In 2018, PROGRESS gave a presentation[7] on the project at its early stages to AFB20 Roadside Safety Design Conference.

Throughout the research, PROGRESS kept participants informed of the developments and outputs of the research. This information was issued to key stakeholders including various academics and road safety practitioners. Furthermore, PROGRESS have published a scientific paper[8] which looks at the Irish case study, and how topic modelling can be used to identify concurrent patterns of attributes that relate to run-off road collisions, and corresponding interventions.

The research team have also continuously promoted the dedicated project website throughout the research project. The website provides key information on the research, updates to the project and deliverables available for download.

[6] IRIS website: www.cedr-iris.eu

[7] Erginbas, C., 2018. Change of the European Vehicle Fleet and its Effects on VRS. AFB20 (2) International Research Activities Subcommittee. Transportation Research Board (TRB) Committee AFB20. European Workshop. Lisbon, Portugal.

[8] Roque, C., Cardoso, J.L., Connell, T., Schermers, G., Weber, R., 2019. Topic analysis of Road Safety Inspections using latent Dirichlet allocation: A case study of roadside safety in Irish main roads, Accident Analysis & Prevention, Volume 131, Pages 336-349,
https://doi.org/10.1016/j.aap.2019.07.021

A workshop due to be held in collaboration with the SANA-4U project in 2020 has been postponed due to the Covid-19 pandemic, as have presentations[9][10] due to be given at the International Symposium on Highway Geometric Design 2020. These dissemination events were rescheduled for 2021. Both projects presented their findings at a CEDR hosted online event.[11] Feedback on the PROGRESS event focused mainly on the excel tool developed and its usefulness. The project team highlighted the lack of testing in the pilot stages but noted that it would be valuable to receive any feedback from authorities currently using it should the tool be revisited at a later stage for updates.

3.1.4 SANA-4U Dissemination

SANA-4U developed a good practice guidance document based on a review and investigation into the standards and guidelines of member states. Preliminary findings were presented to the CEDR Technical Group in Warsaw 2018, and guidelines were finalised based on these outputs.

Social media has been utilised to inform interested parties about the research with a short webinar[12] describing the project objectives and preliminary findings available for viewing. This webinar was presented at CEDR's stand at TRA 2018. The published deliverables for the project are to be made available on the CEDR website.

SANA-4U had planned for a final dissemination event to take place jointly with the PROGRESS project in 2020, which has been postponed until 2021 due to the Covid-19 pandemic.
The topic lead to discussions around the safe system approach to road design. The project team noted the benefits of the safe system approach but acknowledged the complexities and constraints around legacy road networks, and the need to strike a balance between road safety and practicality.

3.1.5 Call 2016 Safety Final Programme Conference

The final programme conference for the 2016 Safety Call took place in June 2021 as an online dissemination event. A separate report for this event was drafted and is available in Annex I.

3.2 Implementation Phase

It is acknowledged that past CEDR projects have, on occasion, been unsuccessful in terms of their implementation across member states for which there can be various reasons. Although there has been no full examination of the dissemination and implementation of historic safety calls, the PROGRESS project did touch on the importance of raising awareness and ensuring research is effectively disseminated through their survey questionnaires.

When asked about their knowledge of past projects, and their usefulness and applicability, 60% (19/34) of survey respondents said they were aware of historic research by CEDR. Of the 19, 95% said the outputs were useful, however only three quarters (14) said they had implemented these results in some manner. These figures highlight that a greater focus is required on developing a focused route towards

[9] Roque, C., Cardoso, J.L., Connell, T., Schermers, G., Weber, R., 2021. Roadside safety assessment of compliance with standards and guidelines through latent Dirichlet allocation applied to road safety inspection reports. To be presented at the 6th International Symposium on Highway Geometric Design, Amsterdam, The Netherlands.

[10] Schermers, G., Erginbas, C., Connell, T., Cardoso, J.L., Roque, C., van Petegem, JH., Weber, R., 2021 Developing a Roadside safety Organisational Robustness Assessment Tool - The CEDR project PROGRESS Experience. To be presented at the 6th International Symposium on Highway Geometric Design, Amsterdam, The Netherlands.

[11] CEDR Online Event, November 24th – SANA-4U and PROGRESS
[12] SANA-4U webinar: https://www.youtube.com/watch?v=nKxCQA_njxU

implementation for member states. It is important to continue bringing the research a step further in individual countries to ensure there is value to be gained from the research outputs.

To achieve this, the outputs of the projects must firstly be sensible and applicable to be considered for implementation across member states. These four projects took into consideration the practicalities of implementation and sought to produce recommendations that could be fully or partly implemented by roads authorities depending on the level of control they have. Nonetheless, further discussions around implementing change found that in some countries, it is not feasible to implement any research recommendations due to the governance structures in place. These barriers to implementation should be examined by the CEDR governing board who would be better placed to influence change. High level discussions between countries who have successfully implemented findings and those who have not demonstrated an ability to implement research is recommended to highlight the benefits the research can bring about.

To promote implementation, CEDR has for the first time introduced an implementation phase and aims to survey all CEDR members in 2020 to analyse their implementation of historic CEDR research. This survey focuses on collating information surrounding the usability of projects, and the expected implementation of the project. It also allows member states to evaluate the findings of the project and discuss what knowledge gaps were addressed and the value of the findings, as well as identify further research needs. It is anticipated the results from the implementation surveys will drive the areas of future research development and inform high-level CEDR groups of the success or otherwise of implementing historic research.

3.2.1 Example of good practice implementation

This section summarises the implementation to date from a selection of countries. Member states who have been involved in early implementation of the projects were asked to provide a summary of their findings including how the research has been applied, any details on barriers to implementation and any lessons learned as a result. The sharing of knowledge with regards to implementation will ensure a greater understanding of the applicability of research and to reduce repeated errors.

United Kingdom (Highways England):

- The tool developed by the PROGRESS project has been used to identify knowledge gaps and research needs with regards roadside safety. This has led to an internally funded project being established for the in-depth assessment of all fatal incidents on the Highways England road network which have involved roadside infrastructure (including vehicle restraint systems). This project has initially looked back at incidents in the past five years and will be actively investigated going forwards. The aim of the internal project will be to identify any trends in these incidents such that changes can be made (as necessary) to National requirements.

- Outputs from the SANA-4U project were considered during the rewriting of the Design Manual for Roads and Bridges documents which are concerned with the provision of facilities for Vulnerable Road Users, in particular within our document CD 195 – Designing for cycle traffic.

Ireland (Transport Infrastructure Ireland):

- TII are currently developing a pilot route scheme for the N4 Collooney to Castlebaldwin route. The scheme being developed is taking recommendations identified through the SANA-4U trial at this location into consideration. Furthermore, TII are updating their suite of geometric design standards to reflect the outputs from the SANA-4U project.

- The guidance produced by the ADVERTS project has been utilised by planning authorities in Ireland to support decision-making processes for requests relating to the installation of digital billboards near roadsides.

- The results from the IRIS project have been circulated to the Motorway Maintenance contractors in Ireland for their information.

- Ireland has assessed their National Road Network with the PROGRESS tool and will take the recommendations into consideration for future amendments to the Safety Barrier Standards.

4 Recommendations

Some general recommendations and lessons learned are outlined below:

Where technical tools are being developed, consideration could be given at an early stage to maintenance of the tools going forward. Past CEDR projects have developed tools as part of their project, and although functional have provided no after-project support making them unlikely to succeed long-term. These tools also need to allow for flexibility across different member states. Robust piloting and testing of tools with member states is also recommended throughout the lifespan of the project.

Consideration could be given to shorter more focused projects in the future. The benefits of this include receiving project results in a shorter time frame. The uptake towards interviews and questionnaires by road safety professionals and relevant stakeholders was much lower than anticipated throughout this Safety call. Further efforts to raise awareness amongst stakeholders of the importance of their contribution and expertise knowledge to the research could be considered for future calls. Similarly, to encourage greater participation, researchers could endeavour to compose concise surveys and interviews to encourage greater participant involvement.

Research projects may wish to be more specific in terms of how the findings can be implemented. Whilst results can be implemented and trialled through pilot studies, these are usually focused on specific scenarios in individual member states, and more specific information on how other NRA's can adapt the knowledge and findings to their own specific requirements. This could be set out in the Description of Research Needs for future projects.

Difficulties have been emphasised with the ability of some member states to implement any research findings due to the governance structures in place. To achieve successful implementation of research, CEDR may wish to consider engaging in high-level discussions between members of the governing board to review barriers to implementation and effect influence to change.

CEDR and the PEB may wish to consider more focused and local events to disseminate the project results. Whilst large conferences are important and reach a wider global audience, consideration should be given to promoting the research at local seminars and/or online workshops where guidance could be provided with regards to the implementation of the results.

The COVID-19 pandemic has shown that online events are very feasible and could be a more sustainable way for CEDR projects to be disseminated in the future. As the SANA-4U and PROGRESS projects have not yet held their final events, online webinars could be considered as an alternative. To ensure the success of these events and the subsequent implementation phase, actively promoting the events in advance is important to draw a large attendance and engage participants with the project findings.

The distribution of surveys following completion of the project to NRA's are recommended to engage with member states on the added value of the research findings, and suitability for implementation. This survey could highlight the successful aspects from the projects, details on the implementation and knowledge gaps that are of interest to NRA's for future research.

Consideration could be given to the consistency of future Safety Calls. Selecting one common theme for future Safety Calls could support the dissemination and implementation phase giving CEDR and the PEB greater opportunity to promote all projects together. A review of previous projects to identify gaps for future research could help ensure that past work is being built upon.

4.1 Recommendations for Future Research

Knowledge gaps have been identified throughout the research and the following section outlines some of these potential areas where future research could be developed.

ADVERTS identified a significant lack of research around driver distraction, particularly in relation to digital advertising. There is an absence of clear evidence that can quantify the extent to which billboards can distract drivers. Potentially, research on specific data such as this – i.e., how much movement is required to draw attention from the driving task may help inform decision-makers on future policies surrounding permissions for advertising on the network. Similarly, although it has been established that longer glances from the road raise the risk of a collision, research could be instigated to further refine the effects of different durations of glances away from the driving task. Commentary from member states have indicated that the issue of increasing numbers of digital billboards may not be as prevalent as expected at the outset of this research. This is a factor to consider when looking into future research. Follow-up surveys from existing research are recommended to ensure that outputs are continually relevant and useful to member states.

There has already been much research into the topic of road work zones. The IRIS project focused primarily on the current situation at road work zones. Consideration was not given to potential future issues that may arise such as autonomous vehicles. There are pros and cons to remote controlled vehicles, and future research may look at whether autonomous vehicles could have difficulties in detecting road works where temporary signage and road markings are present and where pre-existing permanent linings have been removed.

PROGRESS noted that to further improve roadside safety in an effective manner, further systematic research on the relationship between the application of guidelines and standards and roadside safety should be investigated.

Furthermore, significant efforts have gone into developing European wide data collection tools in past CEDR projects which record the incident data at road work zones. There are many benefits to promoting the use of these tools as they allow for more consistent monitoring of data and thorough evaluation of the effectiveness of different traffic management measures. Implementing such a process requires a high level of support across member states, and future research could investigate the reasons why these tools are not used, and what steps could potentially be taken to start increasing a harmonised database incident at work zones.

5 Project Overview and Conclusions

The four research projects focused on key safety issues selected by member states. These issues include driver distraction, safety at road work zones, safe roadsides, and vulnerable road users. Throughout the lifecycle of each project, the research teams investigated these concerns and endeavoured to identify tools and guidance to inform road authorities of ways of improving safety. This report aimed to bring together the findings and recommendations from each project and provide information and examples of how these can be implemented by member states.

The ADVERTS project can be considered as a new theme in the CEDR safety research focused on the distractions caused by digital advertising and looking to 'future-proof' road networks against these new technological challenges. The outputs of this projects have been utilised in Ireland where authorities have employed the guidelines for use in the planning decisions of billboard placement, and the Netherlands who have used the outputs to improve their guidelines used to assess the suitability and safety of roadside advertising.

Overall, the PROGRESS results are seen as very helpful for road authorities in identifying areas of improvement. The progression of this theme has developed over time throughout different safety calls and research projects. PROGRESS carried out an in-depth look at the research that has built on past research by looking at more practical implementation tools rather than focus on issuing best practice guidance. The tool has been applied by a number of member states who have used it to pinpoint areas that could be improved upon in their organisation and to aid in informing revisions to guidelines and standards.

The IRIS project built on past CEDR research by BROWSER and ASAP and identified key recommendations for both road users and road workers to increase safety. IRIS highlighted the 'work zone review process' as being of key importance for member states to take responsibility for the performance and evaluation of processes in place. This premise was touched upon in workshops whereby reference was made to the importance of planning the work zone and implementing a good safety culture from the top down and bottom up. The outcomes of the IRIS project provide the supporting evidence for NRA's to build on their own policies and guidelines and implement changes where possible. The best-practice guidelines issued acknowledge that not all measures will be suitable in every member state, and whilst member states have acknowledged certain measures are unsuitable for their specific scenarios, it is expected that overall the guidelines will provide benefit to most countries.

The importance of piloting research in earnest was raised throughout this project. The IRIS project requested incident data from member states for a collision analysis. An earlier Safety call project, BROWSER, developed a dedicated tool to collate this information and share knowledge across member states. Although this tool was successfully piloted, the IRIS project highlighted that no country provided the data in this format and deduced that the tool was no longer in use by any member states. Had the data been provided in this format, a more thorough accurate analysis of incidents at work zones could have been established. The tool, although functional, has no after-project support. With no long-term support or reinforcement of the benefits of the tool, it is unlikely they will succeed long term. Consideration should be given at earlier stages to provide maintenance of technical tools going forward. In addition, these tools should be piloted, tested, and adjusted to ensure reliability.

SANA-4U has provided recommendations for providing safe roadsides for vulnerable road users. The outputs of the project aim to support road authorities implement safe systems for vulnerable road users on existing rural road networks.

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7 Appendices

Annex 1: CEDR Call 2016 Safety Final Conference Report

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Abbreviations

AADT	Annual average daily traffic
ADHD	Attention deficit hyperactivity disorder
ADVERTS	Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage
AWV	Flemish Agency for Roads and Traffic
BRoWser	Base-lining Road Works Safety on European Roads
CEDR	Conference of European Road Directors
HGV	Heavy Goods Vehicle
IRIS	Incursion Reduction to Increase Safety at road work zones
KfV	Kuratorium für Verkehrssicherheit
LNEC	National Laboratory for Civil Engineering
NRA	National Road Administration
PIARC	World Road Association
PROGRESS	Provision of Guidelines on Road Side Safety
RSA	Road Safety Audit
RSI	Road Safety Inspection
RWS	Directorate-General for Public Works and Water Management
SANA-4U	Safety at Non-Urban Areas for all road Users
SWOV	The Institute for Road Safety Research
TII	Transport Infrastructure Ireland
TRL	Transport Research Laboratory
VRU	Vulnerable Road Users
VTI	Swedish Transport Agency
WP	Work Package

1 Executive Summary

The conference

The final conference of the CEDR Transnational Road Research Programme Call 2016 – Safety took place remotely on the 9th of June 2021. Organised as remote event by CEDR and facilitated by Vias institute, approximately 90 participants attended the conference. In the morning session, the four projects carried out as part of the research programme call 2016 were presented. The afternoon session consisted of four parallel workshops. These offered an opportunity to go into more detail and provided a space for discussions.

Plenary session – project presentations

Shaun Helman (TRL) provided an overview of the ADVERTS project. The project's objective was to provide evidence-based recommendations for road authorities on how to minimise negative safety impacts from roadside advertising. He presented ten road safety recommendations for roadside advertising that had been developed as part of the project. Developing and applying guidance, raising awareness amongst stakeholders, including billboards in road-safety inspections and support for further research was recommended as next steps. The presentation concluded that the current evidence was limited and future work was needed on a better understanding of the attention required for driving tasks and on future-proofing these attention standards for new distractors and technologies.

Andras Varhelyi (Lund University) presented the IRIS project which set out to share best-practices on traffic management at work zones with national road authorities in Europe. His presentation gave an overview of the safety issues identified from interviews with practitioners, general measures to improve road safety, temporary traffic management issues and basic principles for safe design and marking of road work zones. The four 'C's for designing and marking road work zones (conspicuous, clear, consistent and credible) were illustrated by real-life examples. Key recommendations were provided for different areas, namely contracting (regular checks in contracts and reduce time-stress), management and education (provide health and safety training and collect incident data), implementation (use clear symbols and pictograms, apply traffic calming measures) and work zone safety examinations (undertake work zone process reviews and on-site inspections).

The PROGRESS project was presented by Ceki Erginbas (TRL). The project intended develop practical recommendations for safe roadside design to address the problem of run-off road crashes. These were developed through the review of existing design, maintenance and operational requirements, followed by an assessment of the implementation capabilities of NRA and their contractors. Based on a fault-tree diagram identifying the harm of a run-off-road accident and potential contributors at all levels, a Roadside Safety Organisational Robustness Assessment Tool was developed by the project team. Using the fault-tree diagram, the presenter discussed potential contributing factors at all levels. A step-by-step demonstration of the practical use of the tool completed the presentation.

The SANA-4U project was presented by Connor McGrath (Arup). The objective of the project was to prepare a document to assist CEDR members in the development of standards for the provision of safe VRU infrastructure in non-urban or inter-urban areas. Through a review of existing standards and the identification of good practice, high level design principles were developed and tested in worked examples. The design principles identified for six key design elements were then compiled in a set of guidelines to inform, support and inspire designers of facilities for VRU on legacy road networks. Key takeaways of the project were that retrofitting VRU infrastructure on legacy roads is very difficult but possible. A structured approach can be helpful to assist designers in selectin the appropriate infrastructure but flexibility is critical as one size does not fit all. Finally, it does not have to be perfect to be safe and fit for purpose but depends on the context.

Parallel workshop sessions

In the ADVERTS workshop, Willem Vlakveld (SWOV) provided attendees with an update on the scientific on the effects of roadside billboards. All new studies confirmed previous findings and recommendations developed by the project. Additional evidence on the distraction generated by billboards is now available, yet evidence remains inconclusive with regards to an increased crash risk, calling for further research. Furthermore, evidence is now available that drivers with attention deficits, just as younger drivers, are more easily distracted while driving. The ban of particularly distracting digital billboards was discussed but the lack of evidence on an increased crash risk makes this politically difficult to achieve, as is convincing the private owners or operators of billboards outside the NRAs jurisdiction of the harmful effect of the billboards. Distraction by signs used by road administrators to inform drivers was also discussed, for which keeping signs as clear and concise as possible is considered to be the only solution.

Four presentations were given in the IRIS workshop by Philip Temmerman (Vias institute), Bernd Strnad (KfV) and Andras Varhelyi (Lund University). These included the analysis of accidents and human factors relevant in work zones, best practices to improve work zone safety and work zone road safety audits. The absence of accident data from most member states other than Ireland in the IGLAD database was deplored and Herman Moning (RWS) suggested that this should be raised in the CEDR Road Safety working group. Portable rumble strips as a means to improve work zone safety were also discussed. It emerged from the discussion that these are currently not applied in some member states because of the additional accident exposure of road workers when applying them on site. Automatic deployment was suggested as potential solution. In addition, work zone safety procedures, unlike in the USA, are not prescribed but only suggested by European legislation and it was agreed that these should be implemented nevertheless.

In the PROGRESS workshop, Ceki Erginbas (TRL) provided a step-by-step demonstration of the Roadside Safety Organizational Robustness Assessment Tool. The tool has already been used in three different countries and user feedback has been positive, both in terms of usability and how the tool can help the NRA to improve at an organizational level. Expectations of more on-site design-level advise were mentioned, which however do not fit within the tool's scope, designed to address issues at the organisational level. Similarly, concerns were raised that the application of the tool's recommendation are outside the typical user responsibility. Several key recommendations on the tool were put forward. Firstly, more options should be added in the list of taken countermeasures. Secondly, a possibility to check the relevance of a guideline should be provided to avoid relying on outdated guidelines. Thirdly, two tools should be developed, one focusing on specific projects/topics and one to give an overview at the level of the road agency. Finally, this test should also be applied on CEDRs own publications and recommendations to allow NRA to adapt their guidelines if necessary.

Two presentations were given by Conor McGrath (Arup Ireland) and Marco Moulder (Arup Netherlands) in the SANA-4U workshop. The first elaborated on a worked example presented in the plenary and the second presented the outputs of the study in more detail, including the design guidelines. The main challenges were the availability of space and physical constraints and the differences between geographies. The biggest discussion point was around the practicality of delivering these schemes, including the trade-offs involving parking and private properties. For the second presentation, discussion focused on whether the VRU or car users should get priority, which depends a lot on the local jurisdiction. Another discussion was on the specific requirements of crossings outside of junctions and the possibilities to increase their safety through design and technology. The need for flexibility, the need to maintain holistic considerations and the importance of a safe and forgiving design solutions were identified as the main design takeaways. The presenters stressed the need to be pragmatic and flexible when designing VRU infrastructure and facing local constraints, all while ensuring the safety of all road users.

2 Introduction

This chapter summarises the final conference of the CEDR Transnational Road Research Programme Call 2016 – Safety held in June 2021. Organised by CEDR and facilitated by Vias institute, the conference took place online via Microsoft Teams on Wednesday, 9th of June 2021. The purpose of the conference was to present and discuss the research undertaken by the four research projects funded by the CEDR 2016 Road Safety research call.

The conference programme was divided into a morning (10:00 – 12:30) and afternoon session (13:30 – 15:40). The morning plenary session started with a welcome and introduction, followed by introductory presentations of the four research projects undertaken as part of the CEDR research call. The afternoon session was then organised as four project-specific workshops held in parallel and facilitated by the individual project teams. After the workshops, attendees re-joined the plenary where feedback from the four parallel workshops was exchanged. The conference concluded with the closing remarks from the chair of the Project Executive Board.

The conference was attended by around 90 participants from a variety of organisations from the CEDR member states. This includes regional and federal road administration government ministries, road safety research institutes and universities, as well as non-profit organisations and civil engineering companies representing seventeen European countries.

3 Plenary Session

3.1 Welcome and Introduction

Participants were welcomed by the moderator, Wouter van den Berghe (Vias institute), and Steve Philips, Secretary General of CEDR. Conference attendees were provided with some practical housekeeping information by the moderator, who then handed over to Steve Philips.

The secretary general welcomed all participants on behalf of CEDR and highlighted the importance of road safety. He pointed out the contributions of the research projects of the current CEDR research call to improving road safety. Steve Philips then thanked all project teams that contributed to the research projects, as well as the CEDR members that provided the vital funding that enabled the research programme. He proceeded to express his gratitude to Herman Moning (RWS), chair of the CEDR Working Group Road Safety, for his commitment, acknowledging his role as a driving force behind many of the projects.

Finally the secretary general thanked all conference participants for their attendance. Stressing the importance of dissemination, implementation and practical application of the research findings, he encouraged all participants to actively engage with each other and to make use of the findings and outputs at the national level. The moderator then briefly presented the programme for the day, followed by a short and interactive ‘warming up’ exercise. The full conference programme can be found at the end of this report.

3.2 Project Presentations

Following the welcome and introduction, the project teams presented their projects and their main results and findings in four presentations of around half an hour each.

3.2.1 **ADVERTS**

Shaun Helman (TRL) provided an overview of the ADVERTS project, focusing mainly on the recommendations developed as part of the project.

Project objective

The project's objective was to provide evidence-based recommendations for road authorities on how to minimise negative safety impacts from roadside advertising. This objective should be achieved by looking at location, physical features, and content of roadside billboards. It should furthermore be based on scientific knowledge and evidence and be aligned to current practice in Europe and throughout the world.

With distraction being a major challenge for road safety, billboards are one of many sources of distraction for drivers. The project reviewed the current state of scientific knowledge and produced an inventory of current practices. Based on these two and input from users, a set of recommendations in relation to roadside billboards was developed.

Recommendations

Shaun Helman proceeded to present the ten recommendations on how to minimise the negative safety impacts from roadside billboards developed by the project, which are:

1. Don't cause confusion with road signs.
2. Don't block road users' view.
3. Avoid complex locations.
4. Don't use moving images.
5. Don't encourage non-driving actions.
6. Keep it simple.
7. Minimise transitions.
8. Don't dazzle road users.
9. Don't have flashing lights.
10. Avoid overlarge billboards.

Conclusion

The presenters recommended the following next steps:

- Developing and applying guidance / legislation based on the recommended practice.
- Raising awareness amongst stakeholders of the importance of road safety and the need for a European standard.
- Including billboards in road safety inspections and raising awareness of the need for regular maintenance.
- Supporting further research aimed at filling the knowledge gaps.

They concluded by stressing that the current evidence was limited and future work was needed on attention standards to understand how much attention is needed for the driving tasks and to future-proof them by ensuring that they apply to all distractors and technologies.

Discussion

Following the presentation the question was asked whether planning authorities should be considered in helping to deliver 'vision zero' as there are many areas outside the road authority's influence where

billboards are placed. As most road authorities are at best consulted in such billboard applications, it was agreed that better collaboration between planning and road authorities would be beneficial. In the case of the Irish road authority, evidence from ADVERTS feeds into advice provided to the planning authorities. In the case of Norway, regulations also apply to advertising on private property if it is visible from or directed at road traffic.

3.2.2 **IRIS**

The presentation on the IRIS project was given by Andras Varhelyi (Lund University). The presentation gave an overview of the objectives, activities and findings of the project. Andras Varhelyi presented the safety issues identified from interviews with practitioners, general measures to improve road safety, temporary traffic management issues and basic principles for safe design and marking of road work zones.

Building on previous CEDR research, the objective of the IRIS project is to share best-practices on traffic management at work zones with national road authorities in Europe. This includes short, medium and long term road works and the project aims to give an overview of best practices in Temporary Traffic Management and Work Zone Safety Examinations. This was achieved through the analysis of accident data related to work zones, the review of international literature and interviews conducted with practitioners in 8 EU countries.

While there is a large variety of other accident types, most fatal accidents in work zones occur at static road works, on busy/congested roads, and in daylight and normal weather conditions. The most common accident type are either single-vehicle accidents or rear-end collisions. Based on interviews with practitioners, the presenter reported the following common safety issues at work zones:

- Speeding
- Attitudes, lack of awareness and distraction of vehicle drivers
- Collisions with protective vehicles
- Deficiencies in signage/devices
- Problems usually arise at the beginning of road work zones
- Problems are greater in short-term road works

The following general measures to improve safety at road work zones are applied:

- Increase safety awareness among all parties involved in road work
- Standardizing design and work sequences
- Tender procedure including security-related issues
- Work Zone Safety Examinations
- Feedback processes, follow-up, lessons learned at different levels - administration, designers

With regards to Temporary Traffic Management , the following issues are to be considered:

- Information, warning & guiding of road users
- Establishment of work zones
- Speed management, enforcement
- Portable barriers
- Lighting
- Incursion warning

The basic principles for designing and marking road work zones can be summarized in four ‘C’s:

- **Conspicuous** - the driver must be physically able to see what is coming up. The work zone must be obvious, noticeable and eye-catching to draw the attention of the drivers and encourage them to act in the desired way.
- **Clear** - all signing, guiding and other instructions through road works must be clear for drivers so they can be certain about what is required from them.
- **Consistent** - drivers should encounter uniform standards, layouts and arrangements at all work zone sites of the same kind, so they are conditioned to act in the expected way.
- **Credible** - the instructions are 'believable' so the drivers can rely on what they are told and that the messages they are given are a true representation of what will occur ahead.

The presenter then illustrated these principles by selected real-life examples applied by road administrators.

In conclusion, a number of recommendations covering four important areas were provided. In contracting, regular checks ought to be fixed in the contracts and time stress needs to be reduced. In the field of management and education, health and safety training must be provided and incident data needs to be collected. When it comes to implementation, the use of clear symbols and pictograms for driver instructions is key, as well as the application of traffic calming measures. Finally, for work zone safety examinations, it is recommended to undertake work zone process reviews as well as on-site inspections.

3.2.3 **PROGRESS**

The presentation of the PROGRESS project was given by Ceki Erginbas (TRL). Starting from the road safety problem of run-off road crashes, he presented the project's objectives followed by an overview of the project structure. He then proceeded to outline the approach taken to develop roadside safety guidelines that resulted in the Roadside Safety Organisational Robustness Assessment Tool.

Research problem

The project intended to address the problem of run-off road crashes. Still responsible for a large number of casualties on European roads, their occurrence could be reduced by an improved roadside environment. PROGRESS therefore set out to develop practical recommendations for safe roadside design that can be implemented by member states to address this road safety problem.

It was discovered that ample technical advice is available in literature and standards on roadside safety design. Still, practical application of the advice and maintaining a safe design over time remains a challenge at organizational level. There are various reasons for this:

- It is unclear which solutions are best for a given situation.
- Some of the previous advice are overly technical.
- Some recommendations are logical on paper, but not applicable in real life.
- The scope of previous advice is often limited at design level, while installation and monitoring over lifetime remains an issue.

Project objectives

In light of the above, the objective of the project was therefore to make recommendations to achieve organizationally robust and practicable guidelines for roadsides that can be implemented by road authorities. This was achieved in three steps:

- Review all existing roadside safety design, maintenance and operational requirements for clear zones and restraint systems.
- Determine to what extent national road authorities in Europe and their contractors are capable of implementing and maintaining compliance with the standards and guidelines.
- Develop recommendations for safe roadside design and management ensuring broad acceptance among member NRAs of CEDR.

Project structure

Ceki Erginbas then presented the project structure and work packages. The project included a technical review on existing standards and research. Data collection and analysis were a significant part of some work packages. Some of the data was acquired from road authorities via survey. The project also developed a guidance tool. This tool was tested and demonstrated and feedback from road authorities was considered to help improve the tool.

RSS Guideline Development Approach

The presenter then focused on the roadside safety guideline development approach and development of the tool. The ambition was to provide guidance based on facts, taking into account research and operational experience while being both objective and robust. The project team therefore proceeded to identify as many contributory factors in all risk phases that could lead to run-off crashes. Suitable mitigation measures were then identified for these contributory factors. This was then used to develop assessment questions and criteria that would in turn lead to specific recommendations to improve roadside safety.

The surveys undertaken as part of the project highlighted a number of recurring difficulties faced when implementing previous research projects, which included:

- Findings contradict with existing standards.
- Findings are too technical.
- Not clear how findings relate to actual implementation.

The following benefits of the self-assessment route were identified:

- Recommendations are not forced from the outside, but rather due to the self-assessment nature, they are identified by the road authority using the tool.
- Findings are generated, as a result of the information entered by the user. So rather than a broad brush approach, which may not fit with specific circumstances in a country, a tailor made set of recommendations are generated.
- Recommendations range from organizational level to site specific applications.
- A back-to basics approach so that the road authority can question the logic behind the existing applications, rather than accepting them as given.

Roadside Safety Organizational Robustness Fault Tree

Ceki Erginbas proceeded to present a fault-tree diagram of the harm resulting from a run-off-road accident. The fault-tree diagram was used to identify all and all potential contributors throughout the road lifecycle. From initially only informing the development of the tool, the diagram then became the underlying structure of the tool. Using the fault-tree diagram, the presenter discussed potential contributing factors at all levels.

Tool demonstration

A live step-by-step demonstration of the tool given by Ceki Erginbas completed the presentation. The practical use of the tool, which was created in Excel, was explained through a quick walk through each of the four steps , namely:

- 1. Provide General Information
- 2. Identify and prioritise issues
- 3. Identify and declare countermeasures
- 4. Generate recommendations

3.2.4 SANA-4U

The SANA-4U project was presented by Connor McGrath (Arup). He introduced the projects aims and objectives, the background and methodology used, the project stages and deliverables. The presentation was completed by an overview of the final deliverables and key takeaways.

Objective and Methodology

The main objective of the project was to prepare a document to assist CEDR members in the development of standards for the provision of safe vulnerable road user (VRU) infrastructure in non-urban or inter-urban areas. The project was structured into five work packages (WP). Each of the WP was briefly presented by Connor McGrath in the context of the project.

Inventory of existing VRU standards (WP 1)

The project included an online search for relevant standards. A questionnaire was circulated amongst CEDR members to assist with collecting relevant standards. Subsequently, follow-up interviews to discuss the standards were carried out with CEDR members who participated in this exercise. The appropriate information from reviewed guidelines and interviews were collated and presented for six distinct design elements considered as part of this project:

- Continuous road segments, including curves
- Crossing points
- Junctions
- School zones
- Small linear Settlements
- Rural Roundabouts

Good practice guide (WP2)

The next step consisted in reviewing existing VRU facilities throughout member states and identify good and bad examples, from which a set of high level design principles were developed for each design topic and summarised in a good practice guide.

Worked examples (WP3)

The purpose of the worked examples was to test and identify the ease or otherwise of implementing the developed draft best practice guide in different geographies, namely in Ireland, Belgium and Sweden. The three worked examples have distinct characteristics and challenges and their locations were:

- N4 Castlebaldwin to Collooney (Ireland)
- N9 Bruges to Ostend between the N307 and N34 (Flanders Region, Belgium)
- Route 293 – Smedsbo to Falun (Sweden)

In the Irish worked example, a pragmatic choice on creating one-bidirectional cycle lane or two uni-directional ones and whether to place them before or behind existing hedgerows or remove them altogether had to be made, providing a specific example illustrating the design decisions required when implementing best practice.

The main challenges faced throughout the process were twofold:

- Availability of space and physical constraints – often difficult to implement desired standard.
- Geographic differences (such as the differences in road frontages – different constraints / opportunities, the choice to afford cyclists more priority safer in countries where bicycle has more dominance)

This in turn led to two key findings for incorporation in Final Design Guidance Document:

- A structured approach to defining type of facility is required for a given scenario
- Design flexibility is required to give designer choice where optimum solution not feasible

Draft Guidelines (WP4) and Final report (WP5)

The objective of the final report was to harmonise the reports prepared during WP 1 to 4, and compile a usable set of good-practice guidelines to assist NRAs in member states in developing standards within their individual administrative region. The general structure followed the six design topics identified above.

Connor McGrath then briefly discussed the guidelines, recommendations and decision tree provided for each design element in the final report.

- Design element guidelines: For three speed categories (≥70 km/h, 50-69 km/h and <50 km/h), complemented by a suite of guiding principles and a set of do's and don'ts (traffic light metaphor)
- Design recommendations: Different levels of design interventions are presented which align with different contexts such as speed, AADT, bicycle volumes
- Decision trees: Based on the above, but with flexibility for legacy road networks

Summary

According to Connor McGrath, the set of guidelines comprises a suite of guiding principles to inform, support and inspire designers of facilities for VRU on legacy road networks. The key takeaways of the project were summarised by the presenters as follows:

- Retrofitting VRU Infrastructure into legacy roads is very difficult, but it is possible.
- Structured approach helpful to assist designer in selection of appropriate infrastructure.
- Flexibility is critical within this structure as one size does not fit all.
- It does not have to be perfect to be safe and fit for purpose – context is everything.

Discussion

During the following discussion, it was clarified that pedestrian issues are indeed taken into account in the decision tree presented earlier, which is aiming to cover all VRU and not just cyclists. Another question

was raised regarding the specific research behind the choice to use a verge with limited width. While the recommendation is in fact to use a wider width, the specific choice was made as compromise due to limited availability of space and the prohibitive costs of infringing on private properties.

4 Parallel workshops

The conference participants reconvened after the lunch break and were invited to join one of the four parallel sessions. The workshops offered an opportunity to go into more detail and provided a space for discussions on project implementation, present additional insights or elaborate on specific parts of the project. Each workshop lasted 1h30m and one workshop session was held per research project:

- Parallel Session 1: ADVERTS
- Parallel Session 2: IRIS
- Parallel Session 3: PROGRESS
- Parallel Session 4: SANA-4U

4.1 Parallel Session 1: ADVERTS

This parallel workshop was run by Willem Vlakveld (SWOV) and Shaun Helman (TRL). The former gave an overview of 11 new studies on the impact of advertising on road safety that had been published since the initial ADVERTS literature review. Globally the new study results are in line with and confirm the recommendations put forward by ADVERTS.

Key issues identified in the literature update

Three key issues have been identified in the review of the recent literature on the topic:

- The same conclusions were obtained by a study using a different conceptual framework.
- The crash risk related to roadside advertising remains inconclusive as shown by two different studies with similarly good study design but opposing conclusions.
- Not all drivers are the same, as people with ADHD are more distracted by billboards than others.

Discussion of the initial findings and literature update

In the following discussion, a number of issues around roadside advertisement and its impact on road safety were discussed. A participant asked whether the advertising industry produces its own research and whether it was involved in any of the recent papers reviewed. The industry does produced its own research but to the knowledge of the presenters it has not dealt with road safety implications of advertisement.

Despite being expected, no research on the impact of autonomous driving has been found. Given that the distraction of drivers increases with a less demanding driving task, making autonomous driving particularly relevant in this context. However, it was also clarified that most drivers are able to self-regulate by focusing more on the road if the driving task is more demanding.

A question was raised why ADVERTS did not take a stronger position on banning digital billboards, because there is now conclusive evidence that they distract drivers. The recommendations lead to discussions with the advertising community on what is and what is not possible. No stronger position on banning digital billboards has been taken because this is a political decision and while evidence on the higher distraction from digital billboards is available, there is no evidence of an increased crash risk yet. In addition, no safe threshold for image switching frequency has been identified yet.

It was then discussed whether the ADVERTS recommendations apply to a greater or lesser extent to highways, rural roads or inner cities. Roadside advertisement is more distracting in a countryside setting where the driver's workload is also lower, while in (urban) setting with higher workload, less attention is given to adverts.

The comment was made the recommendations are not very specific and that for the purpose of regulation, more quantitative and/or specific recommendations are required. The presenters agreed that more specific quantifications of recommendations should be developed as follow-up on the project and they also explained that some countries include these already in their legislation or guidelines.

Many digital billboards are placed outside of the road authorities' jurisdiction. In this context, the question was raised how to convince private owners to refrain from setting them up, especially given the inconclusive evidence on crash risks. Participants agreed that convincing private owners not to set up digital billboards on their roadside property is difficult in the absence of clear evidence of an (likely but not directly proven) increased crash risk. Raising awareness on the risks and legislation on bans or minimum distances were suggested as potential measures.

Another interesting point raised was that digital signs can be used by road administrators to display relevant information to drivers. However, this might also have the effect of distracting drivers. In this case, keeping messages as concise, brief and clear as possible is key.

Studies counting the number of signs and adverts have been undertaken in Ireland and the numbers have been found to be quite high. Similar results were also reported by a recent study. Self-selection is applied by drivers so the number of adverts actively 'seen' by drivers is lower and adverts are ignored when there are too many.

Finally, the question was raised what the percentage of the driving population with attention deficits is. Younger drivers and drivers with ADHD are more easily distracted from the driving task and cannot focus as long. As a rough estimate, around 10% of drivers are considered to be affected by some form of attention deficit.

4.2 Parallel Session 2: IRIS

The parallel workshop on the IRIS project consisted of a four presentation given by the three project members Philip Temmerman (Vias institute), Bernd Strnad (KfV) and Andras Varhelyi (Lund University).

Accident characteristics in work zones and relevant human factors

An overview of accident characteristics at work zones and the human factors relevant when driving in the vicinity of road works and working near live traffic was presented by Philip Temmerman. Relevant human factors for the drivers include:

- The automatic nature of driving a vehicle
- Workload, attention and distraction
- Visual perception
- Perception errors
- Reaction time

To this can be added the risk sensitivity and habituation as well as the risk understanding, illusions and emotions of road workers.

The 'golden rules' for work zone safety were presented:

- Put the driver/worker in the centre of the work zone safety.
- A driver always comes back to what he knows and what he expects.
- A driver gets easily confused.
- A driver can't do many things at the same time.

A number of safety problems experienced by NRA include:

- Lack of awareness, distraction
- Collision with safety vehicles
- Speeding
- Attitudes and behaviour in traffic
- Deficiencies in work zone signage/organisation

It was stressed that the most dangerous phase of road works is the setting up. Different strategies and measures were explained and a demo video illustrated this danger clearly.

Discussion

It was discussed whether data supports the theory of higher accident risk of short term work zones. However, the nature of these works make it difficult to prove any significant effect. This is, among other reasons, due to their short duration, the relative lack of signage and organisation of this type of works, the pressure to minimize road work duration but also the difficulty to obtain relevant data. Difference in data collection further complicate the comparison between different countries.

Practical principles, examples and recommendations

Bernd Strnad then presented very practical principles, examples and recommendations with regard to road work signage and organisation, safety supervision, personnel training and contracting practices.

The principles of safe work zones were summarised as:

- Human factors, psychological rules
- Duration and length of work zones
- Speed control
- Segregation of work zones and road users
- Forgiving roadside
- Design principles
- Vulnerable road users
- Work zone personnel

These principles were illustrated by good and bad examples after which concrete measures to improve work zone safety were presented. The presentation was concluded with the following set of recommendations:

- Shift from 'cheapest offer' to 'best offer'
- Reduce time stress
- Consider basic psychological rules - 4C's concept of PIARC
- Establish procedures (RSA, RSI)
- Reduce speeding

- Keep the signing clear, use symbols, images, pictograms
- Use vehicle restraint systems and collision friendly devices
- Keep adaptation needs of the eye in mind
- Improve skills and knowledge of workers and drivers

Discussion

In the discussion it was stated by a road administrator that they don't install rumble strips at road works because the workers are too exposed in that phase. For this problem, two solutions were proposed. One considered deploying the crash attenuator before placing the rumble strip. Afterwards, repositioning the crash attenuator so the rumble strip was outside the work zone. The other solution discussed was to try to automate the deployment of the rumble strip to avoid staff exposure.

It was further asked whether most of the NRA do not use the data collection developed by the BRoWser project but it became clear that none of the attendees had influence in their organisation on this matter.

Conclusion

The workshop was then concluded with the presentation of Andras Varhelyi. He focused on the regulatory framework, results from the NRA interviews and literature review, recommendations on the requirements for the contractor in the tender call and detailed information on the work zone road safety audit and inspection.

It was noted that most participants either had no first-hand experience with the application of work zone safety measures in general or with adopting the outcomes and recommendations of the IRIS project in particular and were new to the topic. This made it difficult to share experiences on integrating the safety aspects in tenders or on work zone organisation and signage. This lead to the reflection that the projects target audience might not have been defined clearly enough as it might have been too specific for interested persons but not specific enough for professionals working on this topic.

4.3 Parallel Session 3: PROGRESS

The parallel workshop session on the PROGRESS project wasled by Ceki Erginbas (TRL). He provided a more in-depth demonstration of the Roadside Safety Organizational Robustness Assessment Tool and gave a step-by-step explanation of the tool.

Step-by-step demonstration of the Roadside Safety Organizational Robustness Assessment Tool

The purpose of the tool is to identify gaps in the knowledge and making road agencies aware of problems and already undertaken countermeasure to improve their expertise, knowledge, and awareness. The tool allows users to undertake a robustness assessment of the processes and polices with regard to roadside safety. Following a brief explanation, the tool assesses polices and processes in place. For identified issues, it provides suggestions for countermeasures. A list of tailor-made recommendations for procedures and policies to be implemented to improve roadside safety is then produced as output for the user.

In the assessment, different items and topics are addressed, including network performance monitoring, design (standard writing and policy, Use of the standard, departures from the standard, RSA), implementation and installation, operational life and RSI.

The tool was designed to be self-explanatory and provides explanations through a help function. In the discussion it was clarified that the help function can be switched off if desired. While the help function makes it easier to understand the tool and complete the assessment, the tool was not developed to be

used exclusively in one specific way. The user can therefore use the tool as they wish to and an individual interpretation is always possible.

After the assessment step, the user adds countermeasures that have already been taken, making it clear whether issues are addressed sufficiently or not. A list of countermeasures was compiled but the input from participating countries was somewhat limited. Based on the identified problems and countermeasures implemented, recommendations are then shown in the final step and a summary for overview and tracking is provided.

Discussion

During the discussion, the concern was raised that in some cases a problem might be with the design standard itself, which would not be addressed by the tool. While it was agreed that this can be the case, the purpose of the tool is to address the fact that road authorities lack knowledge about what is going wrong on the roads. It does so by raising awareness and helping to identify issues on an organizational level but it does neither provide nor evaluate different guidelines or provide specific solutions, which is out of scope. In terms of use case of the tool the idea was that it can be used for a general assessment on organizational level as well as to assess a part of the network or a specific issue.

It was recommended to undertake the self-assessment as a team and to incorporate the available knowledge and experience within the organisation. Covering other topics related to roadside safety might also be beneficial as this helps to identify issues that tend to be overlooked or to detect previously unknown issues.

For other participants, challenges mentioned were more of an organisational nature. This includes the lack of connections between people at the same organisation, the lack of awareness of work undertaken by other departments. As mentioned before, the tool will also not help identifying improper guidelines or move away from these, though the tool should help to raise attention on guidelines and problems linked to them.

Recommendations

Finally, a number of recommendations were given by the presenters:

- Add more options in the list of taken countermeasures.
- Try to give a list of options and recommendations to check whether a certain guideline could still be relevant or not. Outdated guidelines might give the wrong impression that some measures are in place while not being relevant.
- Try to develop two separate tools, one for a very specific topic or project, and one in a broader sense to give an overview of the current situation within the road agency. Filling in the model might be more difficult in relation to a specific topic in comparison with a general evaluation.
- Perform this test on the publications and recommendations of CEDR. This way, national road authorities can also look back at recommendations and studies from CEDR, to possibly adapt guidelines. A lot of work has already been done, but it can be difficult to trace back to it.

4.4 Parallel Session: SANA-4U

Following on from the plenary session, Conor McGrath (Arup Ireland), Marco Moulder (Arup Netherlands) and Christopher Patten (VTI) explored one worked example to illustrated how the best practice recommendations were implemented. The worked example was complemented by further details on the final report and guiding principles for design elements were given.

The Irish worked example

The purpose of the worked examples was to test and identify the ease or otherwise of implementing the developed draft best practice guide in different geographies. A national road situated in the North-West of Ireland (N4 Castlebaldwin to Collooney) with speed limits between 80 and 100km/h, the Irish worked example route presents a number of constraints, in particular hedgerows and private properties on the roadside.

The constraints, possibilities, the final design choice and the guidance principles applied were presented and discussed through example designs. Participants were invited to interactively share their opinions and suggestions regarding what design principles would need to be applied or considered.

Discussion

A number of design choices were discussed, such as whether to opt for a bidirectional or two unidirectional cycle paths, or whether to let cyclists yield at junctions. For the former, practical and safety considerations, led to the choice of a two-way path. This not only addresses space constraints and the issues of sideroads and street crossing but also comes with the added benefit of perceived comfort and safety, as well as a lower impact on private land. The latter depends strongly on national regulation of cyclist' priority at junctions and how common cycling is locally. The approach considered most safe in the local context should be chosen, which in the example consisted in letting cyclists yield to avoid confusion.

It was noted that for linear settlements, urban standards become more relevant if they are effectively semi/interurban areas with increased activity. In such locations, removal of parking can help generate space for infrastructure for vulnerable road users. At the same time, it was mentioned by participants that this is often causes issues with residents or businesses and in the planning process. In such situations, flexibility and the consideration of different alternative design options is essential.

Conclusion

Reflecting on the worked examples, the main challenges were the availability of space and physical constraints and the differences between geographies. The lack of space, nearby private properties or immovable structures such as canals make it often difficult to implement the desired standard. Differences in road frontages in turn generate locally specific constraints and opportunities. Likewise, priorities between VRU and other road users need to be balanced depending on traffic levels as well as national jurisdictions. Choices such as to afford cyclists more priority is a choice dependent on national specificities, traffic regulation and cycling culture. Such differences between geographies make it difficult to establish a 'one-size-fits-all' recommendation.

Regarding the incorporation of design elements in the Final Design Guidance Document, it was considered essential to provide a structured approach. A decision-tree recommends the specific type of facility for a given scenario. Acknowledging that some design flexibility is required to give the designer choices where optimum solutions are not feasible, a traffic-light system of best practice and next best design recommendations was incorporated.

Further details on the final report and guiding principles for design elements

In the second part of the workshop session, the process used to develop the final guidance and considerations regarding each design element were presented in more detail.

For each design element, guiding principles, design recommendations with descriptions and a decision tree have been developed and can be found in the final report. Speed limit, motorized, HGV and non-

motorized traffic volumes are used to determine the most appropriate design solution. The recommended solution is then described in more detail, as well as the next best solution.

Following the summary of the process and structure of the recommendations, desirable general features were presented for each of the design elements:

- Continuous road segments, including curves
- Crossing points
- Junctions
- School zones
- Small linear Settlements
- Rural Roundabouts

Discussion

Participants asked about the best way to implement crossings for cycle tracks and how to best get cyclists from one roadside to another. Speed reductions and improvements in visibility were stressed as key factors, and traffic volumes also need to be considered. Splitting the crossing in two through refuges and traffic islands helps to reduce traffic exposure and creates a safe zone. Visibility can be improved by locating crossings nearby other crossings. If visibility cannot be improved, speed reduction is the best approach. Signage and (smart) lighting can further improve the visibility and warn road users.

It was further discussed that, while usually sticking to the most direct route is considered preferable, greenways can constitute an alternative to provision alongside the road. However this would be a route choice to make prior to the design of VRU infrastructure. The question when to share a route rather than to provide separate infrastructure for VRU altogether was also discussed and the presenters suggested this is only recommended in low volume situations, with an indicative threshold of <1500 AADT provided, but this would also depend on the traffic composition (in particular the share of HGV).

Finally, the presenters were asked whether they had been contacted regarding the implementation of the guidelines by road designers. So far the guidance was only shared internally with colleagues but no external dissemination has taken place, with the conference being the first step to do so. Participants reported having used the guidance document and gave positive feedback.

Conclusion

For the challenge of identifying the better solution under physical, legal, demographic and environmental constraints in a specific local context, the presenters offered three design takeaways identified throughout the project:

- The need for flexibility. One size doesn't fit all and it is therefore important to be adaptive and use ideas from the toolbox.
- Try and maintain holistic consideration. A better solution is the one that is supportive and self-explaining for all road users. It considers what's around the next bend and also looks at the needs of all road users, not just vulnerable road users, as all road users are interacting with each other.
- Safety First (Vision Zero). The design solution should forgive mistakes and give users the possibility to do the right thing.

Acknowledging that local constraints might limit possibilities, the presenters stressed the need to be pragmatic and flexible when designing VRU infrastructure, all while ensuring the safety of all road users.

The presenters expressed their hope that their guidance will serve as a useful one-stop-shop for comparing and getting ideas for good design solutions for VRU in non-urban areas.

5 Feedback and closing remarks

After the parallel sessions on the individual programmes, the participants rejoined the plenary session and were welcomed back by the moderator Vincent Leroy (Vias institute). The project managers were invited to provide feedback on their parallel workshop sessions in form of a five minutes pitch, providing the other participants with a brief summary, key messages and takeaways from the workshop.

5.1 Feedback from the parallel sessions

5.1.1 **ADVERTS**

Willem Vlakveld (SWOV) reported on the ADVERTS workshop in which he had provided attendees with an update on the literature that serves as evidence for the recommendations that had been developed for roadside billboards. He noted that a different peer-reviewed literature review study came to the same conclusions as the ADVERTS project and that additional evidence on the distraction generated by billboards was now available.

In addition, an Israeli study with good study design confirmed that the crash risks increases around billboards, yet a similar Canadian study reports provides no evidence of such an increase. Willem Vlakveld concluded that the evidence is still inconclusive with regards to an increased crash risk. Furthermore, evidence is now available that drivers with attention deficits, just as younger drivers, are more easily distracted while driving. In conclusion, all new studies confirmed previous findings and recommendations developed by the ADVERTS project.

The ban of digital billboards, which are found to be more distracting, was discussed but the lack of evidence on an increased crash risk makes this politically difficult to achieve. A further point of discussion was how to convince the private owners or operators of billboards outside the NRA's jurisdiction of the harmful effect of the billboards. Finally, the distraction by signs used by road administrators to inform drivers was discussed. Keeping signs as clear and concise as possible is considered to be the only solution. The self-regulating character of drivers distraction as a function of driving workload is also helpful in this context.

5.1.2 **IRIS**

For the IRIS project, Andras Varhelyi (Lund University) reported on the parallel session, in which presentations on four topics were given. These included accident analysis, human factor, best practices to improve work zone safety and work zone road safety audits.

While he stated that there had been limited discussions, he explained that the IGLAD database was mentioned that was developed as part of a previous research project and was supposed to be completed with accident data from all member countries. So far, this has not been the case except for Ireland, despite constituting a valuable tool for research.

Portable rumble strips as a means to improve work zone safety were also discussed. These are not applied in Wallonia because of the additional accident exposure of road workers when applying them on site. It was discussed that automatic deployment could constitute a solution in this case. Finally, work zone safety procedures are in place in the USA but not in Europe and Andras Varhelyi suggested that NRA should strive to implement these even if they are not prescribed by European directives.

Herman Moning (RWS) added that work zone safety procedures are indeed suggested in the relevant directives but not required. Regarding the accident database, he suggested that he would raise the issue in the Road Safety working group.

5.1.3 **PROGRESS**

Ceki Erginbas (TRL) reported back from the PROGRESS parallel session, stating that the tool has already been used in three different countries and user feedback has been positive, both in terms of usability and how the tool can help the NRA to improve at an organizational level.

One user commented that they were expecting more on-site design-level advice from the tool, but it was clarified that the tool was designed for issues at organizational level. Another comment was concerned that the application of the tool's recommendations at organizational level is the responsibility of higher levels within the NRA.

5.1.4 **SANA-4U**

Conor McGrath (Arup Ireland) provided feedback from the SANA-4U workshop, in which two presentations had been given. The first elaborated on a worked example presented in the plenary and the second presented the outputs of the study in more detail, including the design guidelines.

Concerning the first presentation, participants had a good appreciation of the design considerations of designing for VRU in rural environments on which they engaged interactively throughout the workshop. The biggest discussion point was around the practicality of delivering these schemes, including the trade-offs involving parking and private properties. In this context, dedicated greenways have been put forward as an alternative approach to adding VRU infrastructure directly on rural roads.

For the second presentation, discussion focused on whether the VRU or car users should get priority, which depends a lot on the local jurisdiction. Another discussion was on the specific requirements of crossings outside of junctions and the possibilities to increase their safety through design and technology.

5.2 Closing remarks

Following the feedback from the individual workshop sessions by the rapporteurs, the moderator Vincent Leroy (Vias institute) concluded the parallel sessions. He pointed out that the sessions had been interactive and had enabled participants to go into more details and share the addressed challenges, project results and lessons learned. The moderator then invited the participants to interactively share their main takeaways from the conference which were then shared with all attendees.

At the end of the conference, Alastair de Beer (TII), Chair of the 2016 Programme Executive Board provided the closing remarks. He thanked the presenters and participants and asked participants to provide feedback on the implementation of research findings presented at this conference.

Alastair de Beer further proceeded to thank Herman Moning (RWS), from whom he had taken over as chair, for all the effort and work put into the Programme Executive Board, for which he had been instrumental. The chair then expressed his hope to meet the participants at the next CEDR dissemination workshop. He added that while it had been an interesting experience to hold this event online, he expressed the hope for participants to come back to an in-person event in the future.

6 Annex

6.1 Conference Programme

- **9u45:** Check-in
- **10:00:** Welcome and Introduction (CEDR)
- **10:15**: Project Presentations (1/2)
    - ADVERTS Assessing Distraction of Vehicle drivers in Europe from Roadside Technology-based Signage
    - IRIS Incursion Reduction to Increase Safety in road work zones
- **11:15**: Break
- **11:30**: Project Presentations (2/2)
    - PROGRESS Provision of Guidelines for Road Side Safety
    - SANA-4U Safety in Non-Urban Areas for Vulnerable Road Users
- **12:30**: Lunch
- **13:30**: Arrangements for the afternoon session: instructions
- **13:40**: Workshops in 4 parallel sessions and discussions on project implementation
    - Parallel Session 1: ADVERTS
    - Parallel Session 2: IRIS
    - Parallel Session 3: PROGRESS
    - Parallel Session 4: SANA-4U
- **15:10**: Feedback from the parallel sessions
- **15:30**: Closing words
- **15:40**: End of Conference

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