



SBAKPI

Strategic Benchmarking and Key Performance Indicators

Final Project Report

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Executive Summary

Key performance indicators (KPI) are used by National Road Administrations (NRA) to communicate various aspects of their performance; including safety, reliability, and value for money. The ERA-NET ROAD II call identified a requirement to produce KPIs that would enable NRA to communicate strategic environmental and social issues in a similar way. These KPIs would demonstrate to key stakeholders; such as Government, the public or special interest groups, the performance of the NRA and enable benchmarking across Europe. Whilst the need was identified it was also understood to be a significant challenge and was not thought possible by a Conference of European Directors of Roads (CEDR) subgroup in 2010¹.

The Strategic Benchmarking and Key Performance Project (SBAKPI) was tasked with working through those challenges. The project has created a framework that NRAs can follow to develop new KPIs by investigating the ability of NRAs to complete KPIs developed for key topic areas. Following tasks were delivered to achieve this goal:

- Literature search – identified KPI reporting methods and topic areas of interest to NRA
- Consultation – establish an agreed set of ten topic areas to investigate further and trial the implementation of KPI in NRA
- Trial phase – Tested the use of the KPIs in real world conditions to understand if they can be implemented, how they would be adopted and whether NRAs could benchmark performance.
- Refinement phase – Identified the strengths and weaknesses of the KPIs both in how they were developed and how they were used, thus informing the development of a Benchmarking Framework.
- Reporting/dissemination – Providing a Benchmarking Framework for NRAs to use to create KPIs and report on the results of the trial.

The literature review and consultation identified ten KPI topic areas to focus on for the trial. This included six Environmental and four Social topics: Noise, Air Quality, Water Quality, Waste, Climate Change, Biodiversity, Stakeholder Satisfaction, Safety, Development and Travel. Eleven KPIs were developed; two for noise and one for each of the other topics. EU legislation or international commitments were incorporated where possible, so that measurements common to NRAs in Europe could be incorporated.

¹ CEDR 2010 Road Data and Performance Indicators

http://www.cedr.fr/home/fileadmin/user_upload/Publications/2010/e_Road_Data.pdf

A three month trial program was developed to investigate whether the NRAs could complete the KPIs, whether the KPIs could be used to benchmark performance, what problems they may have in completing the KPIs, if they had any recommendations for improvement and how relevant the proposed KPIs may be. The trial documentation requested for the NRA to come up with their own ideas for amendment or replacement if they did not think a KPI was suitable.

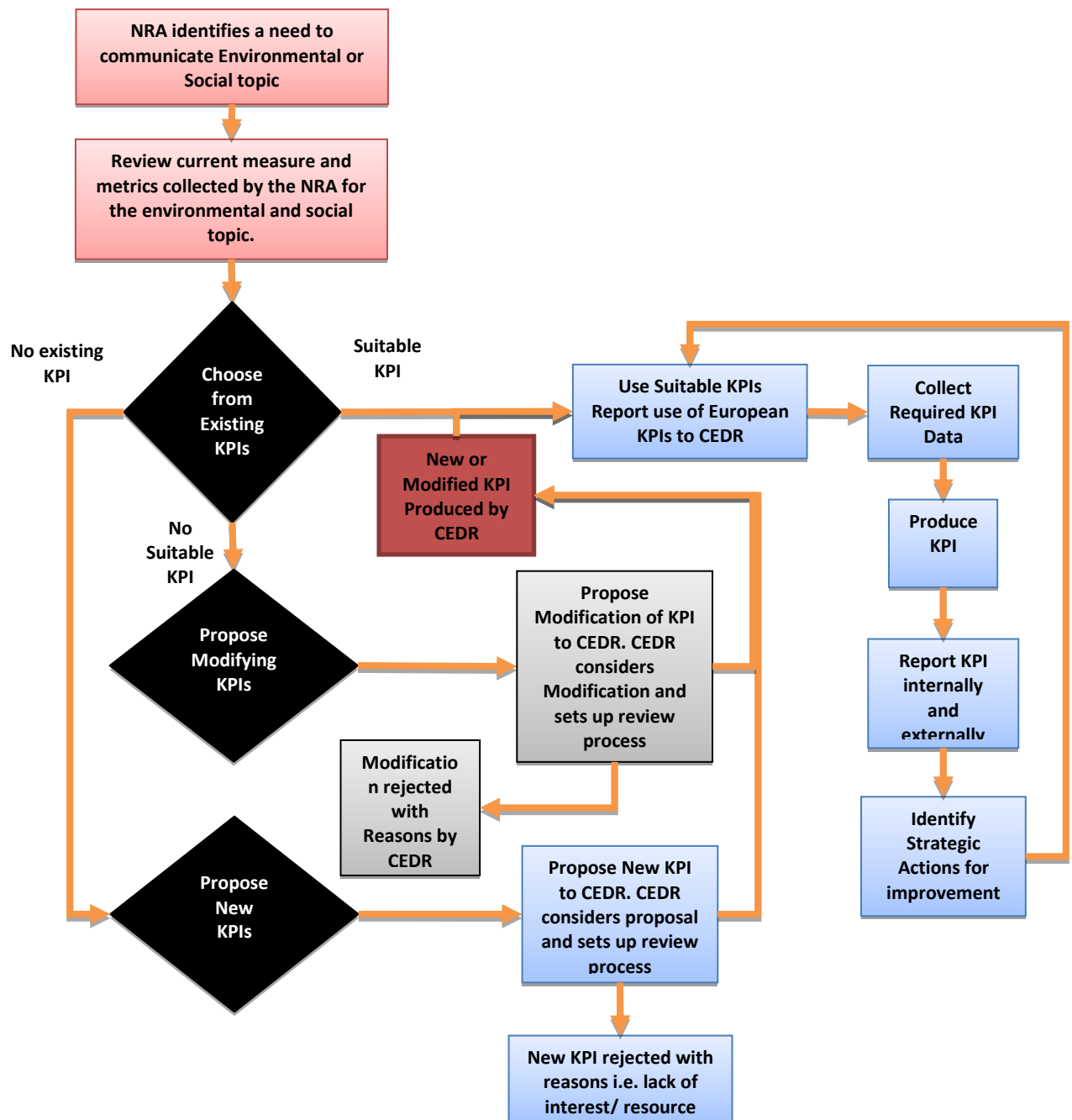
Twenty eight NRA from across Europe were invited to take part in a trial of the new KPI. Six were able to participate and provided comment or completed KPI information. Responses were received from Belgium (Flanders), Denmark, France, Ireland, Scotland, Sweden, who between them produced results for Seventeen KPIs and commented twenty three times on the other KPIs.

The results of the trial provided information on the challenges faced by NRAs communicating environmental and social issues and highlight two key points:

- To benchmark across Europe a greater engagement in social and environmental KPIs is required – Twenty two of the organisations contacted were not able to take part in the trial. Reasons given included: already collecting data for a trial such as EVITA; lack of money or time; not responsible for any of the proposed KPIs; not currently collecting data relevant to the proposed KPIs; being on leave for a year; a change in government;
- A process is required to identify common measurements and metrics before KPIs can be implemented - Out of the ten topic areas chosen five of these indicator areas; Water Quality, Climate Change, Biodiversity, Safety & Development could be adopted by NRA's following feedback from the trial members however more work is required to develop clearer definitions.

There is a significant variation in environmental and social understanding, commitment, and implementation at a strategic level across European NRAs and this reflects in the ability to commit to supporting the KPI project and to identify the data needed. This lack of engagement with the workshops and the trial could be due to the knowledge of environmental and social topic being spread over several people within an NRA which makes it less practicable to identify or send one or two representatives.

This research has however shown that NRA are able to report on social and environmental issues. The variation in understanding and the need for a consensus highlights the requirement for a process to develop environmental and social KPIs. To enable benchmarking NRAs should follow a process which ensures they consider current practice, identify a way of drawing a consensus across Europe and build on the current understanding within the priority topics. Presented in the Benchmarking Framework is the following process which addresses these key points:



As a first step the conclusions of this report recommend how to take the KPIs evaluated in this project forward:

KPI Description & Recommendations

KPI	KPI Description	From Trial Able to be adopted?	Recommendations
Noise	Noise complaints reported to the NRA. Number of dwellings exposed to excessive noise/NRA road network mapped.	Not at this stage	A forum should be identified to explore this opportunity linked to EU law when it arises
Air Quality	Level 1 Number of AQZAs/km of NRA road network. Level 2 Length of road network within AQZA/km of NRA road network	Not at this stage	Discussion needs to be held at appropriate forum to determine level of NRA interaction with EU law
Water Quality	Level 1. Proportion of NRA road with managed drainage. Level 2. Number of Managed Drainage Outfalls. Level 3. Outfalls with water quality treatment.	Yes	Implement as a first step the level 1 indicator
Waste/ Natural Resources	Level 1: Tons of waste sent to landfill / km (maintenance) Level 2: Tons of waste sent to landfill / km (new road) Level 3: Tons of waste sent to landfill / km (total)	Not at this stage	The KPI should be expanded to include consumption of natural materials as well as waste data availability to be established.
Climate Change	Carbon Dioxide (CO ₂) emitted by NRA and contractors per year/ km NRA road network.	Yes	Define the boundaries for construction related calculations. Joint NRA work on this desirable.
Biodiversity	Number of wildlife crossings on the network / 1000km NRA road network	Yes	Implement the indicator with an alternative normalisation factor.
Stakeholder satisfaction	Number of complaints to NRA / km NRA road network Number of responses from NRA / km NRA road network.	Not at this stage	Determine whether a common satisfaction survey format report could be implemented across NRA and the score reported as a benchmark.
Safety	Annual reduction in number of People killed or seriously injured (KSI) in road traffic accidents, as a 3-year rolling average.	Yes	Draw on work outside this project which is identifying a common metric for safety
Development	Population / km new road constructed Population / km new lanes constructed Population/ km ITS/ICT constructed	Yes	Identify an appropriate forum to agree on what constitutes development.
Travel	The length of road affected by schemes to reduce congestion and improve journey time reliability per 1000km of the NRA road network per year	Not at this stage	A discussion is required between NRAs to identify a more specific KPI for journey time reliability.

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1 Introduction

1.1 Background

Detailed key performance indicators have been developed over the years by National Road Administrations (NRAs) across Europe for various aspects of road networks, including safety, reliability, and value for money. These have been very helpful in understanding the performance within National Road Administrations (NRA) however there has been traditionally been a focus on economic and engineering aspects and the economic KPIs currently do not provide an overall strategic and holistic picture of the performance of the road network managed by an NRA. To gain this picture there is a need for a set of high level indicators, including environmental and social performance monitoring.

To support NRAs in gaining this holistic understanding the Strategic Benchmarking and Key Performance Indicators project ('SBAKPI'), funded by ERA-NET ROAD , has developed a voluntary Benchmarking Framework that will help NRAs develop strategic level environmental and social key performance indicators (KPIs) and an initial set of environmental and social KPIs to be measured.

The Benchmarking Framework has been designed to provide NRAs with a mechanism to examine the environmental and social performance of their organisations in relation to other NRAs across Europe. It is hoped that this will allow NRAs to better manage their environmental and social performance and to gain an insight into the performance of other NRAs, with the aim of driving up environmental and social performance in Europe.

The project was undertaken by the Transport Research Laboratory (TRL) in the UK and the Danmarks Tekniske Universitet (DTU) in Denmark.

1.2 Objectives

The objectives of the project were to:

- Understand the needs of NRAs and capture their experiences of using KPIs within their organisations;
- Develop an environmental and social Benchmarking Framework tool for NRAs;
- Identify and develop suitable core KPIs;
- Identify and develop suitable regional KPIs;
- Test the Benchmarking Framework for practicable use by NRAs; and
- Report on the outcomes of the Benchmarking Framework trial and make any suggested improvements.

1.3 Scientific and technical methodology

The project involved the following methodology:

Literature search – To identify research papers and other published documents relating to environmental and social KPIs and benchmarking with a focus on those relevant to infrastructure and the transport sector.

Consultation – To facilitate a flow of information and ideas between the project team and the NRAs and their stakeholders to enable the Benchmarking Framework and KPIs to reflect the needs of NRAs

Trial phase – To test the Benchmarking Framework and KPIs in real world conditions to see if they provided the benefits envisaged at the consultation phase.

Refinement phase – To use the findings from the trial phase, including the issues and opportunities identified by the participants, to improve the Benchmarking Framework and KPIs.

Reporting/dissemination – To make the Benchmarking Framework and KPIS (attached to this final project report) available to NRAs and their stakeholders.

More detail on the methodology is given in chapter two of this report.

1.4 Structure of the report

This report is structured as follows. Chapter two provides a description of the methodologies used within the project. Chapters three and four provide details of the trial of the Benchmarking Framework, including the results and analysis. Chapter five outlines the overall interpretations resulting from the trial. Chapter six contains the project conclusions, recommendations and next steps. Appendix A contains the Benchmarking Framework and Appendix B contains the suggested environmental and social KPIs, both of which have been updated following the trial.

2 Methodology

2.1 Literature search

In order to understand what environmental and social KPIs were currently being measured by NRAs a literature search was undertaken. This involved searching the websites of the European NRAs to understand what they are currently measuring and contacting appropriate stakeholders within the NRAs to gain further information.

The reviewers had language reading capability in Danish, Swedish, French, English, and some German and this was backed up by the use of translator software on the internet. From the Research undertaken there was no clear evidence from their websites of strategic environmental and social Key Performance Indicators (KPIs) being used by NRAs.

The project looked for information on the uses of KPIs by NRAs or developments of KPIs that may be helpful. The literature review consisted of searches of known literature such as COST 356 and electronic/web searches on key websites for information or documents relating to environmental or social indicators or references to the use of KPIs.

The literature review included:

- NRA websites or relevant regional/government websites
- European Road Research sites for example CEDR, FEHRL, COST projects etc.
- Websites featuring the use of Key Performance Indicators
- Sites related to environmental and social reporting i.e. Global Reporting Initiative
- European Union Regulation and Guidance
- Websites containing information on environmental and social topics which have relevance to NRAs

The references for this literature review can be found in Section 9.

NRA websites and relevant regional government websites

NRAs either have their own websites or are part of wider government websites relating to transport and travel. In the study, both national and regional NRAs were looked at from all parts of the European Union, including the Balkan States, Eastern Europe, North Western Europe, Scandinavia, and Southern Europe, as well as NRAs in smaller countries, such as Malta, and larger countries, such as France.

It was noted that some NRAs had clearly identified sections relating to its environmental issues but fewer NRAs had sections or clearly reported on social issues relating to the NRA.

European road research sites for example CEDR, FEHRL, COST projects etc.

The literature search looked for evidence of previous KPI work relating to road transport and this included work undertaken by the COST programme². The most significant recent work identified was COST 356 “Towards the definition of a measurable environmentally sustainable transport (EST)”, which helped to provide an initial starting point for this project. The website of FEHRL³, which is a body consisting of road research organisations, was reviewed.

Contact with staff from Conference of European Directors of Roads (CEDR) identified a document⁴ that was being worked on by a CEDR subgroup which was of interest to the project. The subgroup was sharing performance data across Europe on the European strategic road network (TERN). Although environmental indicators were identified as being significant, it was felt by the subgroup that there was insufficient data across the European NRAs to produce more than eight performance indicators and none of which were on environmental or social performance. However the project did show that it was possible for European NRAs to share performance data with each other which is a necessary step in developing benchmarking.

Websites featuring the use of Key Performance Indicators

Websites such as <http://kpilibrary.com/> Provide information on large numbers of KPIs including transportation, unfortunately these KPIs are aimed at commercial road users and are not suitable as strategic environmental and social KPIs for NRAs (though some of these may be helpful for corporate or project level reporting activities).

Sites related to Environmental and social reporting i.e. Global Reporting Initiative

Information related to environmental, social and sustainable auditing and reporting was considered. The main source of information was the ISO organisation⁵, which has international standards related to the environment (ISO 14001 and associated standards), and a recent standard on social responsibility (ISO 26000). The sustainability reporting guidance from the Global Reporting Initiative⁶ was also investigated. Whilst there was good information from these organisations on process and structure, it was felt that any recommendations based on existing standards or formats may be considered too restrictive by the NRAs as some of the approaches may require significant staff and financial resources to develop formal auditing and reporting. It was later found that one NRA (Italy) was using the Global Reporting Initiative reporting format to report on its corporate environmental activities.

² European Cooperation in Science and Technology - Transport and Urban Development (TUD)
[http://www.cost.eu/domains_actions/tud/Actions/\(acno\)/1](http://www.cost.eu/domains_actions/tud/Actions/(acno)/1)

³ FEHRL Website: <http://www.fehrl.org/index.php?m=1>

⁴ CEDR 2010 Road Data and Performance Indicators
http://www.cedr.fr/home/fileadmin/user_upload/Publications/2010/e_Road_Data.pdf

⁵ International Organization for Standardization <http://www.iso.org/iso/home.htm>

⁶ Global Reporting Initiative <https://www.globalreporting.org/Pages/default.aspx>

European Union Regulation and Guidance

Identifying potentially relevant European environmental and social regulations of relevance to NRAs was one exercise undertaken by the project team and this generated the list below. Some of the legislation on this list was later not used as it was not as relevant to the NRAs due to the lack of NRA ability to influence, such as EU legislation related to vehicle construction and use. References to relevant legislation related to environmental and social topics can be found in Section 6 of Annex A.

Air Pollution

Air Quality

- Pure air for Europe - Directive [2008/50/EC](#)
- Management and quality of ambient air – Directive Council Directive [96/62/EC](#)
- Exchange of information and data on ambient air quality – Directive Council Decision [97/101/EC](#)
- Clean Air for Europe (CAFE) Programme

Atmospheric Pollution

- Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air - Council Directive [1999/30/EC](#)
- National emission ceilings for certain atmospheric pollutants - Directive [2001/81/EC](#)
- Nitrogen dioxide - Council Directive [85/203/EEC](#) of 7 March 1985
- Substances affecting the ozone layer - Regulation (EC) No [1005/2009](#) of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.
- Protocol on Heavy Metals - Council Decision [2001/379/EC](#)
- Elimination and minimisation of production, use and release of persistent organic pollutants (POPs) - Council Decision [2006/507/EC](#)
- Recovery of petrol vapours during storage - European Parliament and Council Directive [94/63/EC](#)
- Petrol vapour recovery during refuelling of vehicles - Directive [2009/126/EC](#)

Land Motor Vehicles – All Motor vehicles

- Emissions from heavy duty vehicles (Euro VI): certification rules - Regulation (EC) No [595/2009](#)
- Euro 5 and Euro 6 standards: reduction of pollutant emissions from light vehicles - Regulation (EC) No [715/2007](#)
- Motor vehicles with trailers: polluting emissions - Council Directive [70/220/EEC](#)
- Motor vehicles with trailers: emission of gaseous pollutants from diesel engines - Council Directive [88/77/EEC](#)
- Quality of petrol and diesel fuels: sulphur and lead - Directive [98/70/EC](#)
- Motor vehicles: use of biofuels - Directive [2003/30/EC](#)

Land Vehicles – Road Vehicles

- Reduction in CO2 emissions of new passenger cars - Regulation (EC) No [443/2009](#)
- Clean and energy-efficient road transport vehicles - Directive [2009/33/EC](#)
- Emissions from air conditioning systems in motor vehicles - Directive [2006/40/EC](#)

Water

General Framework

- Water protection and management (Water Framework Directive) - Directive [2000/60/EC](#) of the European Parliament and of the Council of 23 October 2000
- Flood management and evaluation - Directive [2007/60/EC](#) of the European Parliament and of the Council of 23 October 2007

Specific uses of water

- Bathing water directive - Council Directive [76/160/EEC](#)
- Water suitable for fish breeding – protection of Fresh Water - Council Directive [2006/44/EC](#)

Discharges of substances

- Integrated pollution prevention and control: IPPC Directive - Directive [2008/1/EC](#)
- Environmental quality standards applicable to surface water - Directive [2008/105/EC](#)
- Protection of groundwater against pollution - Directive [2006/118/EC](#)
- Protection of the aquatic environment against discharges of dangerous substances (until 2013) - Directive [2006/11/EC](#)

Websites with Environmental and Social topics of relevance to NRAs

A wide range of environmental and social websites were reviewed to identify environmental and social topics relevant to NRAs with a focus on identifying information and guidance that is relevant to NRAs across Europe. References to these documents and websites containing further information can be found in the environmental and social topics section - Section 6 of Appendix 1

As environmental and social information is often updated, it is good practice for NRAs to have processes to ensure that their knowledge of environmental and social topics is kept under review, and any new issues of significance or changes in the law are identified and brought to the attention of those with environment and social responsibilities in the NRA.

The Benchmarking Framework

Following this literature review a draft Benchmarking Framework was developed (see Appendix 1 of this report). The benchmarking framework covers the following issues:

- The benefits of using strategic KPIs for NRAs and their stakeholders, include cross Europe comparability, driving up standards and improving network performance, identifying good practice, reducing costs, and meeting environmental and social objectives.
- An introduction to the relevant environmental and social topics, i.e. those identified in the literature review, including a brief description of the relevance of the topic to NRAs and examples of good practice/interventions. It is deliberately not prescriptive due to the differences between NRAs.
- Guidance on using existing KPIs, modifying existing KPIs and developing new KPIs.

This was accompanied by a list of key environmental and social topic areas that were considered important for NRAs.

At this stage of the project it was agreed that what were originally going to be known as ‘regional’ indicators would be renamed ‘focused’ indicators. This was to reflect more accurately the purpose of these more specialised indicators, in particular it was considered that the term ‘regional’ may have been misinterpreted as solely geographical in nature whereas other linkages such as similarity of NRA structure and stakeholders would also be relevant.

2.2 Consultation

A consultation workshop was held on the 5th April 2011 in Brussels. This was a joint workshop with the EVITA project, which is developing environmental KPIs for NRAs at a project level. Invites for this workshop were sent to over 50 people in over 20 European countries. These included representatives from a range of organisations, including NRAs and their stakeholders. This workshop was used to discuss the draft initial Benchmarking Framework and to understand which environmental and social topics the NRAs present considered to be most important, such that KPIs could be developed that most meet their needs. The workshop was attended by representatives from NRAs in Germany, England, Belgium and Israel.

During the workshop, attendees were asked to provide their views on the priority of environmental and social topics within their own NRA. For each topic they were asked whether the priority was low, medium, high or very high and to provide any explanation as to why that level was selected. A further part of this exercise asked attendees to comment on each potential topic areas with regard to a list of criteria that should be considered when developing KPIs. This criterion was developed as part of COST 356 and included 10 topics, these being validity, reliability, sensitivity, measurability, data availability, ethical concerns, transparency, interpretability, target relevance and actionability. Finally, attendees were asked to provide feedback on what topics they thought should be represented by universal indicators and what topics by focused indicators (previously known as regional).

A summary of the feedback given in the workshop is provided in Table. 2.1. Due to time constraints not all of these areas were discussed, however the areas considered of most relevance to the NRAs were covered.

Table 2.1: Feedback from the workshop on environmental and social topics

Environmental and Social Topics	Highways Agency (England)	BASt (Germany)	Maa'tz (Israel)	Agency for Roads and Traffic – Road Engineering Division (Belgium)
Environmental topics				
Climate change/carbon	High	High	Not scored	Low
Air	Very high	Medium	Not scored	High
Water	Topic not discussed at the workshop (out of time).			
Noise – EU Limits	High	Very high	High	High
Noise – Tranquillity	Low	Low	Low	Low
Noise – Vibration	Low	Low	Low	Medium/Low
Landscape	Medium/Low	High*	High	High
Cultural heritage	Low	High*	Medium	Low
Resources/ waste/ energy	Very high	Very high	Not scored	Very high
Nature and biodiversity	High	High	Not scored	Low
Soils and geology	Low	Low	Not scored	Medium/Low
Social topics				
Safety – User	Very high	Very high	Very high	Very high
Safety – Operator	Very high	High	Not scored	Not scored
Education	Not scored	Not scored	Not scored	Low
Society and community	Very high	Very high	Not scored	Very high
Accessibility	Medium/High	Medium/High	Not scored	High
Spatial planning	Not scored	High	Not scored	Not scored
Poverty	Not scored	Not scored	Not scored	Not scored
Development	Not scored	High	Not scored	Not scored

* These were scored highly although dependent on the region, i.e. in the Rhine Valley landscape would be given high priority.

In addition, the SBAKPI project was presented and discussed at a number of EVITA workshops. The feedback from all these sessions was also fed into the development of the Benchmarking Framework and KPIs (see Tables 2.2/ 2.3/ & 2.4).

Table 2.2: EVITA Workshop 1

Title:	EVITA Workshop
Date:	2 nd February 2011
Location:	Ministry of Ecology, Energy, Sustainable Development and Sea, Paris, France
Attendees:	Kajsa Lindström, Trafikverket, Sweden Tom Casey, NRA, Eire

	<p>Stefan Poelzlbauer, ASFINAG, Austria</p> <p>Emmanuel De Verdalle, VEOLIA, France</p> <p>Jenne van der Velde, RWS, Nederland</p> <p>Jean-Loup Madre INRETS, France</p> <p>Irvin Tapia-Villarreal INRETS, France</p>
Discussions/ Outputs:	<p>Introduction of the ERAnet Road</p> <p>Presentation of SBAKPI and EVITA projects</p> <p>Work on a list of selected items or questions</p> <p>General discussion</p> <p>Investigation on the needs and understanding of different NRA stakeholders on environmental indicators and the meaning of strategic and project level in terms of the SBAKPI and EVITA project.</p>

Table 2.3: SBAKPI Workshop

Title:	SBAKPI Workshop
Date:	5 th April 2011
Location:	European Conference of Transport Research Institutes (ECTRI), Brussels, Belgium
Attendees:	<p>Tali Avidan, Israel National Roads Company, Israel</p> <p>Margo Briessinck, Agentschap Wegen en Verkeer, Belgium</p> <p>Ivan Le Fevre Highways Agency England</p> <p>Peter Haardt, BASt, Germany</p> <p>Camille Delepierre, Energikontor Sydost AB, Sweden</p>
Discussions/ Outputs:	<p>Welcome and Introductions</p> <p>Introduction to the Benchmarking Framework</p> <p>Discussion of the Benchmarking Framework</p> <p>Introduction to SBAKPI KPIs</p> <p>EVITA KPI Presentation</p> <p>Discussion of the KPIs</p> <p>KPI and Benchmarking Framework round up session</p> <p>Presentation provided on the aims of SBAKPI with discussion on the significance of KPIs to the NRAs and their Stakeholders and a review of the potential characteristics of the KPIs. See Table 2.1</p>

Table 2.4: EVITA Workshop 2

Title:	EVITA Workshop
Date:	28 th June 2011
Location:	ECTRI, Brussels, Belgium

Attendees:	Willy Peelen, TNO, Nederland Jure Leben, Gov Office of Climate Change, Slovakia Camille Delepierre, Energikontor Sydost AB, Sweden Chris Britton, Chris Britton/Balfour Beatty, UK Julia Baker, Chris Britton/Balfour Beatty, UK Margo Briessinck, Agentschap Wegen en Verkeer, Belgium Erland Røsten NPRA, Norway Luc Peeters, EMEA, Belgium Lennart Folkesson, VTI, Sweden
Discussions/ Outputs:	Welcome and Introductions WP2 Introduction Output and findings of WP2 Stakeholders: Expectations: Necessary and existing KPIs Feedback session Introduction to Work package 3 “Environmental KPIs” Discussion with Stakeholders of the EVITA KPIs E-KPI Noise E-KPI Air & Water E-KPI Natural Resources E-KPI round up session and next steps Presentation provided on the aims of SBAKPI as part of the Environmental KPIs introduction with discussion on the significance of strategic KPIs to the group this was noted by the project manager for further use.

2.3 Development of the trial documentation

Following the feedback from the attendees at the workshop and the telephone interviews the Benchmarking Framework was revised. The changes made to the structure and content were minimal, with the framework following the format as outlined in Appendix A.

A set of KPIs was developed concentrating on the key priority areas identified through the consultation process. Originally the aim was to develop five universal indicators and five focused indicators. However following feedback from stakeholders it was felt that the project should concentrate on developing universal indicators as a priority over the focused indicators. Also it was considered originally that there would be an even split between the number of environmental and social indicators, however feedback suggested that NRAs placed a higher priority on environmental indicators due to perceived greater need (resulting from drivers such as environmental regulation), and the lack of social data available.

In order to develop the set of KPIs the following criteria were considered:

- Whether any existing KPI achieved the priorities identified. For example, it was considered that the KSI indicator would cover a priority social topic.

- What key (European) regulation is likely to be needed to be met by NRAs or their stakeholders, for example, the Noise Directive.
- What existing data may be available within NRAs.
- What data may be accessible to NRAs from other stakeholders, such as other government departments or statutory environmental bodies.
- What was considered achievable in terms of time and staff resources.

As a result of this process a number of draft KPIs were developed. These are outlined in Table 2.5 below. Universal indicators are referenced with a 'U' and focused indicators are referenced with an 'F'. For several of the topic areas, a choice of KPIs was produced; this was to ensure that NRAs with different data collection capabilities could produce a response.

Table 2.5: The draft KPIs

Topic Area	KPIs
Environmental	
Air Quality (U)	1. Number of Air Quality Management Areas (AQMA) or equivalent, through which the NRA's road network passes / 1000km of NRA road network. [X Air Quality Management Areas / 1000km NRA road network] 2. Length (km) of NRA road passing through AQMA where traffic has been identified as the main cause of the AQMA / 1000km of NRA road network. [X km of road within an Air Quality Management Area / 1000km NRA road network]
Biodiversity (U)	Number of wildlife crossings on the network / 1000km NRA road network. [X wildlife crossing points / 1000km road]
Carbon (U)	Carbon emitted by NRA and contractors per year/ km NRA road network [X tonnes of carbon / per km NRA road network]
Natural Resources (U)	1. Tonnes waste arising from road maintenance / km of NRA road network [X tonnes of waste / km generated by maintenance of NRA network] 2. Tonnes waste arising from new road construction/ km new road constructed [X tonnes of waste / km from new road built by the NRA network] 3. Total waste arising from NRA's maintenance and construction activities/ km NRA road network [X tonnes of waste / km NRA network]
Noise (U)	1. Number of noise complaints about the NRA road network received by the NRA or passed to the NRA from other sources (i.e. Government) per year/ 1000km of the NRA's road network. [X complaints per 1000km/year] 2. Number of dwellings exposed to road noise >55dBA/ km of the NRA's road network for roads with >6 million vehicles per year. [X dwellings over 55 dBA night threshold / km of NRA noise mapped roads]
Water (U)	1. Proportion of NRA road network with managed drainage. [Xkm (X%) of NRA roads with managed drainage] 2. Number of NRA managed drainage outfalls/ km of NRA road network. [X managed outfalls / km of NRA network]

	3. Number of managed drainage outfalls with water quality treatment / km of NRA road network. [X managed outfalls with water treatment / km of NRA network]
Social	
Development (F)	1. Population / km new road constructed. [X people / km of new road] 2. Population / km new lanes constructed. [X people / km of new lane opened]
Congestion and Journey Time Reliability (U)	The length of road affected by schemes to reduce congestion and improve journey time reliability per 1000km of the NRA road network per year [Xkm per 1000km of road]
Safety (U)	People killed or seriously injured in road traffic accidents. [X reduction in KSI 3 year rolling average]
Social (U)	1. Number of complaints to NRA / km NRA road network. [X complaints / km] 2. Number of responses from NRA / km NRA road network. [X responses / km]

For each of the indicators the following structure was developed. This was to provide consistency of reporting between indicators.

- The **indicator** was defined.
- The **rationale** for the indicator was described.
- A **formula** was given.
- **Definitions** of terms were provided.
- A fictional **worked example** was given.
- What **good performance** of the indicator might look like, for example an upward or downward trend.
- The **collection interval** was outlined.
- The **data sources** required.

A reporting/calculation table for each indicator was developed (Appendix C).

The KPIs along with the Benchmarking Framework were then compiled into a document that could be sent out as part of the trial.

The following chapter describes the trial phase of the project.

3 Trial Phase

3.1 Overview

The trial phase of the project was conducted from October 2011 to March 2012. It involved participant NRA's being asked to report performance for a selection of strategic KPIs within ten themes related to environmental and social impacts of road transport and NRA activity.

The overall aim of the KPI trial was to help provide an initial KPI set and establish a basis for a future benchmarking program for European NRAs, including assets related to environmental and social sustainability. More specific purposes were to identify:

- Relevance of KPIs for reporting environmental and social sustainability;
- The most useful KPIs for reporting and engaging with strategic stakeholders;
- The availability and quality of environmental and social data;
- Relevance to and actionability for NRA practices; and
- The resources (time/effort) needed to generate the KPIs i.e. values to populate the KPI.

NRAs participating in the trial were sent a guidance document with explanations and examples showing how to calculate each KPI. NRAs were asked to report data for each KPI in a table format. If not feasible, NRAs were asked to comment about missing data and to inform of any problems encountered in providing the KPIs, or any viewpoints on the relevance of the KPIs.

3.2 Trial participants

In early September, email invitations were sent out to potential trial participants. Table 3.1 lists the NRAs (and other stakeholders) that were approached to be part of the trial. It also provides detail of their response to the invitation. The initial invitation to participate in the trial, together with an explanatory document about the SBAKPI project, was made by e-mail with the main contact for each country by either TRL or Camille Delepierre (Energy Agency for Southeast Sweden) on about the 13th of September, 2011. The list of participants had been drawn together during the previous stages of the project. A master spreadsheet containing all contact details and progress with making contact was shared and maintained by TRL and Camille so that both parties knew who was contacting who. At this time, a few contacts responded quickly saying that they needed to consult with more senior staff with regard to their involvement in the SBAKPI trial. All of these initial contacts were then e-mailed again on the 15th of September, 2011 to quickly follow up the initial invitation e-mail and answer any questions that arose. At this point, the 22nd September 2011, all the organisations were then phoned (where possible) or e-mailed again on, to discuss their participation.

During the next six weeks, correspondence with interested parties took place. This usually consisted of providing more detailed information that could be put forward to senior management to persuade them of the benefits of participating. By the beginning of November 2011 any party that had expressed an initial interest, but with which we had received no further contact was e-mailed again to try and generate a response.

Any organisation that had not responded so far was then contacted once more on the 7th December 2012 to give them a final chance to participate. However if no response was received at this time, then they were not contacted again so that more time and effort could be directed to supporting those organisations that were preparing data and comments for submission to the trial. Out of the 28 initial contacts that were made, 18 expressed interest in the trial and 6 of these went on to actually submit comments and/or data for the SBAKPI trial.

The final six organisations that have contributed to the SBAKPI trial consists mostly of those that have been in touch with TRL or Camille about their interest and involvement since the initial e-mail contact was made in September 2011 or they have had the opportunity for informal discussions with the team members at the various SBAKPI and EVITA workshops that have taken place and are detailed earlier in this document in Section 2.

Table 3.1 below attempts to summarise the level of contact that was made with each country, in order to encourage them to participate in the SBAKPI trial. Information is given on the contact made by TRL or Camille (Energy Agency for Southeast Sweden), and where a contact has responded, this information is given. Where a box has a ✓ in it, this confirms that an email or phone call was made by either TRL or Camille in an attempt to contact them. Where a box contains “–”, this denotes that the organisation was not contacted again as they were not interested or not able to take part in the trial. To summarise:

- 28 counties/organisations were contacted initially;
- 18 (64%) of the countries/organisations initially contacted expressed an interest in participating in the trial but,
 - Of these 18 initial interested countries/organisations, 12 (43%) were unable to participate for a variety of reasons;
 - Reasons given for not being able to participate in the trial include: already collecting data for a trial such as EVITA; lack of money or time; not responsible for any of the proposed KPIs; not currently collecting data relevant to the proposed KPIs; being on leave for a year; a change in government;
 - And 1 of the 18 that showed interest initially did not reply to any further correspondence;
- 6 (21%) countries/organisations out of the 28 originally contacted went on to participate in the trial and submit comments and/or data (these 6 are highlighted blue in Table 3.1 below).

Table 3.1 Summary of contact with countries/organisations for participation in the SBAKPI trial

Country	Timing & type of contact made by TRL/ Energy Agency for Southeast Sweden (dates are approximate)						
	13/9/11 Initial email invite & project summary sent	15/9/11 Follow-up email	22/9/11 Phoned/ emailed	9/11/11 Email reminder sent offering assistance	7/12/11 Email sent reminding of submission deadline & offering assistance ¹	10/1/12 Email sent reminding of deadline & offering assistance.	2/2/12 Email sent reminding of deadline & offering assistance
Trafikverket, Sweden	√	√	√	√	Collating comments & data for submission	√	Data/comments submitted.
Wallonia Public Service, Belgium	√	–	Info sent in French to be passed on to senior management	√	–	–	–
Agentschap Wegen en Verkeer, Belgium (Flanders)	√	√	√	Collating data for submission	√	√	Data/comments submitted
Ministry of Communications and Works, Cyprus	√	√	√	√	–	–	–
Danish Road Directorate	√	√	Collating data for submission	√	√	√	Data/comments submitted
Estonian Road Administration	√	√	√	√	–	–	–
Finnish Transport Agency	√	√	√	On leave this year	–	–	–
Liikennevirasto (Finnra), Finland	√	√	√	√	–	–	–
Greek Road Administration	√	√	√	√	–	–	–
Hungary Coordination Centre for Transport Development	√	√	√	√	–	–	–

Anas – National Road Administration, Italy	√	√	Very interested but no time. Sent 2010 Balance Report for info. Would like copy of final report.	–	–	–	–
Netherlands-Rijkswaterstaat	√	√	√	√	–	–	–
Norwegian Public Roads Administration	√	√	√	√	–	–	–
General Directorate for National Roads and Motorways, Poland	√	Internal consultation required about involvement.	Would like to be involved but no time. Would like copy of final report.	–	–	–	–
Ministry of Public Roads, General Directorate of Roads, Spain	√	√	Too busy to take part.	–	–	–	–
NRA, Ireland	√	√	√	√	Progressing with data collection. Difficult to collect some data.	√	Data/comments submitted.
HA, UK (England)	√	√	Discussion with TRL about KPIs.		Not currently collecting KPI data.	–	–
BASt, Germany	√	√	Requested further info	Unable to take part at this time due to EVITA project	–	–	–
Bundesministerium für Verkehr, Bau und Stadtentwicklung, Germany	√	√	√				
LRA, Lithuania	√	√	Difficulty receiving emails – might be interested.	√	√	–	–

MEEDDM, France	√	√	√	√	√	Interested but need more time.	Data/comments submitted
ASFiNAG, Austria	√	Not interested as already committed to EVITA project data collection.	–	–	–	–	–
FEDRO, Switzerland	√	√	√	√	–	–	–
DRSC, Slovenia	√	√	√	√	Cannot participate at this time due to a change in government	–	–
Welsh Assembly, UK	√	√	√	√	–	–	–
Transport Scotland, UK	√	√	Confirmed participation in trial	√	Progressing with data collection.	√	Data comments submitted.
Directeur des Ponts et Chaussées, Luxembourg	√	√	Not responsible for the majority of proposed KPIs so not relevant to NRA.	–	–	–	–
Malta Transport Authority	√	Keen to contribute to trial.	√	√	–	–	–

¹ At this point in the project, it was decided to focus attention on supporting those countries that expressed interest in contributing to the trial. Consequently, contact ceased with countries that had not responded at all up to this point.

4 Outputs from the trial

4.1 Responses from NRAs

As outlined in the previous section six of the seven NRAs who agreed to take part in the trial provided a response either reporting the KPI's and/or providing comments. All of the responses received were partial, with none of the NRAs providing full feedback, with backup data for all of the KPIs.

The responses for each KPI have been categorised as shown in Table 4.1.

Table 4.1: Key to categories of response

Code	Description
<i>K</i>	KPI provided with backup data
<i>D</i>	Some data provided but not enough to generate the KPI
<i>CP</i>	Comment Positive on Proposed KPI (i.e. just need to develop data to Develop KPI)
<i>CN</i>	Comment Negative on Proposed KPI but with no other proposal at this time
<i>CS</i>	Comment with suggested changes to KPI or new KPI proposed
<i>X</i>	No response to this KPI

The NRA responses per KPI have been mapped to the categories in Table 4.2.

Table 4.2 NRA Responses Categoricalised

Country	Belgium (Flanders)	Denmark	France	Ireland	Scotland	Sweden	Total (Code number of respondents)
Noise 1	X	<u>CS</u>	X	K	K	<u>CS</u>	K ₂ CS ₂
Noise 2	X	D	X	X	D	CN	D ₂ CN ₁
Air Quality	K	CN	X	K	CP	CN	K ₂ CN ₂
Water Quality	X	X	K	K	K	CP	K ₃ CP ₁
Natural Resources	CP	X	X	X	K	<u>CS</u>	K ₁ CP ₁ CS ₁
Climate Change	<u>CS</u>	X	X	CP	CP	CP	CP ₃ CS ₁
Biodiversity	<u>CS</u>	X	K	CP	K	K	K ₃ CP ₁ CS ₁
Stakeholder satisfaction	X	X	X	K	<u>CS</u>	CP	K ₁ CP ₁ CS ₁
Safety	<u>CS</u>	K	X	K	K	<u>CS</u>	K ₃ CS ₂
Development	X	X	X	K	K	<u>CS</u>	K ₂ CS ₁
Travel	X	X	X	K	X	<u>CS</u>	K ₁ CS ₁

Table 4.2 has 6 * 11 = 66 possible response cells. There are 17 K responses, with water quality, biodiversity and safety receiving the most K responses with three each. Water quality and the biodiversity indicator also received one positive comment each, suggesting that three NRA's were able to complete the indicator and one would see the benefit of completing the indicator. Whilst the safety indicator was completed by three NRAs, two respondents made suggestions for improving the indicator. Some conclusions can therefore be drawn from the trial of the water quality, biodiversity and the safety KPIs and recommendations made for implementation.

The noise 1, development and air quality indicators were completed by two NRAs. The noise 1 indicator received two suggestions and the development and air quality indicators received one suggestion for improving the indicator. The air quality indicator also received two negative comments. This suggests that the noise 1 and development indicators could be implemented but requires improvement. The air quality indicator should however be reviewed before any suggestion of implementation.

The natural resources and stakeholder satisfaction indicators were completed by one NRA, received one positive response and one recommendation. This suggests that these indicators can be implemented but we cannot evaluate their potential for benchmarking and further development is needed.

The travel indicator was completed by one NRA and a positive response was made by another. This is positive but would need to be trialed in a greater number of organizations to be definitive.

The climate change indicator was not completed by any NRA but it was commented on positively by three NRAs and an improvement was suggested by another. This suggests a requirement to understand why it was not completed if so many thought it was a good KPI.

The Noise 2 indicator received the least positive responses with two organizations providing data but were unable to complete the indicator. The other comment received was negative. This suggests that either further work is needed or this indicator should be dropped.

Whilst we can make these modest observations the most frequent occurrence overall is 'X' (no response) with 25 counts. Only two NRAs (Ireland and Scotland) were able to complete more than two KPIs, with seven and six K responses respectively out of the ten themes/11 KPIs. These two NRAs stand out not only by their relatively high number and overlapping K responses, but also by providing some response (including comments) for almost all KPIs.

The other four NRAs made between zero and two K responses each, and a total of 23 D, CP, CN and CS responses between them, most of which came from Sweden.

Hence most NRA's responses are partial and limited for most KPIs. A possible reason for this is that whilst the indicators are based on a literature review and workshops held with organisations across Europe the language and terminology used lends itself to an English speaking audience. This is not a language issue but a technical terminology issue that may need to be addressed if a broader range of organizations are going to implement the KPI.

Two NRAs have that additional information could be expected if time was allowed. This hints at another issue which is that even the five month (three month with extension for some NRA) trial time was not sufficient for NRAs to gain approval and receive data to complete the indicators. This may be the reason there was such a low response (21% of contacted NRAs participated in the trial).

Before further overall interpretations are suggested, the following sections will review results for each theme/KPI. For each KPI a rationale is given for the theme/KPI, results are shown (if available) and comments from NRAs are reported where available. Finally a summary review of the benchmarking potential for each KPI is suggested.

4.2 Noise

Rationale

Noise is a nuisance that affects many people, and it also has potential negative health effects. Road traffic is a major source of ambient noise. The EU Noise Directive requires the level of noise to be assessed on all roads with more than 6 million vehicle passages per year.

For noise two different KPIs were presented to NRAs:

Option 1 Noise complaints reported to the NRA.

Option 2 Number of dwellings exposed to excessive noise/NRA road network mapped.

Results

Option 1: Two NRAs, Ireland and Scotland reported on this KPI and the results are shown below.

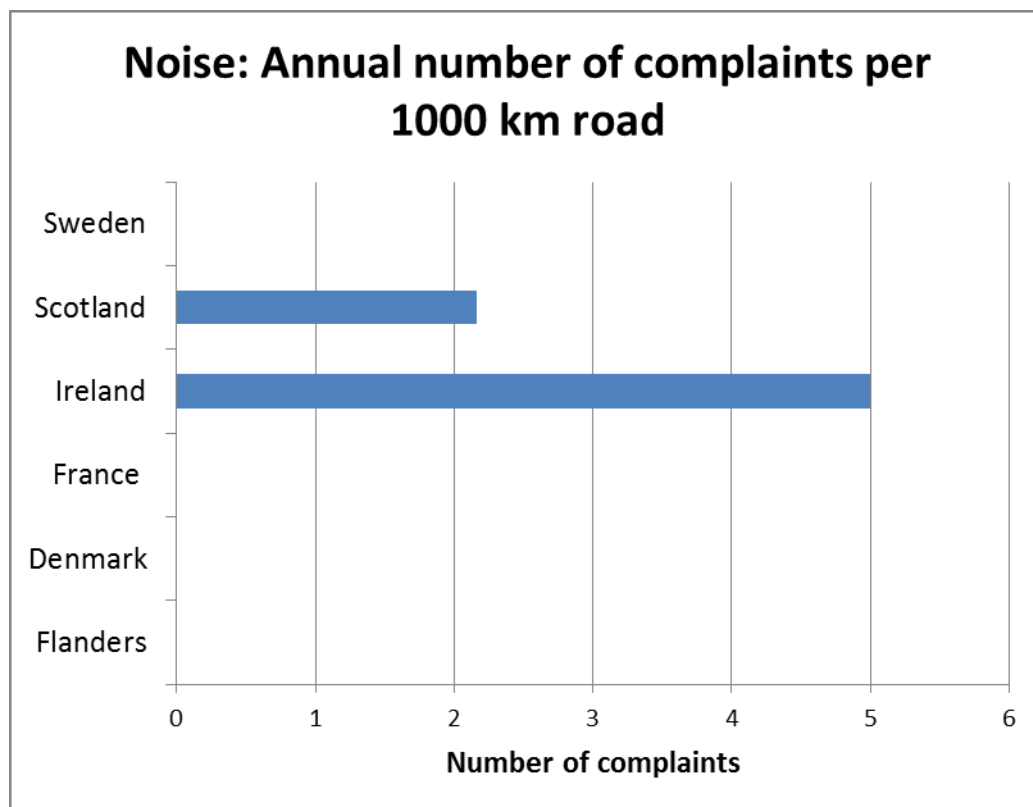


Figure 4.1. Noise KPI results

Note (1) Submitted figure for Scotland recalculated due to a mathematical error when calculated originally by the NRA.

Comments from NRAs:

Scotland: Transport Scotland has a formal complaints process described in a booklet and available on the web. The information is extracted from the NRA's files. Scotland commented however that the information arrived from a variety of sources that are difficult to track. Scheme specific complaints have not been included. A separate tracking and assessment process for noise complaints is being considered.

Denmark: Does not have records on the number of noise complaints. Suggests possible alternative indicator based on EU required noise maps and action plans (below). 'A possibly more interesting indicator to benchmark could be what is done to limit noise, e.g. budget for noise mitigation'.

Sweden: Cannot see for what reasons complaints are compared to km road length. Sweden has a low population density with long distances travelled. How could this KPI demonstrate the sustainability? Suggests the number of inhabitants as a possible alternative normalization factor.

Summary review of option 1

The KPI is not ideal. Most NRAs do not seem to collect complaints systematically, or in the same way, or at all. The use of road length for normalization is problematic, since this would favour NRAs in large rural countries. There is no basis to interpret the results as expressions of actual difference in performance. Overall there is low current opportunity for benchmarking, although practices to handle noise complaints may be an area for knowledge exchange or joint development.

Option 2: Dwellings affected by noise/NRA roads mapped

No NRA reported fully on this KPI. The Danish NRA reported data which could be used to calculate the KPI but was not calculated by the NRA.

Denmark: Important to specify which indicator (e.g. L_{den} 4m or L_{den} 1.5m). Denmark does not adopt exactly the same metrics as in the EU directive. In 2012 noise mapping will be complete for 100 % of the national trunk road network

Sweden: Not completed. Data is available. A data collection was performed 2009 and is planning to repeat this in 2012. Does not see the benefit of the calculation as it stands.

Scotland: Is tracking the data according to the European Noise Directive, and linking this to a list of noise actions. Round two mapping is due to begin soon.

Summary review of option 2 and total

The KPI exploits noise mapping that should be available due to EU requirements, but only a few NRAs report having sufficient data available. A problem may be differences in indicator metrics used in different EU countries, a conversion factor could be explored but more data is required on the

level of noise mapping that is being completed. Normalization (dividing by road length mapped) may also need reconsideration as there were some negative comments from respondents.

Suggestion: it may be useful to consider alternatives based more directly on metrics over which NRAs have responsibility and influence as indicated by the Scottish NRA. For example, share of low noise road pavement/total new pavement?

Overall, there is low present current opportunity for benchmarking, but with potential due to data availability through mandatory noise mapping/action planning.

The two Noise KPIs are very different and benchmarking each could support rather different functions within an NRA, for example handling of complaints versus reporting on noise conditions along the road network. Each would require considerable further development.

Recommendations

Noise 1: The Noise 1 KPI could be implemented in its current form but could only be used by individual NRAs to benchmark their performance year on year. The differences in recording methods by the different NRAs mean this indicator could not be used to benchmark performance across the EU.

Noise 2: This indicator cannot be used in its current form but could be developed if required.

Overall: There is a requirement for the NRAs to agree what they need to improve in terms of noise. Is it an overall reduction in noise or a response to noise complaints? As there is no agreed KPI in use across the EU then this is the first step for benchmarking performance between countries.

Mandatory noise mapping / action planning provides a potential route to developing a future KPI.

4.3 Air quality

Rationale

Emissions from vehicles produce a number of harmful gaseous emissions including oxides of nitrogen (NO_x) and particulates (fine solid material which can enter lungs).

These and other emissions from vehicles are hazardous to health and present a significant challenge to NRAs and the transport industry. EU legislation imposes limit values on air emissions and the limit value for NO₂ can be breached where congestion is high on a strategic road network.

For air quality, two levels of the same KPI could be adopted by NRAs. Both levels focus on areas with air quality issues, namely so-called Air Quality Zones and Agglomerations (AQZAs) as defined in the EC Directive 2008/50/EC on ambient air quality and cleaner air for Europe.

Level 1 Number of AQZAs/km of NRA road network.

Level 2 Length of road network within AQZA/km of NRA road network

Results

Two NRAs submitted KPI results for both levels. No other NRA provided data. The rank among the two NRAs is reversed depending on which level is consulted. The Irish NRA deals with fewer AQZA's than Flanders, but has a larger share of its road network within them.

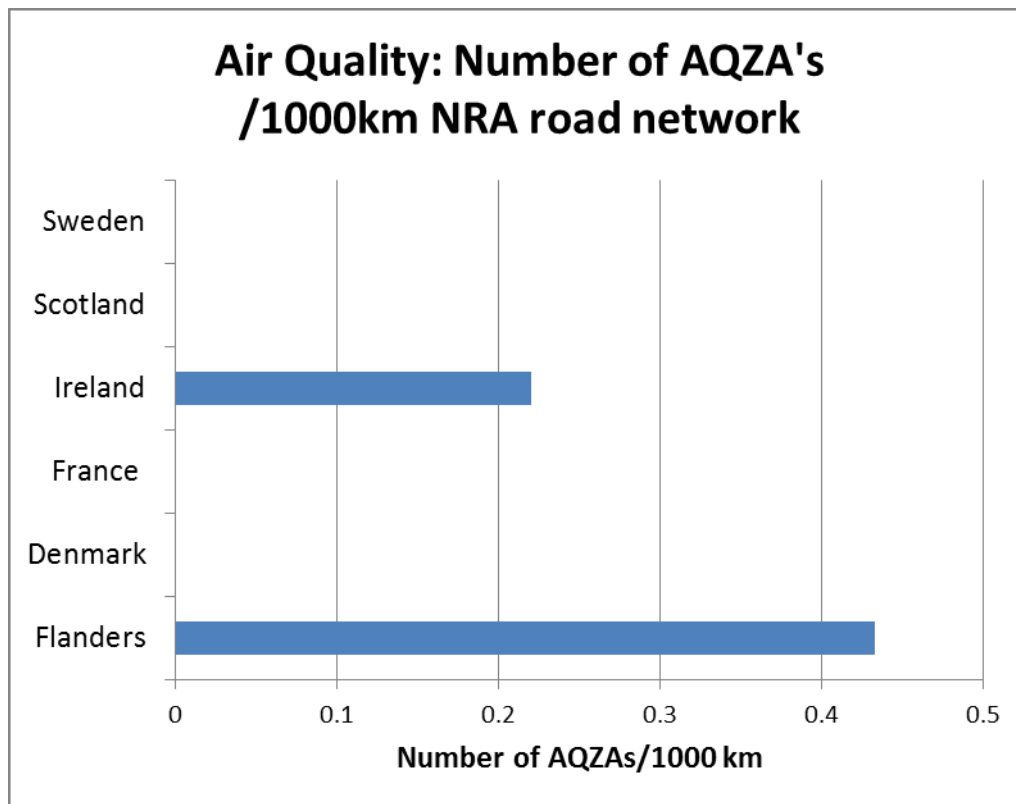


Figure 4.2. Air Quality KPI results level 1

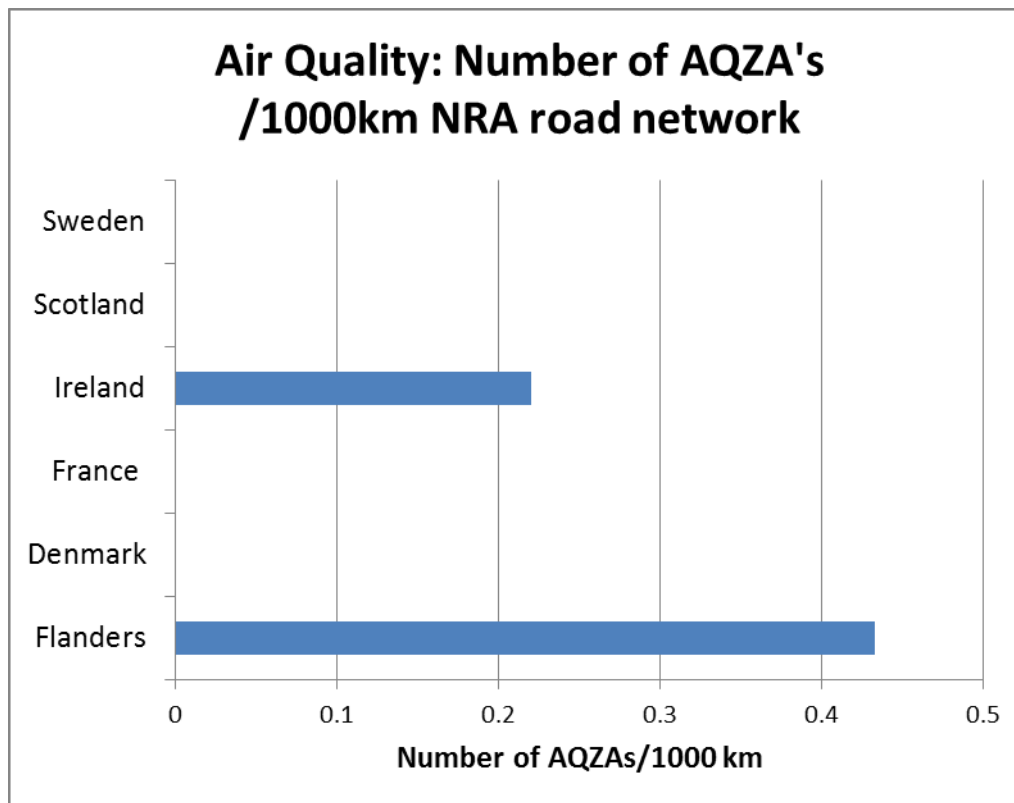


Figure 4.3. Air Quality KPI results level 2

Note (1). Ireland data refers only to major inter urban routes.

Comments from NRAs (referring to both levels)

Denmark: Air quality monitoring is conducted by the Ministry of Environment. There are no monitoring stations along the national trunk road network. Copenhagen is the only city where air quality limits are exceeded, and the Ministry of Environment may therefore have to prepare an action plan. The Road Directorate (NRA) has funded the development of a model to calculate air quality along the national freeways. In general no problems with keeping within air quality limits along freeways have been identified. Such problems are associated with streets in major cities with intense traffic and a street canyon configuration.

Sweden: Not completed. Data could be collected but has not been for this trial. .

Scotland: Not completed. A series of AQMAs has been established in Scotland and the NRA works closely with the various authorities on those that involve NRA network. The requested KPI could be produced in a joint effort with relevant local authorities as part of a move towards a more strategic approach to managing air quality.

Summary review

Only two NRAs provided full KPIs supported with data that could be used to calculate both KPIs, i.e. level 1 and 2. It is noteworthy that the rank between the two NRAs shifts from level 1 (based on number of zones alone) to level 2 (based on length of network within zone). This shows that the

results are sensitive to the metrics used for normalization. The number of zones alone (level 1) seems far too crude a parameter to allow a sound comparison of performance, as the number of zones is very low in both cases, and the number itself means little for the negative impacts of air pollution.

NRA road networks often do not include central urban roads (but this varies across countries) where the air pollution levels are highest. Moreover air quality is the result of a large number of factors including background levels, street configuration and meteorological conditions. Few NRAs report to be strongly involved in managing AQMAs.

This all suggests that the KPI may have limited relevance for NRAs and the benchmarking potential is low. It may be in order to consider possible alternative KPIs for air quality.

Recommendations

There is insufficient data from the trial to recommend the use of either KPI, and the comments from NRAs suggest that the measurement is not always completed by them or is not a major factor on highways and major trunk roads. The options identified in the trial are:

1. Combine the reporting with Local Government to identify the NRAs contribution to meeting EU legislation and reducing hot spots.
2. Identify an alternative air quality indicator that better reflects the performance criteria of NRAs.

4.4 Water quality

Rationale

Water quality is a significant issue in Europe with EU legislation which requires governments and their agencies to have a minimum level of water quality in controlled waters, such as rivers, lakes, coastal areas, and groundwater etc. Road transport affects water quality in a number of ways. These include emissions from vehicles settling on the road surface, leaks and spills of fluids from vehicles, and the use of salt during winter maintenance.

The proposed KPI focuses on how drainage water from roads is treated. The KPI comes in three levels:

Level 1. Proportion of NRA road with managed drainage.

Level 2. Number of managed drainage outfalls.

Level 3. Outfalls with water quality treatment.

Results

For level 1 'Proportion of NRA road with managed drainage' three NRAs submitted full KPI. For this KPI performance is extremely diverse, with the best performer (Scotland) having a 100% coverage,

another (France) 82% and a third (Ireland) less than 10%. It seems likely that the variation reveals some real differences in performance levels for this KPI level.

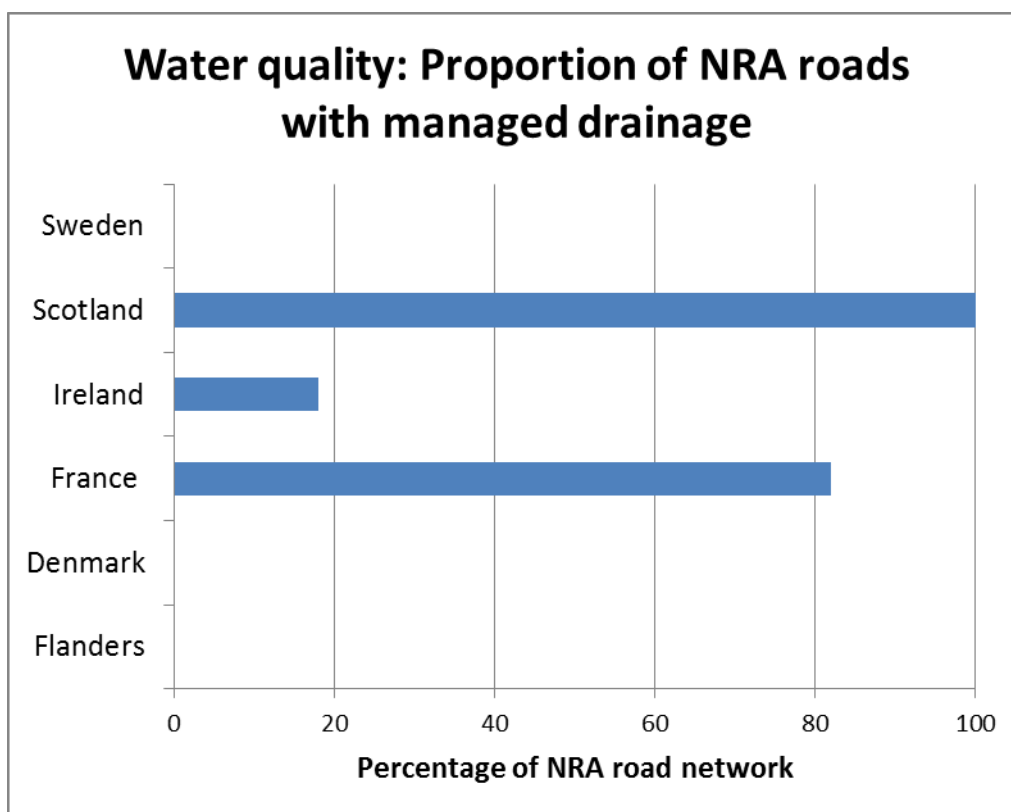


Figure 4.4 Water Quality KPI results level 1

One NRA (Scotland) also provided data for Level 2 'Number of Managed Drainage Outfalls', and Level 3 'Outfalls with water quality treatment', while, another NRA provided extensive comments but no data.

Comments from NRAs

Ireland: All the newly built major inter urban routes have managed drainage systems (which obviously does not apply to all existing ones). The number of outfalls is not determined.

Scotland: Data has been obtained from the Agency's Routine Maintenance Management System (RMMS). However, much data is presently not available or recorded. A project to collect all RMMS inventory data is underway. Further, records of outfalls do not record where they discharge to. Drainage with water quality treatment refers to discharge to balancing ponds.

Sweden: Not completed as data are not available in any inventory. The Swedish NRA considers the KPI as sensible and relevant, if the purpose is to show recipient water load. It should be clarified that if there is no collection or the surface water infiltrates within the road area, there will be no recipient water load. Furthermore, it should be supplemented with airborne load i.e. carried by the air directly from vehicles to the water. From roads directly adjacent to water bodies and bridges this is a significant airborne transport of the pollutants which later can be found in the water. At busy

roads adjacent to water and bridges, the airborne proportion exceeds 90% of recipient water load i.e. from pavement to drainage via mechanisms such as rain.

Summary review

Water runoff handling is a 'core' NRA activity. All three KPIs refer to installations entirely under NRA control, with no reference to derived or calculated final environmental impacts. One should assume that most NRAs have some information about the treatment facilities installed along the network. Indeed this is one of the few KPIs where three NRAs provide a full response for one KPI 'Proportion of NRA road with managed drainage.' The fact that the other NRAs do not respond or provide data may partly be due to a limited priority given to the collection and submission of data. Hence, it appears that this is one of the KPIs with the best potential for benchmarking.

A main concern could be with the KPI's relevance for environmental sustainability. Environmental quality impacts are not obvious from the mere existence of managed drainage. However, only one NRA provided information about water quality treatment. As noted by the Swedish, KPI road impact on water quality may only partly be determined by run-off as airborne pollutants also contribute. However, this will not be an area an NRA can easily influence.

In summary one could consider water quality measured with drainage KPIs as a relatively expedient area for benchmarking but with a need to develop further knowledge and metrics to construct KPI's that could serve to describe environmental sustainability impacts.

Recommendations

The level 1 KPI 'proportion of NRA road with managed drainage' should be implemented as a first step. Consideration should then be made by NRAs to understand the limits of the water quality KPI and what contribution they want to make to water quality. Levels 2 and 3 provide potential options for further KPIs but work may be required to address airborne load.

4.5 Natural resources / waste

Rationale

Road construction consumes a variety of natural resources, some of them ending up as waste, others with a potential for recycling. The level of waste sent to landfill during construction and maintenance activities provides an indication of the level of natural resources consumed. Generally, higher levels of waste suggest that waste has not been reduced in the design phase and there has been less reuse and recycling of materials. The KPI is focused on reducing waste.

Three levels of the KPI were introduced:

Level 1: Tons of waste sent to landfill / km generated by maintenance of NRA network

Level 2: Tons of waste sent to landfill / km from new road built by the NRA network

Level 3: Tons of waste sent to landfill / km NRA network

Results

Three NRAs reported feedback but only one (Scotland) provided results with data for the KPI (all three levels). The data from Scotland is still partial (for some units/districts only). No comparative results can be presented.

Comments from NRAs

Ireland: Maintenance and new road construction works are undertaken by 24 local authorities under various contract types. The NRA does not have access to decentralised waste data.

Sweden: Data are not readily available, but according to the NRA the KPIs for both maintenance and construction activities could most likely be produced with some effort (not specified).

Disagrees that the level of waste sent to landfill provides an indication of level of natural resources consumed. Comparing waste to consumption of new material could be a useful indicator.

Scotland: Transport Scotland reports maintenance and new road construction by lane km constructed or maintained not by carriageway km. For this KPI it is felt that lane km would be a better measure.

There has been reporting on 23 waste streams and five materials since April 2011. This is being introduced in connection with developing new sets of contracts. Two relevant monitoring Indicators have been defined ('waste generation and management' and 'use of reused, recycled, renewable materials'). There is a policy of 'Halving the Waste to Landfill' for which metrics are being discussed.

Summary review

There is significant variation between NRAs with regards availability of data to produce the KPI for waste. One has some data already available, and is currently developing a more systematic comprehensive reporting scheme catering for all three levels; another NRA believes data are available that could feed into the KPI; and a third does not envisage that the KPI should be used without an understanding of the material inputs.

It seems from the experience that waste data from maintenance/construction has a potential as a KPI for benchmarking. Even if maintenance/construction is outsourced/decentralized a requirement to report could probably be included in standardised contracts. However it does not appear to be the most expedient area for benchmarking at this stage. It is not clear from the exercise which of the levels are most promising (waste from maintenance, or new construction)

At the general level it is questioned to what extent the waste KPIs adequately reflect the sustainability concerns regarding consumption of natural resources. This comment would not invalidate waste minimization and associated KPIs as relevant for NRA strategies, but points to a need to further develop the KPI to increase its broader relevance.

At the more detailed level it is proposed to consider lane length (km) as a more correct normalization factor than road (full carriageway) length.

Recommendations

Develop the KPI to include a benchmark for natural materials consumed such as a the Net Waste figure proposed by the UK's Waste and Resources Action Programme or a development of this such as Net Natural Materials figure i.e. Total Materials Consumed – Recycled materials used + total waste – total waste reuse, recycled or recovered. Any figure should be normalized by lane length.

To develop a KPI of this nature NRAs will need to first understand what data is available.

4.6 Climate Change

Rationale

Road transport is major source of emissions of greenhouse gasses including carbon dioxide (CO₂) which is believed to be contributing to climate change. The carbon dioxide emissions to be considered are those relating to the NRA's (and their contractors) maintenance and construction activities and the operation of their road network. Emissions from NRA's office activities (e.g. lighting, heating/cooling, office equipment) may also be included. Emissions related to the use of the road network by other road-users are not included in the trial, due to the limited ability of for NRAs to influence those emissions. All emissions are expressed as tons of carbon dioxide.

The KPI proposed was: carbon dioxide (CO₂) emitted by NRA and contractors per year/ km NRA road network. The following components were included:

- Emissions from NRA's office activities (tons CO₂/year)
- Emissions from new road building (tons CO₂/year)
- Emissions from operation of network (tons CO₂/year)

Results

No results were submitted, although four NRAs submitted information or comments.

Comments from NRAs

Ireland: currently working on this indicator and likely to be in a position to respond to this metric soon (no details given whether data will focus on corporate sources, construction, or maintenance)

Sweden: NRA Corporate sources: The following data are already available (of fairly complete coverage and OK quality): direct emissions from business travel, electricity and heating usage in buildings owned and leased premises. Not available: indirect emissions of goods and services purchased / procured.

Road building/Infrastructure: Not yet able to generate data on the climate impacts of infrastructure. The aim is to be able to produce this data in a few years. Data is not available, but suggests a need

for more clear definitions and boundaries for calculations in this area, including a definition of what is 'new road construction', and whether end-of-life phase of infrastructure should be covered.

Operation of Network: Data of electricity use in installations can be provided, which could be transformed into CO₂-equivalents

Maintenance of Network: Data is not available. The aim is to produce such data in a few years.

Scotland: Transport Scotland is developing a system to assess carbon throughout the operation, management, maintenance and construction activities. The first year of development is complete and preliminary data on corporate CO₂ emissions is currently being assessed. The current year will focus on emissions in regard to contracts for projects and maintenance.

Brings attention to variables to use for normalization. Metrics considered potentially suitable include life to failure or first intervention, road type, road length, or vehicle distance driven. It may be useful to test several of these.

There may be tradeoffs for example in increasing the carbon content of a material (say SMA for example), if the durability is increased by an appropriate level

Another challenge is choosing an appropriate start date for benchmarking, and in fixing the related carbon factors.

Overall positive to work towards including CO₂ in NRA benchmarking.

Flanders: Data not available for corporate sources, new road building or maintenance. For network 'operation' figures on road user CO₂ emissions can be provided. Questions the purpose of the indicator.

Summary review

No NRAs submitted any actual KPI or data on any of the dimensions of the KPI for climate change/carbon dioxide emissions. Thus this is one of the KPIs with the weakest response.

However some NRAs reported that some data was available or could soon be produced for some aspects, either for corporate activities (especially Sweden, Scotland) or some aspects of construction and maintenance.

One NRA pointed to emission inventories for road traffic, which is however outside the scope of the proposed KPI.

From the responses received it is not possible to identify where the greatest potential for future benchmarking may lie, or when a KPI could be developed. For that it would be necessary to conduct a more detailed discussion among NRAs. It seems that NRAs are generally interested in the area, which is not surprising considering the general attention to climate change and the role of the road sector.

Useful comments from NRAs include the need to define system boundaries for construction related calculations, and the need to define proper normalization measures for comparisons.

Recommendations

Define the boundaries for construction related calculations and publish the KPIs as examples of good practice that NRAs should work towards measuring.

4.7 Biodiversity

Rationale

Road infrastructure effects biodiversity, for example by placing barriers for migration for several species of animal. Establishing wildlife crossings is one way in which NRAs can help limit negative impacts on connectivity and eventually biodiversity. Connectivity should be judged in conjunction with Biodiversity Action Plans (BAPS). Crossings should be evaluated after placement to determine their effectiveness, and should not be counted if they are not effective in allowing wildlife to cross.

The proposed KPI is number of wildlife crossings on the network / 1000km NRA road network.

Results

Two NRAs submitted data to calculate the KPI, Scotland and France. Scotland provided a detailed inventory of 112 crossings divided into categories for different animal species or functions. Overall result is 29 crossings per 1.000 km road. France reports 1128 crossing points with no further details, with 127 per 1.000 km NRA road. France thus appears to have more than five times more wildlife crossings per km road compared to Scotland. However there is not sufficient basis to draw conclusions on the background for the considerable difference in performance. It could for example be due to different natural conditions, different types of crossings being constructed or reported, or different types of road being controlled by the NRAs in each country.

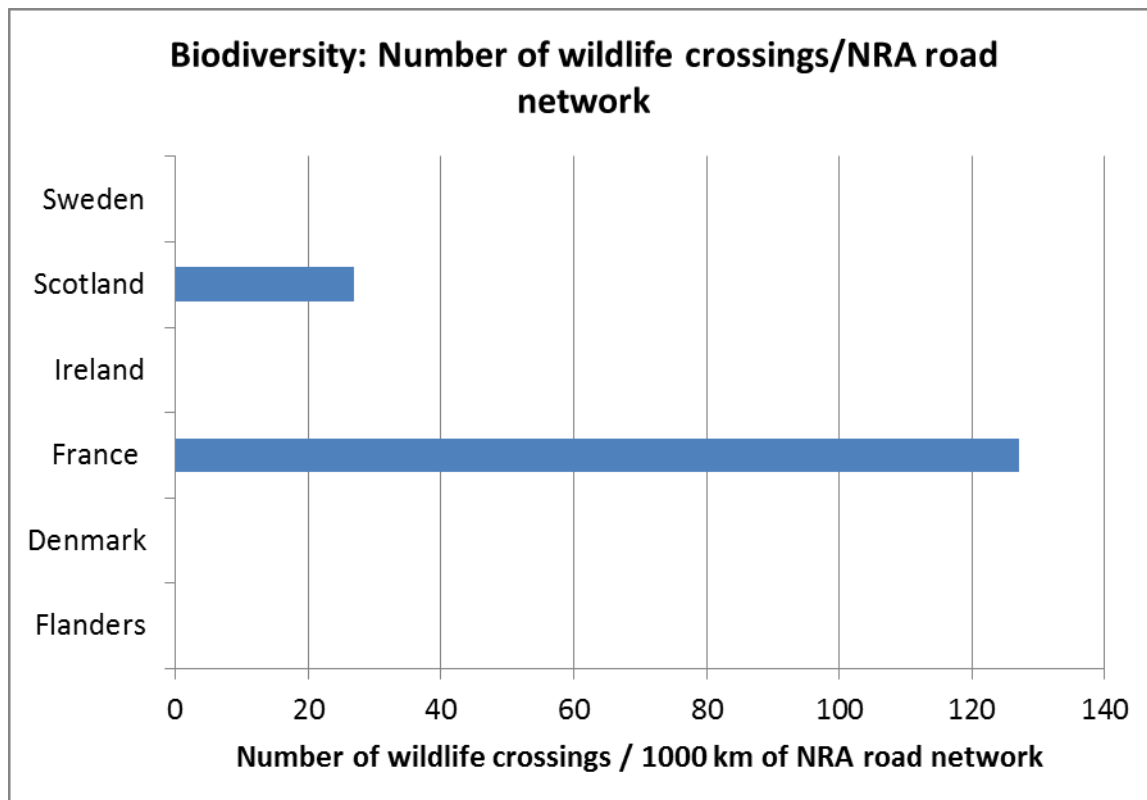


Figure 4.5. Biodiversity KPI results

Comments from NRAs

Ireland: Not completed. The NRA is currently in the process of collating this data from “as built” drawings as part of their asset management data inventory. This process will not be completed until the end of 2013

Sweden: Not completed. There is information that approximately 60 wildlife passages have been constructed, but no actual inventory has been produced. Most crossings are located at the high density traffic parts of trunk road network (approximately 8 500 km) (which would from these figures represent 14 crossings per 1000km of NRA road network). Since Sweden has a considerable number of NRA owned roads, it could bias comparisons if total the NRA road length was used a divisor. Sweden suggests divide with length of the trunk road network.

Scotland: States that the reported number of crossings is partly an estimate, and the real number is likely to be higher.

Denmark: provided informal comments that the proposed KPI was not necessarily useful to distinguish the best performers among NRAs with regard to biodiversity.

Summary review

Even though two NRAs report KPI data and this seemed to allow for a comparison, this is not an immediate basis for benchmarking performance or practices. More detailed analysis would be required to determine if similar definitions of crossings are used, and if there are other significant differences in the conditions, or approaches undertaken by NRA's. No information was provided about Biodiversity Action Plans.

On the other hand it is clear that several NRAs are involved in the practice of constructing wildlife crossing, and there could be scope to benchmark this area.

Before any direct comparison of performance is pursued it is also relevant to consider the most relevant section of the road network i.e. strategic roads or whole road network if the NRA manages a wider road network. .

Another important issue raised in verbal comments from one NRA was the relevance of using wildlife crossings as a positive indicator for NRA contributions to preserve biodiversity, which is obviously a much more difficult notion than identifying the number of crossing points.

Recommendations

The use of crossing points as a measure of NRA contribution to biodiversity seems to be limited but is being collected by NRAs. This would be an achievable starting point although an alternative normalisation factor is needed. A more complex indicator is required in the future to fully appreciate the biodiversity impact of NRA activities.

Implement the indicator with an alternative normalisation factor.

Explore an alternative that will fully take into account the biodiversity impact of NRA activities.

4.8 Stakeholder satisfaction

Rationale

The rationale for measuring stakeholder satisfaction is to identify the overall level of satisfaction/dissatisfaction with the road systems.

Two KPIs were proposed:

1. Number of complaints to NRA / km NRA road network
2. Number of responses from NRA / km NRA road network.

The breakdown of complaints to various channels for submitting complaints was also included (e.g. directly to NRA, received from local government, etc.)

Results

Only one NRA (Ireland) provided a KPI with data. Two other NRAs provided limited feedback (Sweden and Scotland). Ireland reported 71 complaints in a year or 0.016 per 1.000 km NRA road network. The same number was given for responses, as all complaints were apparently addressed.

The Irish NRA divided complaints in six different topic groups, ranging from noise with 23, to graffiti with 3. However, the NRA explained that the recorded data may include other records than complaints proper such as general enquiries, and thus there may be double counting.

Comments from NRAs

Ireland: see above.

Sweden: Reported not having data.

Scotland: Not completed. However the Scottish NRA reported having recorded data on complaints and other correspondence in similar categories as proposed in the KPI with a possibility to calculate an index of complaints against length of network. The same is the case for responses.

Questions if the KPI would provide a clear reflection of the public ‘satisfaction’ with the service provided. It seems not necessary to distinguish complaints/responses as all complaints would be responded to.

As a possible alternative to the proposed KPIs Transport Scotland mentions a ‘customer satisfaction’ survey, regularly undertaken, which would provide a better reflection of customer satisfaction. Core questions address topics such as perceptions of trunk roads, roadworks and winter maintenance, lighting, markings and signage, cycle lanes and footways.

Summary review

There was limited response to the proposed KPIs, and no immediate option for benchmarking results or performance. It is clear that some if not most NRAs (even some not providing feedback) do receive complaints on various aspects of their services or road network performance, and that they do manage and respond to such complaints them in various ways. Each NRA may however categorize and handle complaints in unique ways and it seems not immediately feasible to develop a standardized approach.

Rather than seeking to benchmark directly on the number of complaints to express satisfaction, it may be more feasible and relevant for NRAs to exchange experience with customer satisfaction survey practices. The system developed by Transport Scotland’s could serve as an example.

Recommendations

Determine whether a common satisfaction survey format report could be implemented across NRAs and used to benchmark their performance.

4.9 Safety

Rationale

Traffic safety remains among the major long standing concerns of NRAs. Traffic safety is sometimes classified as an impact related to the social dimension of sustainable transport.

The most commonly used indicator that measures safety is the total number of people killed or seriously injured (KSI) in road traffic accidents. NRA performance will contribute to national casualty reduction targets.

The proposed KPIs is the annual reduction in number of people Killed or Seriously Injured (KSI) in road traffic accidents, as a 3-year rolling average.

Results

Three NRAs reported data for the KPI for the period 2007-2010, Scotland, Ireland and Denmark. Ireland has seen the greatest improvements in performance (decrease in the KSI) followed by Denmark and Scotland. Direct comparison of results must proceed with caution, however (see comments below). One NRA (Sweden) provided comments without KPI data.

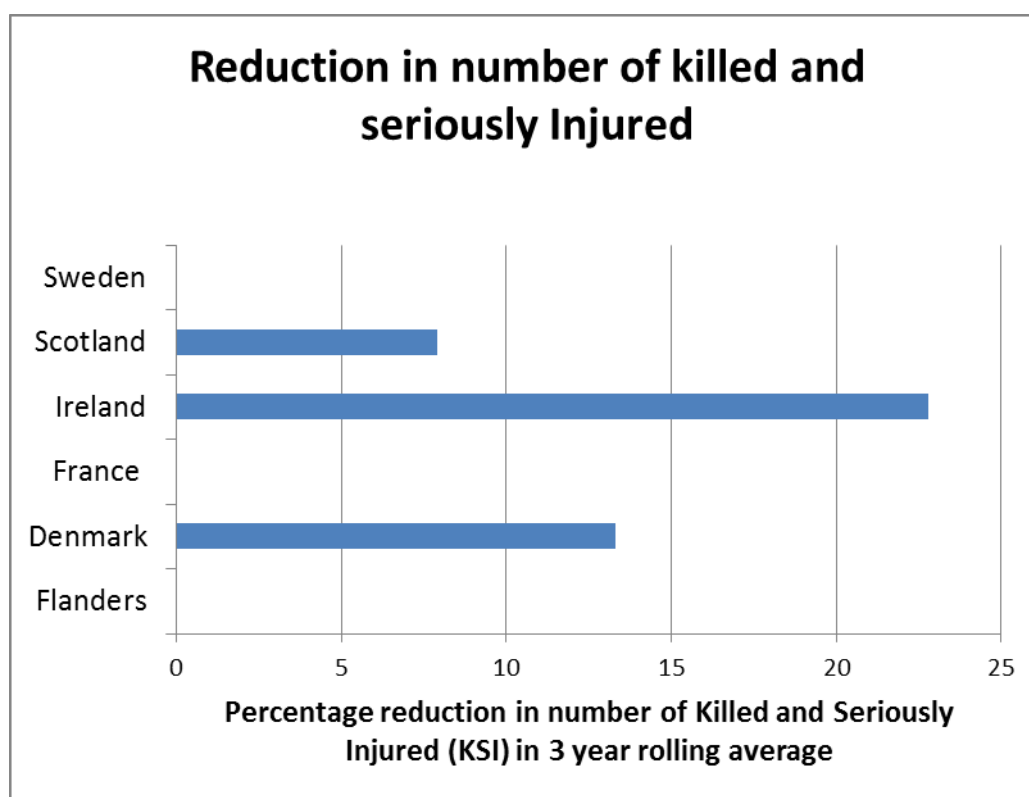


Figure 4.6. Safety KPI results level 1

Comments from NRAs

Denmark: For the safety KPI the Danish NRA finds it acceptable to use the percentage reduction in K+SI, but strongly advise against using actual figures on seriously injured as part of the safety KPI. The data for severe injuries cannot be considered directly comparable across NRA's due to substantial differences with regard to definitions, underreporting etc. Only fatality data are (adequately) comparable.

Sweden: Data are available but not submitted. Swedish NRA finds a need to discuss if serious injured should be included. Experience through the work into Europe is that different definitions of the

“serious injured” exist. The calculation will therefore be misleading and potentially misused. Sweden prefers to use only the number of fatalities, since it has a clearer definition among the European countries as well as good supporting data.

Summary review

The safety KPI appears as one of the most developed ones with detailed data available for several NRAs, although most NRAs did not report information or comment.

The most significant issue appears to be whether data for seriously injured should be included. Even if absolute definitions and levels vary across NRA it may be feasible to compare relative improvements time. Even if fatalities have a more standardized definition⁷ and provides the most reliable data, fatalities are (fortunately) at a lower rate than serious injury, and may not fully represent performance of NRA efforts to improve safety.

Recommendations

This KPI is well developed but further work is needed to develop a cross Europe definition of Seriously Injured which has no agreed EU definition.

4.10 Development

Rationale

New and improved roads can contribute to economic development and social wellbeing by allowing improved and faster access to services and new markets for goods. Where regional development plans are in place it may be most appropriate to calculate the KPI on a regional basis.

An alternative or supplement to expanding the road network may be to improve the utilization of existing roads by managing traffic flows and travel demand through the use of ITS.

Three indicators were proposed:

- 1) population / km new road constructed
- 2) population / km new lanes constructed
- 3) population/ km ITS/ICT constructed

The first indicator will be most appropriate for countries with extensive road construction activities whereas the second will be more appropriate for those with a mature network. The third indicator identifies the development of more intelligent interaction and road management between road user and the NRA.

Results

Two NRAs (Ireland and Scotland) submitted KPIs with full data for the first indicator, whereas Scotland also submitted for the second and third one. One NRA provided qualitative comments.

⁷ 1968 Vienna Convention on Road Traffic <http://www.unece.org/fileadmin/DAM/trans/conventn/crt1968e.pdf>

New road construction has been much more extensive in Ireland in 2010 than in Scotland, more than ten times so. Whether this reflects the latter having a more ‘mature’ network than the former is not obvious since Scotland reports ‘0’ for the second indicator. Scotland also reports 8 km of road fitted with ITS. The second and third indicators cannot be compared.

Another NRA (Denmark) prepared some data for the extension of ITS systems along the NRA network, but did not complete the KPI by relating to annual deployment.

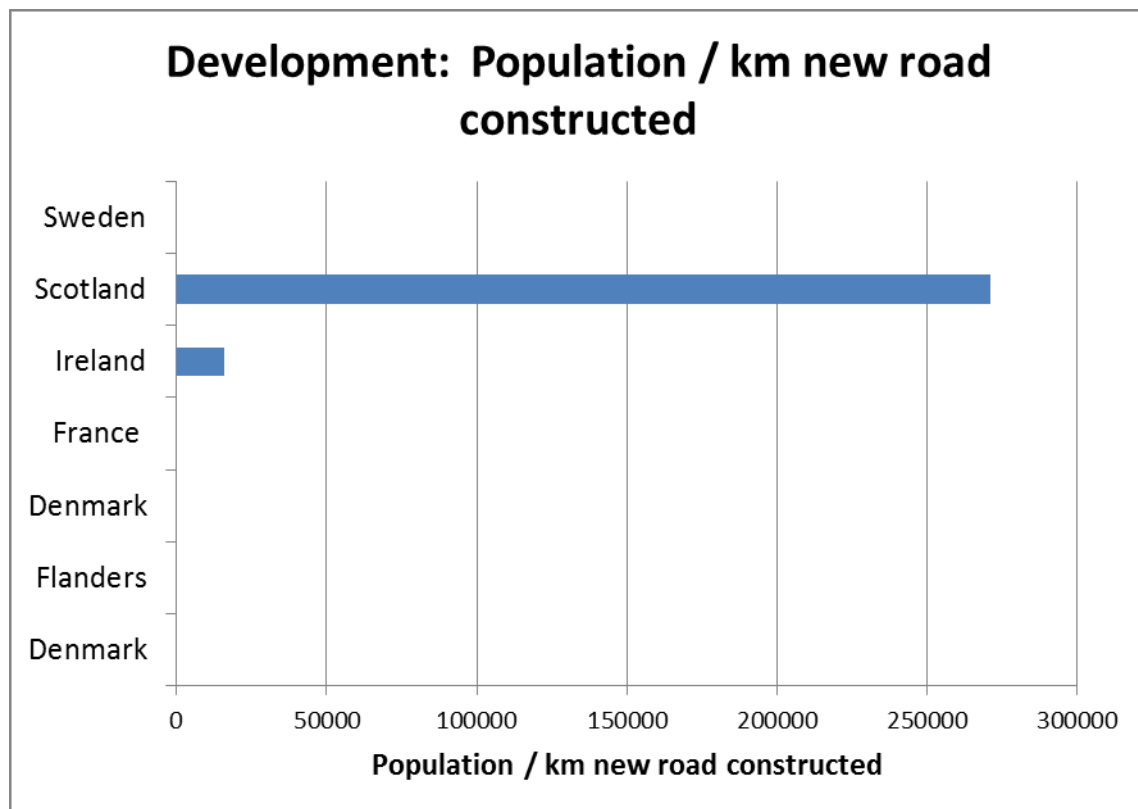


Figure 4.7. Development KPI results

Comments from NRAs

Sweden: Not completed, although data on all three indicators is available and could be calculated.

Swedish NRA finds the KPI for “new road construction” needs to be more clarified, and their experience says European NRAs often apply different definitions of the new road construction. Some of the upgrading could be included into the new road construction and some other cases of upgrading will not be included. The calculation can be misleading and misused.

Denmark: Submitted informal comments that the proposed ITS indicator was not found to be sufficiently meaningful

Summary review

It is likely that more than 2-3 NRAs could provide data on the 'development' KPIs measured as new roads or new lane km completed divided by population. Some may also supply data on ITS although only one did.

One NRA cautions about the accuracy of a 'new road' definition, which could be part of the explanation for the rather extreme variation between two NRAs which otherwise seem relatively comparable. Another explanation for this difference could be large and possibly coincidental fluctuations in the annual completion schedule for road extensions; this could probably be mitigated by averaging over a longer period. Another issue is that road scheme completion could be affected by national economic policies beyond the control of NRAs.

The ITS KPI does not take into account different types of ITS solutions, and may need to be developed further on the conceptual level to become accepted as an indicator of development.

All in all there is limited opportunity for benchmarking 'development', but most likely a potential to develop comparable measures with proper attention given to definition of standards.

To what extent simple expansion of the road network reflects a positive, or the most effective, contribution an NRA can make to social development and progress could be questioned. This could be included in discussions among NRAs in order to develop an agreed KPI.

Recommendations

NRA should agree on what constitutes development.

4.11 Travel

Rationale

The quality of travel is important to road users. Unreliable journey times can cause significant frustration, making it hard to plan a journey. The purpose of this KPI is to obtain a measure of the actions being taken by the NRA to reduce congestion and improve journey time reliability.

The proposed KPI is the length of road affected by schemes to reduce congestion and improve journey time reliability per 1000km of the NRA road network per year (some alternatives are given for the definition of the KPI).

Results

Only one NRA (Ireland) submitted full data for the KPI. A total of 69 km of road per 1.000 km NRA network (=6.9%) was affected by a scheme to reduce congestion. One NRA provided comments and another stated that data are forthcoming.

Comments from NRAs

Ireland: Noted the ambiguity in the definition of the KPI (per scheme or 1.000 km), but did provide data per 1.000 km.

Sweden: Not completed. Swedish NRA states that data could be collected from inventory. Mostly relevant for the major cities Stockholm, Gothenburg and Malmö but also in a smaller scale in some more cities. In the rural areas the risk of congestions is normally reduced by constructing a motorway or a 4-lane road with managed junctions such as large roundabouts or in some cases interchanges.

Summary review

It seems that some or several NRAs have data and could produce a KPI for schemes used to reduce congestion. It is not clear from the response however, if such schemes are comparable or have similar definitions across NRAs. It is possible that a focused discussion among NRAs could reveal more specific practices that could be benchmarked.

Recommendations

A discussion is required between NRAs to identify a more specific KPI for journey time reliability.

5 Interpretations and discussions

5.1 Interpretations of the results

The literature review identified 19 topic areas where Environmental and Social KPIs could be developed. These topic areas were prioritised into 10 through a workshop with four NRAs. Through workshops with EVITA and a further literature review the topic areas were refined into 11 KPIs. These KPIs were then trialed.

In general the response from NRAs was low with only six of the 28 NRAs contacted agreeing to complete the trial. This suggests potentially a lack of enthusiasm for the topics within the vast majority of the organizations contacted, a difficulty in finding the right individual in an NRA to respond, a lack of resource within the NRA to be able to respond, more time required within the trial period to enable the NRA to respond or an inaccessibility of the documentation, potentially through the terminology used or the indicators identified.

Only two NRAs provided comprehensive, rich responses, while several NRAs provided comments, some of which were constructive and detailed, while others were more sporadic, or indicating only a tentative interest.

Because of the low take up, the trial does not answer fully to what extent NRAs are broadly convinced of the potential benefits of benchmarking in the area of environmental and social sustainability, or the relevance and suitability of the selected themes or KPIs. Clearly there is scope to discuss and develop further themes and KPIs, as many critical comments were made about the KPIs, and some alternative options were proposed.

However of the six NRAs that reported none found any of the ten themes, or the general idea of benchmarking with regard to social and environmental impacts to be of no value.

With regard to the main aims of the trial the following can be noted:

1) Relevance of the KPIs for reporting environmental and social sustainability

There is not a clear indication. It seems that the themes are generally accepted in terms of their general relevance for environmental or social impacts, but NRAs were not asked (nor did they respond to) if other themes with associated KPIs may have been more or less relevant for sustainability than the ones trialed. Several individual KPIs were critiqued or questioned with regard to their value or relevance to sustainability, e.g. KPIs for waste/natural resources, biodiversity, satisfaction and development. However in most cases only one NRA raised a particular critique. For some KPIs, such as air quality, several NRAs were uncertain of or unfamiliar with the KPI.

2) The most useful KPIs for reporting and engagement with strategic stakeholders

The NRAs did not comment on the usefulness for reporting or engagement with stakeholders. In one instance, stakeholder satisfaction, it was proposed to undertake (and possibly benchmark) specific satisfaction surveys rather than using complaints as a KPI.

3) The availability and quality of environmental and social data

The review demonstrates that NRAs to varying degree have data available to report on a number of environmental and social issues including most of the 10 themes included in the trial. For six KPIs at least two NRAs were able to report more or less comparable figures, although the general level of data provision was low, and the actual comparability of the data was not equal across KPIs and in no case fully established.

Only a few of the proposed KPIs presently seem fully expedient with regard to comparison and benchmarking of performance across all or many NRAs.

The KPIs for water quality and safety have the most immediate scope (with three NRAs reporting), but it is likely that three or more NRAs would be able to report data for several of the other themes (see further in summary analysis below). On the other hand more detailed analysis may reveal limitations to the comparability.

4) Attribution to and actionability for NRA practices

NRAs were not directly asked about how strongly the KPIs relate to actions or practices in the NRAs control, in other words the extent to which the KPI would be sensitive to actions that could be undertaken by the NRA as opposed to KPIs reflecting various external developments or triggers. It nevertheless seems that NRAs could have had issues with several KPIs that measure conditions of limited influence for NRAs such as noise, air quality or climate change (see further in summary analysis below).

5) The resources (time/effort) needed to generate the KPIs

The NRAs did not explicitly report on the time/efforts required although three NRAs reported that some extra effort would be required to report on the KPIs for water quality and safety. In some cases NRAs reported to have data available, which was not reported in the trial (due e.g. to work effort required to obtain and report the data, or due to reservations with regard to the relevance of the KPI even if data could be produced). This appears to be the case for some NRAs with regard to the KPIs for noise (based on noise mapping), natural resources, and climate change.

For some of the KPIs different levels and different detailed categories were offered. It is clear that more detailed categorisations (e.g. different types of complaints, different types of waste etc.) require more demanding data collection. On the other hand, SBAKPI did not exhaust the possibilities for defining simple KPIs that several NRAs may be able to report on these with limited extra effort (for example utilizing data collected for mandatory EU reporting, or for management of subcontractors).

Summary analysis

In this subsection an attempt is made to provide an overall assessment and tentative ranking of the KPIs, based on the trial input as well as further subjective analysis of the results. Each KPI has been ranked according to the extent to which it is related to the sustainability of road transport, the availability of data and the extent to which the NRA can influence the KPI (actionability). For each of the three dimensions each KPI in the trial has been ranked on a scale from 1 to 5 with 5 as the highest level, as shown in Table 5.1.

Table 5.1. Summary review categories

Rank	Sustainability	Availability	Actionability
5	Essential to measure road transport sustainability	Complete and comparable data delivered for all NRAs	Full and unambiguous responsibility of the NRA
4	An unambiguous and direct measure of a key aspect of road transport sustainability	Complete and comparable data delivered or available for more than half of NRAs	Significant and clear attribution to NRA practices
3	An indirect measure of some importance for road transport sustainability	Mostly complete and comparable data available for at least two NRAs	Some and mostly clear relations to NRA practices
2	An indirect and somewhat ambiguous measure of road transport sustainability	Incomplete and only partly comparable data for a small number of NRAs	Limited and somewhat unclear relation to NRA practices
1	A measure of low or very uncertain relevance for road transport sustainability	No data, or entirely incomplete/incomparable data for a few NRAs	No or entirely unclear relation to NRA practices

The results are shown in Figure 5.1 below. It is important to observe that these results do not represent a direct outcome of the trial responses, nor do they pretend to reflect an objective assessment. It is solely an attempt to provide an overview for possible consideration in further work on identifying KPIs for environmental and social benchmarking for NRAs.

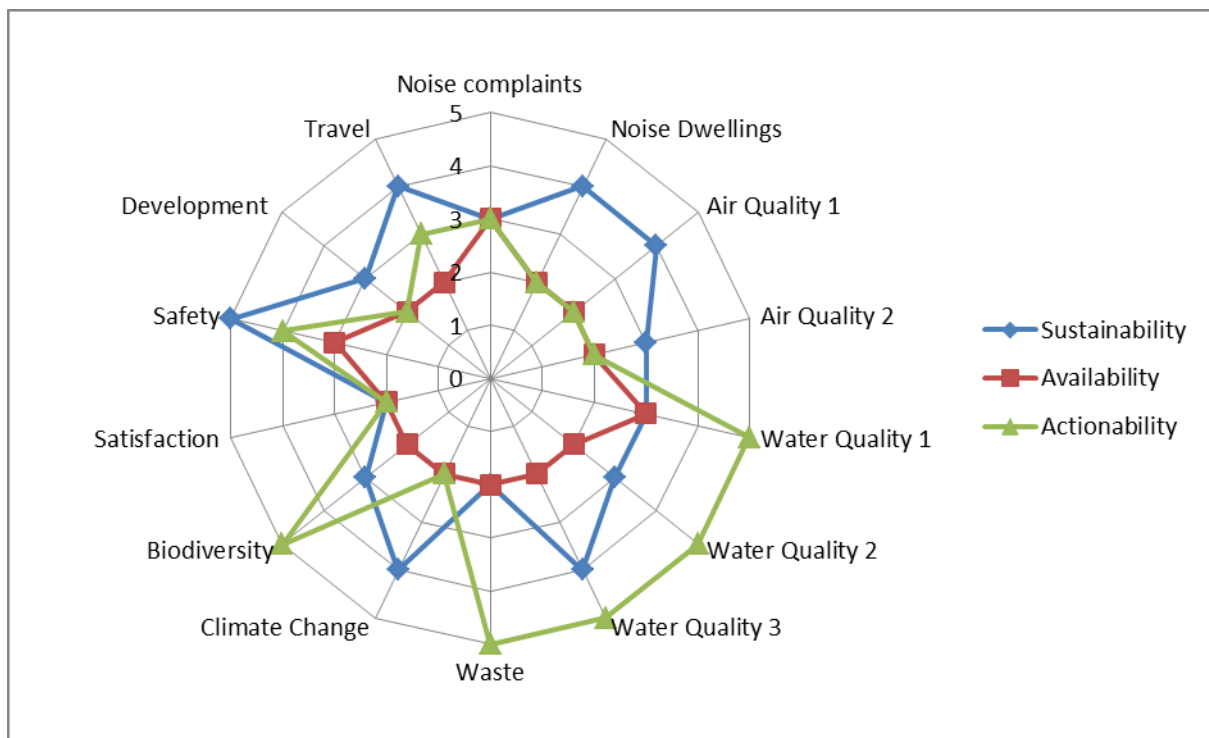


Figure 5.1. Results of KPI summary analysis

What appears from this analysis is that the proposed KPIs possess different qualities that are not necessarily in full harmony. Some KPIs appear capable of representing key outcomes of relevance to environmental or social sustainability, while others are more clearly actionable from the point of view of an NRA. For example the water quality KPI (level 1) on managed drainage can be considered an indirect measure of some importance for road transport sustainability, while it is fully under the control of the NRA (conditioned by available resources). In general more KPIs stand out as fully actionable for the NRAs than necessarily being unambiguous, direct measures of road transport sustainability, where only the safety KPI (killed and seriously injured) has the top score among the KPIs). In general the KPIs score lowest on the 'Availability' scale, due to the fact that so few NRAs reported fully on any of them. This, however, may be partly an artifact of the limited trial, where in reality more data could potentially come forward if the exercise was continued. This is discussed further below.

All in all the KPIs for safety, water quality, biodiversity and possibly noise complaints have the higher overall scores, meaning most potential expedience for quantitative benchmarking. However, even in those areas there is considerable scope for improvement. Also in several other areas there may be opportunities to compare and develop practices from mutual exchange in more qualitative ways (learning) even if the data at this point does not support strict comparisons.

5.2 Final discussion

The limited scope for benchmarking environmental and social sustainability for NRAs for the KPIs as applied in the SBAKPI trial may be ascribed to a number of factors or barriers to overcome. Taking into account the results of the trial, as well as observations in the reviewed literature on benchmarking and sustainable transport, the following factors or barriers could be considered as having some importance in further work:

- Limited availability of data comparable across NRAs. Obviously not all NRAs collect the same data, or do so in the same way for each theme or impact. In some cases this may be due to different priorities with regard to the themes/impacts importance, which again may have national, historic or agency specific reasons; such factors could be hard to change. In other cases a limitation may be the lack of availability of time series data that would allow measurements of relevant rates of change over time for KPIs rather than absolute levels, which may be comparatively easier to overcome. In some cases data may become much more readily available if there is agreement over and buy in to the KPI from NRAs.) There is a lack of consensus on the normalization factors to be used for making performance comparable in a meaningful way (e.g. length of road network, population, extension of mapping efforts...). It is important to avoid factors that could introduce bias in comparisons favoring or disfavoring NRAs e.g. because of differences in geographic conditions.
- The question of control over / attribution to NRA activities of factors influencing KPI results. To what extent should strategic KPIs be directly measuring activities, practices or results under direct control of the NRA, compared to measuring general social or environmental impacts; the KPIs adopted in the trial represent a mix of those.
- Organizational issues; the way in which NRAs are compartmentalized such that different themes and KPIs are more or less well connected and coordinated. There may also be difficulty liaising with other organizations which may hold data required for generating a KPI.
- Lack of a common concept of sustainability for NRAs which could potentially help provide a comprehensive, integrated framework for the benchmarking with regard to both present and future needs within social, economic, and environmental dimensions. A new ERAnet road funded project SUNRA8 will be working with NRAs to develop relevant definitions of sustainability which should help with this issue.
- Finally the small scope and resources of the SBAKPI project imposed limits on how much NRA representatives could be engaged in data mining within the NRAs, reflections over KPI relevance and comparability etc; and also limitations on the depth of the analysis of the observed results. Support for data collection and analysis would be available from the NRAs contractors and supply chains for construction and maintenance projects if individual NRAs

⁸ ERANET road website <http://eranetroad.org/>

develop appropriate contracts and tenders which require data to be collated as part of normal contract activities.

6 Conclusions and recommendations

There is a mixed understanding, commitment and implementation of Environmental and Social KPIs across Europe. This study has reviewed the current practice and tried to bring forward the discussion by proposing a set of KPIs that addresses the key topic areas identified by NRAs. There are limitations in the conclusions that can be drawn from the study because of the limited attendance at the project workshop and the lack of response to the trial. This research has however enabled a process to be developed to enable NRAs to identify KPIs that they can use to benchmark performance and suggest recommendations for the most important topic areas.

Of the six organisations that have been involved in the project there has been an acceptance that the following proposed topic areas were a priority in measuring environmental and social performance:

- Noise
- Air Quality
- Water Quality
- Waste
- Climate Change
- Biodiversity
- Stakeholder satisfaction
- Safety
- Development
- Travel

It is clear that the KPIs that were developed to accompany these topic areas could not be universally adopted but from the results of the trial recommendations can be made to propose a direction of travel to implementing a series of KPIs that will enable NRAs to benchmark their performance. The project has shown that it is possible to make a start on the development of agreed European strategic Environmental and Social KPIs though it will not be possible for some time to develop a comprehensive set of KPIs that large numbers of NRAs can sign up to.

Many of the proposed KPIs need further discussion between NRAs to determine the most appropriate metrics and forums such as CEDR subgroups could be used to discuss options.

The conclusions and recommendations for each of the KPIs are included in Table 6.

Table 6.1 Conclusions and recommendations for the trialled KPIs

Topic	KPI	Should the indicator be adopted?	Recommendation
Noise	Noise complaints reported to the NRA.	In their current forms neither indicator was attractive to the NRAs because of variations in metrics.	Mandatory noise mapping / action planning provides a potential route to developing a future KPI. A forum should be identified to explore this opportunity when it arises.
	Number of dwellings exposed to excessive noise/NRA road network mapped.		
Air Quality	Level 1 Number of AQZAs/km of NRA road network. Level 2 Length of road network within AQZA/km of NRA road network	There is insufficient data to determine if either KPI could be adopted.	NRAs should determine whether air quality should be considered at a strategic level and integrate their performance with local government or whether they should limit their scope to what can be controlled by the NRA. Discussion needs to be held at appropriate forum.
Water Quality	Level 1. Proportion of NRA road with managed drainage. Level 2. Number of Managed Drainage Outfalls. Level 3. Outfalls with water quality treatment.	Yes, although airborne load could to be integrated to fully measure sustainable performance.	Implement as a first step the level 1 indicator, 'proportion of NRA road with managed drainage' and identify a forum to determine the scope of NRA responsibility to water quality.
Waste/natural resources	Level 1: Tons of waste sent to landfill / km generated by maintenance of NRA network Level2: Tons of waste sent to landfill / km from new road built by the NRA network Level 3: Tons of waste sent to landfill / km NRA network	No. Whilst the KPIs could be adopted by some NRAs it should include consumption as well as waste.	The KPI should be expanded to include consumption of natural materials as well as waste. To develop a KPI of this nature NRAs will need to first understand what data is available.
Climate Change	Carbon Dioxide (CO ₂) emitted by NRA and contractors per year/ km NRA road network.	Yes, if the boundaries for emissions relating to construction are defined.	Define the boundaries for construction related calculations. The KPIs then demonstrate examples of good practice that NRAs should work to measure.
Biodiversity	Number of wildlife crossings on the network / 1000km NRA road network	Yes, if an alternative normalization factor is used, however the KPI is limited.	Implement the indicator with an alternative normalisation factor. Explore an alternative that will fully take into account the biodiversity impact of NRA activities.
Stakeholder satisfaction	Number of complaints to NRA / km NRA road network Number of responses from NRA / km NRA road network.	No. The data that is collected by NRAs varies greatly and cannot be used to benchmark performance.	Determine whether a common satisfaction survey format report could be implemented across NRA and the score reported as a benchmark.
Safety	Annual reduction in number of People killed or seriously injured (KSI) in road traffic accidents, as a 3-year rolling average.	Yes, although concerns were raised over how different NRAs measure serious injuries.	Draw on work outside this project which is identifying a common metric for safety. ⁹
Development	Population / km new road constructed Population / km new lanes constructed Population/ km ITS/ICT constructed	Yes. However questions were raised as to whether the KPI best represents development.	Identify an appropriate forum to agree on what constitutes development.
Travel	The length of road affected by schemes to reduce congestion and improve journey time reliability per 1000km of the NRA road network per year	No.	A discussion is required between NRAs to identify a more specific KPI for journey time reliability.

⁹ http://ec.europa.eu/transport/road_safety/specialist/toolbox/index_en.htm

A set of KPIs can therefore be developed using the benchmarking framework (Appendix A) and the above recommendations as guidance. Further work by NRAs on the subject of KPIs and benchmarking for environmental and social sustainability issues is, however, required and should include:

- a) Agreement in principle among NRA representatives - possibly involving other stakeholders - on a set of themes to work jointly while taking into account an overall understanding of sustainability for NRAs.
- b) Discussion and joint interpretations of SBAKPI trial findings among NRA representatives internally, including considerations of the significance of factors identified in 1 – 6 of Section 5.1 and the recommendations in table 6.
- c) More detailed approach to develop appropriate KPIs for each theme one by one, taking into account the overall framework as provided by SBAKPI.

7 Lessons learnt

The project has drawn out some significant findings and the guidance will enable NRAs to develop common KPIs that will support benchmarking across the EU. During this exercise a number of lessons have been learnt which both contextualise the conclusions and provide guidance for future European projects of this nature:

- The potential to send a joint questionnaire out with the other projects was explored but unfortunately was not possible on this occasion. With a longer lead in time and greater collaboration this could have been beneficial.
- There is a need to get buy in across NRAs to deliver an exercise of this nature as data and reporting of metrics is completed by different individuals and often different departments. An agreement upfront from NRAs to support a trial programme would help them to gain further support internally.
- The KPIs were written in terminology commonly used in English speaking countries and the question was raised as to whether this has had an impact on overall take up across Europe. It is interesting to note that respondents were mainly northern European and those who did it well were UK based. Understanding common terms and references in different countries could help to increase take up. Referring to European standards would have the strongest impact.
- There is a real issue with finding the right people within NRAs. This includes those willing and able to take this forward and/or those with the available resources. Additional lead in time and support from sustainability contacts within NRAs may be required to find these individuals.

8 Glossary

National Road Administration

Any organisation at a national or regional level authorised by a Government to take responsibility for developing and maintaining some or the entire national or regional road network. The organisational characteristics of NRAs can vary considerably, for example, some NRAs may be responsible for managing other transport networks such as rail. Some NRAs may be directly part of National or regional Government or may be a separate Agency required to meet government objectives.

Stakeholder

People or organisations whom actively or passively interact with 'the NRA', its road network and the NRA's road construction and maintenance activities. Key stakeholders include road users, government (and its agencies), the general public, and the community around the road network.

Strategic Key Performance indicator

A Key Performance Indicator which is aimed at understanding the overall performance of an organisation at a senior level

Universal Key Performance Indicator

A Key Performance Indicator which can be applied to all NRAs i.e. all NRAs in Europe will be able to collect the relevant data and produce the KPI .

Focused Key Performance indicator

A Key Performance Indicator which is designed to meet the needs of a few NRAs with similar environmental or social concerns which are not shared across Europe, this may be for geographic, organisational or for topic which other NRAs have no priority.

Benchmarking Framework

A management framework designed to inform and assist in the use of existing KPIs and provide guidance for the modification of existing KPIs and development of new KPIs, as well as providing information about a range of environmental and social topics.

Green Estate

Any location which is owned or is managed by the NRA which is not road pavement and may be of value for the environment and flora and fauna (plants and animals). Typical examples of green estate that can be owned or managed by NRAs include roadside verges, drainage and balancing

ponds. The green estate can be managed to minimise environmental impact and also maximise opportunities for wildlife.

9 References

9.1 Organisations

Conference of European Directors of Roads (CEDR) Website: <http://www.cedr.fr/home/>
Delivering Alien Invasive Species Inventories for Europe (DAISIE) Website: <http://www.europe-aliens.org>
European Cooperation in Science and Technology (COST) Website: <http://www.cost.eu/>
ERANet Road II Website: <http://eranetroad.org/>
European Environment Agency (EEA) Website: www.eea.europa.eu
Global Reporting Initiative (GRI) Website: <https://www.globalreporting.org/Pages/default.aspx>
European Agency for Safety and Health at Work Website:
<http://osha.europa.eu/en/legislation/index.html>
International Organization for Standardization (ISO) Website: <http://www.iso.org/iso/home.htm>
National Road Research Organisations in Partnership (FEHRL) Website:
<http://www.fehrl.org/index.php?m=1>
Ramsar Convention on Wetlands Website: <http://www.ramsar.org>
United Nations Educational, Scientific, Cultural Organisation (UNESCO) Website:
<http://www.unesco.org/new/en/>
World Health Organisation (WHO) Website: www.euro.who.int
World Road Association (PIARC) Website: www.piarc.org/en

9.2 Documents

CEDR 2010 Road Data and Performance Indicators
http://www.cedr.fr/home/fileadmin/user_upload/Publications/2010/e_Road_Data.pdf
COST 356 report Joumard and Gudmundsson (2010)
http://www.cost.eu/domains_actions/tud/Actions/356
European Cooperation in Science and Technology - Transport and Urban Development (TUD)
[http://www.cost.eu/domains_actions/tud/Actions/\(acno\)/1](http://www.cost.eu/domains_actions/tud/Actions/(acno)/1)
International Road Traffic and Accident Database (IRTAD) Website:
http://www.oecd.org/document/53/0%2C2340%2Cen_2649_34351_2002165_1_1_1_1%2C00.html
TERM 002 European Environment Agency Transport emissions of greenhouse gases 2011
<http://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-7>
Kyoto Protocol Website: http://unfccc.int/kyoto_protocol/items/2830.php
Ahvenharju, S.; Könnölä, T.; van Grol, R; Walker, W.; Klautzer, L.; Röhling, W; Burg, R; Arend, M; Steiner, P.; Bickel, B.; De Ceuster, G..2004. Operationalising Sustainable Transport and Mobility:

System Diagram and Indicators. (SUMMA). Deliverable 3 of Workpackage 2

<http://www.tmlleuven.be/project/summa/>

UNESCO Cultural Landscapes (listings) <http://whc.unesco.org/en/culturallandscape>

United Nations Economic Commission for Europe (UNECE) 1968 Vienna Convention on Road Traffic

<http://www.unece.org/fileadmin/DAM/trans/conventn/crt1968e.pdf>

9.3 Legislation

Air Quality

EU Council Directive 2008/50/EC Pure air for Europe

EU Council Directive 96/62/EC Management and quality of ambient air

EU Council Decision 97/101/EC Exchange of information and data on ambient air quality

EU Council Directive 1999/30/EC Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air

EU Council Directive 2001/81/EC National emission ceilings for certain atmospheric pollutants

EU Council Directive 85/203/EEC Nitrogen dioxide 7 March 1985

EU Council Regulation (EC) No 1005/2009 Substances affecting the ozone layer - of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.

EU Council Decision 2001/379/EC Protocol on Heavy Metals

EU Council Decision 2006/507/EC Elimination and minimisation of production, use and release of persistent organic pollutants (POPs)

EU Council Regulation (EC) No 595/2009 Emissions from heavy duty vehicles (Euro VI): certification rules

EU Regulation (EC) No 715/2007 Euro 5 and Euro 6 standards: reduction of pollutant emissions from light vehicles

EU Council Directive 70/220/EEC Motor vehicles with trailers: polluting emissions

EU Council Directive 88/77/EEC Motor vehicles with trailers: emission of gaseous pollutants from diesel engines

Commission communication of 4 May 2001 "The Clean Air for Europe (CAFE) Programme: Towards a Thematic Strategy for Air Quality".

Biodiversity

EU Council Directive 2009/147/EC on the conservation of wild birds

EU Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora

United Nations 1992 Convention on Biological Diversity <http://www.cbd.int/doc/legal/cbd-en.pdf>

Vehicle Fuel

EU Council Directive 94/63/EC Recovery of petrol vapours during storage

EU Council Directive 2009/126/EC Petrol vapour recovery during refuelling of vehicles

EU Council Directive 98/70/EC Quality of petrol and diesel fuels: sulphur and lead

EU Council Directive 2003/30/EC Motor vehicles: use of biofuels

Equal Treatment of People

EU Council Directive 2000/78/EC of 27 November 2000 establishing a general framework for equal treatment in employment and occupation

Noise

EU Council Directive 2002/49/EC The Environmental Noise Directive (END)

World Health Noise Introduction Website: <http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/noise>

Vehicles & Climate Change

EU Regulation (EC) No 443/2009 Reduction in CO₂ emissions of new passenger cars

EU Council Directive 2009/33/EC Clean and energy-efficient road transport vehicles

EU Council Directive 2006/40/EC Emissions from air conditioning systems in motor vehicles

Waste

EU Council Directive 2008/98/EC Waste Framework

EU Council Directive 99/31/EC Landfill Directive

EU Council Directive 94/31/EC Amendment to Hazardous waste Directive (91/689/EEC)

EU Council Directive 2006/21/EC Management of waste from the extractive industries

Water Quality & Flood Management

EU Council Directive 2000/60/EC Water protection and management (Water Framework Directive)
http://ec.europa.eu/environment/water/water-framework/index_en.html

EU Council Directive 2007/60/EC Flood management and evaluation

EU Council Directive 76/160/EEC Bathing water directive

EU Council Directive 2006/44/EC Water suitable for fish breeding – protection of Fresh Water

EU Council Directive 2008/1/EC Integrated pollution prevention and control: IPPC Directive

EU Council Directive 2008/105/EC Environmental quality standards applicable to surface water

EU Council Directive 2006/118/EC Protection of groundwater against pollution

EU Council Directive 2006/11/EC Protection of the aquatic environment against discharges of dangerous substances (until 2013)

Appendix A: Benchmarking Framework

1 Introduction to Benchmarking Framework

This Benchmarking Framework is designed to assist NRAs to understand the benefits of using KPIs on environmental and social aspects and to provide background information on a wide range of environmental and social topics which may have significance to NRAs.

The framework also provides information on how to use, modify, or develop strategic environmental/ social KPIs. It is intended for guidance and should be modified as required by agreement by working groups of NRAs or with input from relevant NRA supporting mechanisms such as the Conference of European Directors of Roads (CEDR)¹⁰ subgroups as European NRA KPI needs or requirements change.

The intention of producing European level KPIs is to help NRAs communicate their environmental and social performance between NRA peers and with strategic stakeholders such as government, press and public, and to help improve their performance.

2 Benefits of using the strategic KPIs to NRA and key stakeholders

2.1 Comparability

The indicators developed are designed to help NRAs understand other NRAs environmental and social performance. To help take account of differences between countries it may be necessary to normalise KPIs. Typical normalisations may be to:

- Consider an impact per km or per 1000km of road network to minimise the difference between sizes of network;
- Consider an impact relative to population size; and
- Identify only the relevance of an impact such as during new road build or maintenance activities.

2.2 Driving up standards/ improving network performance

The use of European strategic environmental and social key performance indicators in reporting may help to communicate performance to NRA stakeholders as well as to other NRAs. With the use of strategic key performance indicators NRA can have a dialogue with Government and the public on the environmental and social aspects of their work.

¹⁰ <http://www.cedr.fr/home/>

Where performance is especially good this can be used by the NRA to provide government or other stakeholders with good practice case studies and allow the NRA or Government to highlight good practice.

Where performance is lower this gives the NRA an opportunity to discuss how this may be improved by exploring good practice with other NRAs or identifying with government or other stakeholder how the lower performance identified by the KPI can be improved.

KPIs should be monitored on a regular basis so trends in performance over time can be identified and managed.

2.3 Identifying NRA good practice

Where an NRA is generating a significantly good result for an indicator this may help other NRAs to identify those organisations that are particularly good at managing a specific environmental or social issue. This would then allow these organisations to approach the NRA to see if there is anything that they could learn in the way of good practice from the successful NRA and apply what is learnt to their own construction and/or maintenance operations.

This could be particularly helpful for NRAs which have recently been set up, or for NRAs that have just been given new responsibilities for managing a specific environmental or social issue that was previously managed elsewhere in government. These NRAs may be able to learn good practice from NRAs with more experience on the topic.

The development of indicators at a European level may be able to encourage consistency in NRA data collection, reporting and auditing of Key Performance Indicators.

CEDR is already undertaking projects to make data collection and reporting more consistent for the Trans European Road Network (TERN), the strategic network of roads in Europe with designated European road “E” numbers.

2.4 Reducing Costs

Some indicators such as those for material use, energy use and waste reduction can provide an insight into how efficient a NRA is at managing construction and maintenance projects.

With the cost of materials and energy likely to rise, due to the demand for resources around the world, it is important that NRAs and their stakeholders are aware of the overall consumption of energy and materials and the overall amount of waste generated.

Direct Cost Savings

A KPI linked to waste reduction could lead to reduced costs for transporting waste and disposing of waste, and from landfill taxes.

Indirect Cost Savings

Other KPIs could lead to indirect cost savings for the country or region, for example a reduction in the number of killed or seriously injured on the roads (KSI).

NRAs may wish to identify any direct or indirect savings from developing policies, procedures and practices used to influence a KPI.

2.5 Meeting Environmental and Social Objectives

An NRA needs to measure performance against environmental and social objectives in order to be able to demonstrate progress with regard to sustainability which should reflect a balance between environmental, social and economic factors.

KPIs outside of traditional economic and engineering areas will help senior management in NRAs and its key stakeholders to be aware of how the NRA is performing on environmental and social topics. This can be useful for several reasons.

- The KPI could be linked to international or national targets that the NRA has to support, for example, carbon emissions.
- The KPI could be linked to European regulation which the NRA may be legally obliged to comply with, for example, noise limits.
- The KPI could link to the NRAs own environmental and social objectives or key demands of stakeholders, for example, waste reduction targets.

2.6 Limits to benchmarking

Not all topics are suitable for benchmarking. It is important to avoid wasting resources on seeking to build and apply KPIs in a benchmarking framework in Europe or beyond where this is not applicable or achievable. Areas where benchmarking is less feasible are ones which:

- Address concerns which are specific to only one NRA and are likely to remain so;
- There is no significant interest in NRAs or their stakeholders to benchmark a KPI;
- Lack comparable data, or where data cannot be obtained in the future at reasonable cost;
- Cover practices that are already standardized and performance shows little variation across NRAs; and.
- NRAs have no means to influence performance in a significant way.

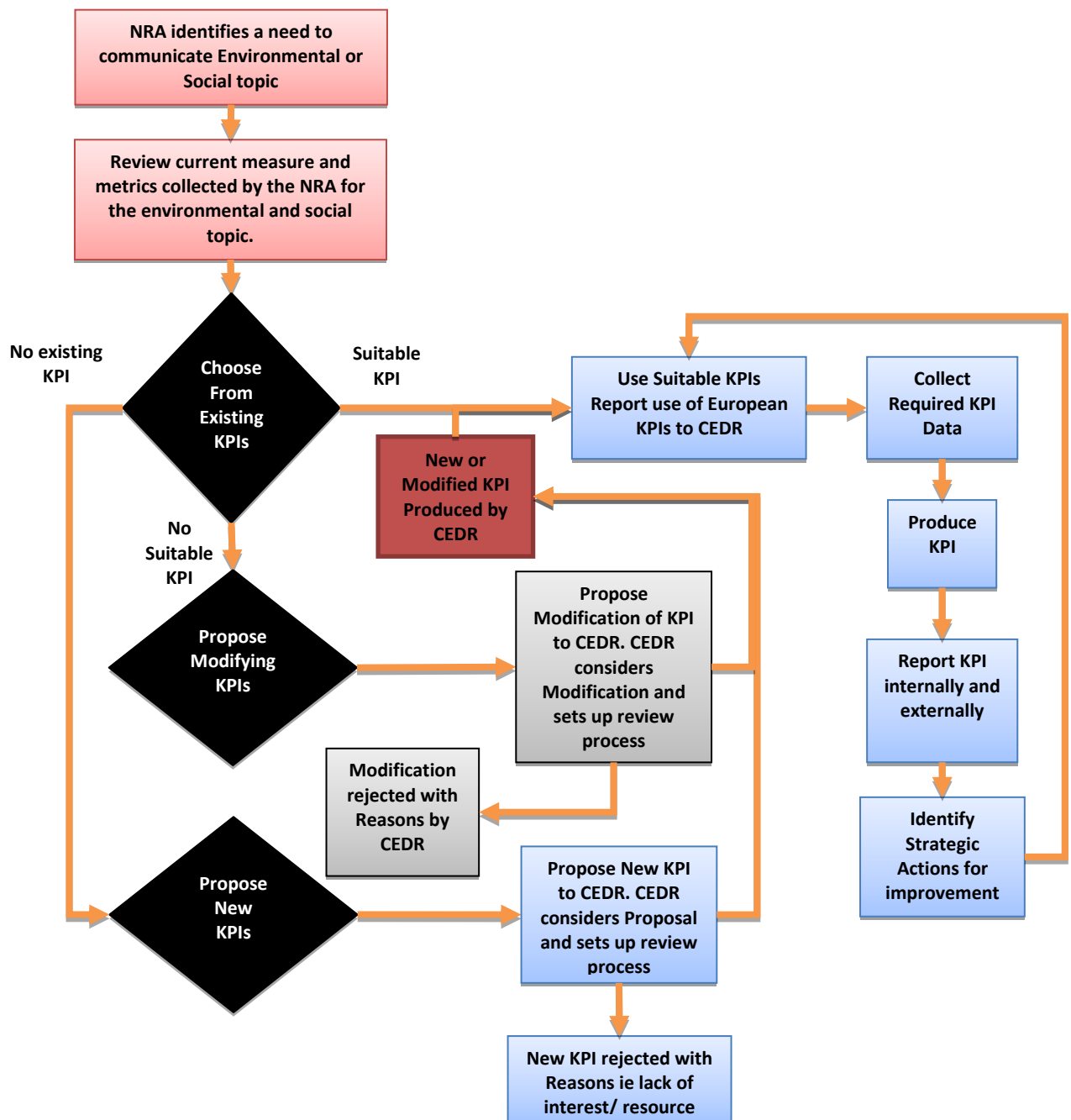
2.7 Accountability

NRAs should be accountable and transparent to their owner, i.e. the Government or regional body as well as to the wider public. KPIs can help stakeholders understand the performance of an NRA on a topic and should always be available to stakeholders.

Information on KPIs should be publically available and requests for information from the public on environmental and social performance should be responded to in a timely manner.

3 Developing a KPI

The diagram below shows the process through which NRAs will need to go when developing a Strategic KPI. The following sections of this report then go on to explain this approach in more detail. The diagram below shows the recommended process NRAs should undertake when developing a Strategic KPI and the process of using the KPI. The following sections of this Appendix explains this approach in more detail.



4 Using Existing Key Performance Indicators

4.1 Selection

Existing key performance indicators should be used where they are available.

A good example of an existing social KPI is the indicator for road safety KSI (Killed and Seriously Injured). This indicator has been used for decades to compare the performance of EU countries on the overall safety of a strategic road network (although more work will be needed to improve European consistency on what data is recorded for the KPI).

Existing key performance indicators should be selected using the following criteria:

Universal Indicators

- Represents a significant environmental or social concern;
- Can be applied to all NRAs;
- A significant number of NRAs want to use the indicator;
- Provides information on performance that is useful to the NRA and its stakeholders;
- Can be used to influence environmental or social policy, procedures or practices in a way that can lead to improvements;
- NRAs are willing to report on the indicator at regular intervals; and
- NRAs can provide evidence of the indicators performance on request in a way that is transparent to any stakeholder.

Focused Indicators

- Represents an environmental or social concern;
- Can be applied to at least three NRAs but is specialist in nature and is not universally applicable;
- Provides information on performance that is useful to the NRA and its stakeholders;
- Can be used to influence environmental or social policy, procedures or practices in a way that can lead to improvements;
- NRAs are willing to report on the indicator at regular intervals; and
- NRAs can provide evidence of the indicators performance on request in a way that is transparent to any stakeholder.

KPI Characteristics

KPIs should have the following characteristics developed in COST 356¹¹:

Representation

- Validity
- Reliability
- Sensitivity

Operation

- Measurability
- Data Availability
- Ethical Concerns

Policy Application

- Transparency
- Interpretability
- Target Relevance

¹¹ COST 356 report Joumard and Gudmundsson (2010) <http://cost356.inrets.fr/>

- Actionability

Not all of these may be fully developed for a KPI to exist but ideally a KPI should possess all of these characteristics.

A KPI must also either:

- Help the NRA understand or manage its environmental or social performance (most useful for NRAs); or
- Help the NRA's stakeholders understand the performance of the Strategic Road Network (although it may be an aspect which the NRA has little direct control over and it would be helpful in raising the issue with government or with the public).

4.2 Auditing

Auditing of KPIs should be undertaken on a regular basis. Ideally it should be completed annually to coincide with NRA reporting processes. However, if the KPI is tied to different data collection periods it could be completed every two years or at the extreme every 5 years.

An audit should identify:

- The data sources used for the KPI;
- The methodology used and if necessary the mathematical model/algorithm used; and
- Any uncertainties about the data or methodology.

4.3 Reporting KPIs to stakeholders

Reporting on KPIs should take place annually, normally as part of annual NRA reporting processes to minimise costs.

Reporting should include:

1. A simple presentation of the KPIs used by the NRA
2. A more detailed explanation of the KPIs, including:
 - The data used;
 - The data collection and monitoring;
 - The methodology used;
 - Any uncertainties that need to be highlighted; and
 - The KPI audit process.
3. Comments on KPI good performance and where performance can be improved
4. Actions for the next year to maintain good performance or improve performance as identified in the KPI.

5 Modifying Existing KPIs

5.1 Identification of potential change and the benefits of change

Modifications to KPIs should only be carried out if there is a very good reason for this to occur, as changing KPIs will often prevent them from being compared to the previous version of the KPI and prevents trends being assessed.

Reasons for changing an existing KPI include:

- **The development of a new European wide way of monitoring or measuring a parameter** - for example at present there is work underway to see if noise mapping which is currently calculated by each country in its own way can be changed to have a single European wide way of generating these maps. If this occurs then there would be a good argument for amending any KPI based on noise mapping.
- **Changes in scientific evidence on a topic covered by a KPI** – Science is a process of examining evidence and presenting theories to match the evidence. If new evidence on a topic appears or a new theory emerges that better represents the evidence available this may have an impact on a KPI. Thus all KPIs must be reviewed regularly to see if this occurs.
- **Agreement by NRAs to change the KPI** – As NRAs gain confidence in collaboration and understanding on KPIs it may be that the majority agree to modify a KPI to better reflect their needs and/or to facilitate joint working or data collection.
- **Changes to European Legislation** – If a KPI is directly linked to European Legislation and this is changed or it is known that it will be changed then the existing KPI needs to be reviewed to ensure that it remains relevant if not it should be updated to reflect the changes in European law.

5.2 Collaboration with other NRAs and stakeholders to modify KPIs

It is recommended that modification of existing KPIs be made using one or more NRA recognised forums these include:

ERA-NET Road – the funder for this and similar projects, which has a significant number of NRAs as members and project funders. Other bodies would need agreement from ERA-NET to be involved in the modification or further development of these KPIs. ERAnet Road 2¹² is now a CEDR Subgroup.

CEDR – Conference of European Directors of Roads comprises the senior managers of NRAs across Europe As these are strategic Key Performance Indicators then CEDR which operates at a strategic level for European NRAs runs a number of subgroups which are interested in the issue this would be an excellent forum to discuss modifications to KPIs¹³.

¹² <http://eranetroad.org/>

¹³ <http://www.cedr.fr/home/>

PIARC - As a worldwide body PIARC's input into modification of KPIs would be extremely helpful in providing information from the rest of the world and helping KPIs reach a wider NRA audience¹⁴.

It is recommended that ERA-NET Road (or its successor) or suitable CEDR subgroup takes the lead.

Modifications to universal KPIs should have the widest buy-in from European NRAs; with focused KPIs the main NRA users of the KPI should have the most say in any modification.

5.3 Quality requirements

A modified KPI must meet the quality requirements of an existing KPI i.e. must be as be able to be developed using KPI characteristics and meet the needs of an NRA to monitor performance or the needs of stakeholders to understand the strategic road network managed by the NRA.

5.4 Dissemination of change/ updating framework document

Dissemination of a modification to an existing KPI should undertake a feedback and amendment approach as outlined below:

1. Feedback from NRA or other bodies identifies the need for a KPI modification.
2. A proposal to change the KPI needs to be produced through ERA-NET Road/CEDR or other appropriate body identifying the changes from the existing KPI and identifying the benefits and challenges of modifying the KPI. This should be disseminated widely to NRAs and stakeholders.
3. If feedback from NRAs is positive on the need to change the KPI then, using the initial feedback comments from the NRAs, a detailed proposal of the change needs to be produced.
4. The detailed document is sent out to NRAs, with and comments and feedback requested. A short trial period may be included to see if NRAs have the data and expertise needed to produce the modified KPI.
5. Using the feedback from the detailed document and any trials a final version of the modified KPI should be produced and sent to NRAs with a request to vote on acceptance.
6. For a universal KPI agreement should be obtained from all of the current users of the KPI and all those planning to use the existing KPI in the next reporting year.
7. For a focused KPI agreement should be obtained from all existing users and those planning to use the existing KPI in the next reporting year.

¹⁴ www.piarc.org/en

6 Developing New KPIs

6.1 Identification of need for a new KPI (i.e. gap in existing KPI set or an identified need for a focused KPI for a number of NRAs)

The SBAKPI project only developed 10 KPIs. However there are potentially many more environmental and social topics that may benefit from a strategic KPI.

A new KPI should help to address a strategic need, i.e. what does senior management need to be aware of for managing the NRAs environmental and social issues? What performance information is being demanded by NRA stakeholders?

6.2 Collaboration with other NRAs and stakeholders

It is recommended that organisations representing the needs of NRAs, such as ERA-NET Road, CEDR, PIARC, be involved in identifying and formulating new KPIs, although individual or groups of NRAs could champion the need for a new KPI.

As for modifying an existing KPI there should be an identified need for a new universal or focused indicator. It must be distinct from existing strategic environmental and social KPIs and either directly helps the NRA in understanding and managing its performance or help stakeholders understand the strategic road network managed by the NRA.

New KPIs should be selected using the following criteria;

Universal Indicators

- They can be applied to all NRAs;
- A significant number of NRAs can buy into (sign up to using) the indicator;
- They provide a helpful view of performance for the NRA and its stakeholders;
- They are suitable to be published in progress reports at regular intervals; and
- NRAs can provide evidence of the indicators performance on request in a way that is transparent to any stakeholder.

Focused Indicators

- Can be applied to at least three NRAs but is specialist in nature and is not universally applicable; i.e. a KPI related to snow and ice.
- They provide a helpful view of performance for the NRA and its stakeholders;
- They are suitable for publication in progress reports on the indicator at regular intervals; and
- NRAs can provide evidence of the indicators performance on request in a way that is transparent to any stakeholder.

6.3 Quality requirements

A new KPI must meet the quality requirements of an existing KPI, i.e. it must be as be able to be developed using KPI characteristics and meet the needs of an NRA to monitor performance or the needs of stakeholders to understand the strategic road network managed by the NRA.

6.4 Development of new KPI/ updating framework document

Development of a new KPI should undertake a feedback and amendment approach as outlined below:

1. Feedback from NRA or other bodies to identify the need for a new KPI.
2. A proposal for a new KPI needs to be produced via ERA-NET Road (or its successor)/CEDR or other appropriate body identifying the benefits and challenges of developing a new KPI. This should be disseminated widely to NRAs and stakeholders.
3. If feedback from NRAs is positive on the need to develop a new KPI then a detailed proposal of the new KPI should be produced.
4. The detailed document should be sent out to NRAs for comment. A short trial period may be allowed to give NRAs time to trial the new KPI.
5. Using the feedback from the detailed document and trials a final version of the new KPI should be produced and sent to NRAs for acceptance.
6. For a universal KPI a significant number of NRAs will need to agree. The number should be determined at the start of the process.
7. For a focused KPI acceptance will require the agreement of those NRAs that would directly benefit.

7 Introduction to Environmental and Social Topic Areas for NRAs

7.1 Environmental

This is an introduction to environmental areas on which the activities of an NRA may have an impact. Some of these areas may be the legal responsibility of other national, regional or local bodies. If this is the case it is very helpful to identify the contacts within these organisations that can be approached to enable better coordination of environmental activities with the NRA.

Many of the environmental areas discussed below will be managed in different ways by each NRA. It would be good practice for an NRA to map their responsibilities for environmental issues and identify where other stakeholder organisations have a role.

The following is a summary of environmental topics which may have relevance to NRAs but the overall significance of these topics will be dependent on the circumstances of individual NRAs and the needs of their stakeholders. Significance of environmental topics could also change over time

due to breakthroughs in scientific understanding or changes in the environment or society. Further information on environmental impacts can be found in COST356.¹⁵

7.1.1 Climate change and carbon emissions

7.1.1.1 Carbon / greenhouse gas emissions

National road networks contribute to the emission of greenhouse gases and these emissions can be classified as follows:

- **NRA Own (Corporate) Emissions** – Directly generated by the NRA by its own activities, i.e. NRA offices, vehicles, etc. The NRA can control these carbon emissions through good building leasing/ purchasing management, considering the emissions of purchased/leased vehicles, and helping users of buildings and vehicles to run them efficiently.
- **Network Construction/Maintenance Emissions** – Generated by the NRA or more usually by its contractors and supply chain through the construction of new roads and the maintenance of existing roads. The amounts of greenhouse gas generated in this way will be significantly higher than an NRA's corporate emissions. The NRA can control these emissions though considering them as part of tender and contract terms, designing schemes that emit less greenhouse gas to construct/maintain and working with its supply chain to reduce greenhouse gas emissions via good practice. It is important that the NRA can obtain data on carbon emissions from contractors or the supply chain if emissions are to be managed.
- **Road User Emissions** – Generated by non NRA vehicles using the road network which is managed by the NRA. The amount of greenhouse gas generated will be significantly higher than an NRA's network emissions. NRAs often have very limited means in which to manage road user greenhouse gas emissions however possibilities include having a role in the planning process introducing measures to reduce congestion, managing user behaviour such as managing vehicle speed or user demand restrictions. Data on greenhouse gases from road users is required at a European/international level so this data is available to the NRA¹⁶ if it is not responsible for generating it.

Under the UN Kyoto Protocol¹⁷, a legally binding global agreement to reduce greenhouse gas emissions, signatory nations or groups of nations are obliged to reduce the amount of greenhouse gases from being released into the atmosphere. The national or regional government may require help from NRAs in meeting these targets.

¹⁵ COST 356 report Joumard and Gudmundsson (2010) available at <http://cost356.inrets.fr/>

¹⁶ European Environment Agency Transport emissions of greenhouse gases (TERM 002)

¹⁷ Kyoto Protocol http://unfccc.int/kyoto_protocol/items/2830.php

7.1.1.2 Mitigation

Mitigation is a way of avoiding the greenhouse gases in the atmosphere either by reducing emissions or increasing the carbon sinks (ways for air emissions to be incorporated into other materials not part of the atmosphere such as wood, charcoal, limestone etc).

NRAs can reduce their greenhouse emission from corporate or network sources as identified in the section 6.1.1.1 above. However NRAs also have opportunities to provide more carbon sinks through their green estate for example by planting trees or other plants.

7.1.1.3 Adaptation

Adaptation is about managing the road network to minimise the impact of climate change on the road network, road users and other people and wildlife. Below are some of the potential impacts of climate change and some of the adaptations that can be considered. Climate change impacts will vary from region to region, so some of the issues will be more significant than others to individual NRAs.

Climate Change Impact: Increasing rainfall and severe storms.

Potential Adaptations

- Increase drainage capacity for roads;
- Modify road design to deal with increased flooding events;
- Strengthen/ redesign bridges to cope with higher volume water flows and debris;
- Improve driver information displays to warn of high rainfall/ flooding events;
- Identify areas of the network vulnerable to flooding and develop contingency plans, including alternative routes;
- Modify land to provide water storage capacity;
- Increase salt/ snowplough capacity;
- Modify or design infrastructure to cope with wetter conditions; and
- Consider the risk of landslip related to high rainfall and identify and monitor areas at risk.

Climate Change Impact: Sea level rise

Potential Adaptations

- Improve sea defences for roads at risk or work with other government agencies on updating sea defences to cope with predicted sea level rise;
- Improve information and road diversion management in the event that the road has to be closed due to high tides/poor weather; and
- Identify alternative roads or road alignments if improved sea defences/road closures become impracticable.

Climate Change Impact: Hotter drier weather during summer or other periods.

Potential Adaptations

- Identify risk of fire on or close to the road network and identify controls such as fire breaks or providing fire services access to water via water mains/ponds at vulnerable locations;
- Consider education campaigns to road users on the risk of fire from smoking and litter. or provide signage at parking locations; and
- Design pavements or other infrastructure to cope with higher temperatures predicted by climate change models.
- Consider risk of landslide on the road network and identify areas at risk for monitoring.

7.1.2 Landscape

7.1.2.1 Landscape designations (management)

Some landscapes are considered important at an international, European, national, or local level, such as UNESCO World Heritage Cultural Landscapes¹⁸, which are locations identified by UNESCO as of significant "Cultural landscapes are properties that represent the "combined works of nature and man" designated in Article I of the [World Heritage] Convention". If roads managed by NRAs pass through or adjacent to these protected landscapes then more care is needed when developing or maintaining these roads.

National designations will vary by country and NRAs should seek guidance if they are unfamiliar with national landscape designations and their requirements.

7.1.2.2 Overall landscape condition

NRAs can consider the green estate managed by themselves or on their behalf in terms of its landscape condition.

This can include:

- Scenic Landscape Condition – How pleasing the landscape is to the viewer or road user, for example is the area covered in litter, are the structures along the road in good repair/maintenance, are the structures designed sympathetically to the surrounding landscape and building vernacular?
- Biological Landscape Condition - see Section 6.1.7

7.1.2.3 Landscape quality/characteristics

Landscape can be categorised as has having certain characteristics which are often underpinned by the geology of the land which determines:

¹⁸ <http://whc.unesco.org/en/culturallandscape>

- The shape of the land forms such as plains, rolling hills, deep river valleys etc;
- The type and intensity of agriculture or industrial use; and
- The types of local building materials which provide the local building vernacular such as the use of thatch, slates, tile, timber, stone, brick etc.

The landscape can be defined as having a level of quality which can be defined as if the landscape is cohesive i.e. the landscape is a mix of local vernacular and appropriate local land use or un-cohesive, i.e. large scale construction of buildings which are outside of the vernacular narrative i.e. overall landscape look and use for the land and are not based on the underlying geology.

NRAs need to be sensitive to landscape characteristics and should seek to improve the landscape through sensitive design of infrastructure and management of the green estate.

Townscapes can also be considered a separate area of landscape. Towns will often have their own character and NRAs should work with urban authorities to where possible enhance the townscape through road construction schemes. An example of this includes the construction of landmark bridges or other infrastructure that can enhance the townscape.

7.1.3 Clean Air

7.1.3.1 Air quality (SO_x/NO_x particulates etc) / health impacts

The NRA has control of air emissions from network construction and maintenance, and corporate activities so it is important that these emissions are managed. For example, this can be done by specifying in contracts that the contractor use low emission vehicles and low emission construction techniques where this is possible and design schemes to minimise vehicle and plant use. Minimising air emissions will normally minimise carbon emissions as well.

The main source of air pollution is from road user vehicle emissions. NRA's have very few ways to reduce air pollution generated by road users and many of these require significant changes to road management that negatively impact on the desirability of the user to use the road, and which would normally require significant government/stakeholder support.

Possible ways for NRAs to help manage air quality from user vehicles include:

- Traffic management, i.e. controlling the speed of vehicles to minimise congestion which can significantly increase the production of these emissions from exhausts;
- Demand management, i.e. reducing the number of vehicles on the road when high levels of emissions or atmospheric conditions exacerbate the problem. This could be by tolls or restricting use;
- Restrictions on older vehicles, i.e. preventing older vehicles with higher air pollutant emissions from entering certain areas i.e. a clean air zone which normally restricts older vehicles engines emitting more pollution than a set Euro engine standard from entering an area; and
- Planting of trees and bushes to help to clean the air of vehicle emissions. Although these are unlikely to be effective unless significant levels of planting is undertaken.

Emissions from road user vehicles are normally from petrol or diesel engines; these produce a number of gaseous emissions, the major ones being NO_x (Oxides of Nitrogen such as NO₂) and particulates (PM¹⁰ PM^{2.5}) which are fine solid materials which can enter and damage lungs.

These and other emissions from vehicles are hazardous to health and present a significant challenge to vehicle manufacturers, fuel makers, the transport industry and Government. EU legislation¹⁹ imposes limits emissions although commonly the limit value for NO₂ is be breached in areas of high congestion.

Air pollution may be either a primary pollutant i.e. the pollutant is directly emitted by a vehicle or secondary pollutant i.e. a primary pollutant combines with another primary/secondary pollutant or atmospheric process to create a new pollutant.

Examples of secondary pollutants include:

- Nitrogen dioxide (NO₂) caused by other nitrogen oxides in the atmosphere
- Low level ozone (O₃) this is created by NO₂ molecules in the atmosphere interacting with sunlight

7.1.4 Noise

7.1.4.1 Nuisance

Noise can have a significant impact on both human health and wildlife. Noise from road users and from construction and maintenance operations can have a significant impact on the sleep patterns of local residents. The World Health Organisation recommends limits of exposure to noise²⁰ and these figures are reflected in the requirements of EU law regulation²¹.

Disrupted sleep can lead to significant health problems over the long term and therefore needs to be taken into account by NRAs when considering the design of new road construction or when planning road maintenance.

Road noise can be managed by practicable actions such as:

- Permanent or temporary acoustic noise barriers, which can be made of a variety of materials such as wood or steel;
- Construction of landscape barriers, such as earth banks, to shelter properties from noise;
- Planting of trees and other vegetation;
- Use of low noise road surfacings;
- Minimising the use of concrete road surfaces or resurfacing to lower noise surfaces; and
- Phasing out the use of high noise surfacing, such as concrete if this is possible..

¹⁹ 2008/50/EC & 2004/107/EC

²⁰ <http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/noise>

²¹ 2002/49/EC

Construction and maintenance noise can be managed by:

- When working near residential properties, limit the loudest operations so that they occur during the day or a time that will disrupt sleep the least.
- Ensuring that low noise techniques are used in locations where there are significant population or environmentally sensitive areas where wildlife could be disturbed.

7.1.4.2 Tranquillity

Tranquillity relates to geographical areas where a low level of noise has been the norm for many years, these are normally rural locations which not been subject to noise from road traffic on main roads, low level aircraft, flight corridors, industry, commerce or mass housing and light pollution. It may also have wide open areas, significant plant and animal life in a semi natural state.

Tranquil locations can be rare in densely populated countries or regions, so efforts to retain tranquillity can be a significant challenge and NRAs should consider the impact of road construction or road maintenance in or adjacent to these low ambient noise areas.

7.1.4.3 Vibration

Vibration can be caused by road traffic especially heavy goods vehicles, and it can be influenced by the type of road for example concrete roads, or poor maintenance of roads. Vibration can disturb local residents and can also damage property or other structures if it is severe. Good road maintenance that provides a smooth road surface can often help reduce the risk of vibration from road traffic and reduce the frequency of road maintenance required.

7.1.5 Clean water

7.1.5.1 Water quality

Water quality is a significant issue in Europe with the EU producing legislation²² which requires governments and their agencies to have a minimum level of water quality in controlled waters, such as rivers, lakes, coastal areas etc.

NRAs have a role in maintaining water quality as significant amounts of water runoff from the road may occur due to rain or snow. NRAs may also be responsible for drainage from the strategic road network and must work with the national or regional environmental regulators to ensure that any outfall to controlled waters is appropriately managed. Constructing an asset register of drainage and outfalls to controlled waters is desirable to help manage this issue.

²² http://ec.europa.eu/environment/water/water-framework/index_en.html

During winter many NRAs need to use salt to prevent ice forming on roads to ensure road safety unfortunately salt is often harmful to plant and animal life and can damage reinforced concrete infrastructure such as bridges so minimising its use is an issue for many NRAs.

Issues for NRAs to consider include:

- Controlling the spillage of liquids and other substances from road traffic incidents to prevent them from reaching controlled waters?
- Provision of adequate security such as locking valves on fuel tanks to minimise the risk of water pollution caused by theft or vandalism on construction and maintenance sites?
- Prevention of vehicle fuel & oils from entering controlled waters from NRA managed drainage, such as oil interceptors?
- Cleaning NRA managed drainage water through the use of reed beds or water treatment works before they enter controlled waters?
- Contamination which may impact on water quality within the ground?
- Its application of salt on the roads during winter, so as to use as little as possible whilst maintaining road user safety? Prevention of salt leaching from the storage area into the local environment?

7.1.6 Cultural heritage

7.1.6.1 Heritage

NRAs may own or manage buildings or sites of significant cultural heritage and it is good practice that an asset register is kept detailing the location of these cultural assets and the level of protection and maintenance required.

NRAs should be aware of their country or regions heritage designations and should work with the national or local authorities managing these designated buildings or sites. Some road infrastructure, such as bridges or tunnels, may also gain a heritage designation and thus may also need to be maintained or upgraded in a sensitive manner.

During construction new items of cultural heritage may be discovered during archaeological investigations. If this occurs the NRA should work with the appropriate heritage authority to plan how to manage the newly discovered site or finds.

Issues to be considered include:

- Protection of heritage or archaeological sites from damage by road construction or maintenance operations;
- Provision of access to the public to some sites during or post investigations; and
- Provision of appropriate and sensitive maintenance to heritage sites such as buildings.

7.1.7 Nature and biodiversity

7.1.7.1 Nature designations

Internationally and in Europe there are three main types of designated site. These are:

- Ramsar Sites²³ of wetlands of international importance, for waterfowl habitat these are protected sites and development is restricted on or near these areas.
- Special Protection Areas²⁴ (SPA) Site of European importance for bird protection, development is again restricted on or near these areas.
- Special Area of Conservation (SAC) a site containing listed habitats or species identified in the EU Habitats Directive²⁵, development is restricted on or near these areas and this includes SACs which are candidates awaiting approval by the EU.

There are also likely to be sites designated in the country or region which will need protection, which may or may not have international or European protection. NRAs should work with the appropriate national authority to ensure that new construction or maintenance operations will not significantly impact these sites.

7.1.7.2 Biodiversity Action Plans

Biodiversity Action Plans (BAPs) are in use across Europe as a way of managing the landscape to encourage wildlife and to protect and restore biological systems. Although the Convention on Biological Diversity²⁶, which includes BAPs as the significant management mechanism, has been ratified in 191 countries not all of the countries have made significant steps in creating them at a national or regional level.

NRAs may be able to contribute to a national Biodiversity Action Plan or regionally to Local Biodiversity Action Plans as often the NRA will manage a significant green estate such as road verges, embankments/cuttings, water management areas and other land.

7.1.7.3 Protected species

Where species of plants and animals are at risk or are endangered they will be protected by legislation. NRAs should be aware of the legislation protecting wildlife and should manage new construction and maintenance sensitively and meet legal requirement for the protection of plant and wildlife species. It may be necessary to conduct some maintenance operations such as tree cutting at times of the year which do not impact on nesting birds.

Actions that should be considered include:

²³ <http://www.ramsar.org>

²⁴ Council Directive 2009/147/EC on the conservation of wild birds

²⁵ Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora

²⁶ United Nations 1992 Convention on Biological Diversity <http://www.cbd.int/doc/legal/cbd-en.pdf>

- Identifying what species are on the site of new construction or maintenance activity and if necessary with licensed agents ensure that they are protected and/or moved to a place of safety.
- Ensure that maintenance activities, such as grass cutting, are conducted at a time that minimises impact on the plant and animal lifecycle.

7.1.7.4 Invasive/alien species control

Invasive species can be indigenous species that need to be managed in particular areas but often they are alien species that have been introduced and are over competing ecologically or causing other environmental problems. The importation of alien species has been going on since man started trading by ship; however with the massive increase in world trade by ship and aircraft unintentional and deliberate species introduction has increased in the last few decades. Roads and the surrounding green estate such as verges and ditches can act as a corridor for invasive species and controlling or eliminating the problem can be very expensive. However, if left unmanaged the problem can get much worse and even more expensive to control and the NRA may incur legal liabilities, if the problems spread to land owned by adjacent landowners.

A comprehensive list of alien species within Europe can be found at the DAISIE Website²⁷.

7.1.7.5 Nature corridors

Nature corridors are routes which can be used by wildlife to move from one habitat to another or to migrate along. Roads can act to sever a wildlife corridor or conversely the green estate by the side of a road can act positively as a wildlife corridor in its own right.

NRAs should be aware of the need for migration and movement by animals and where issues are identified i.e. from wildlife experts or recorded incidents of road kill, ways of helping wildlife to cross roadways may be needed.

Examples of interventions include:

- Wildlife tunnels or pipes under roads for creatures such as otters, badgers, and amphibians;
- Wildlife bridges for animals (it may also be possible to incorporate a dual use crossing for humans and wildlife if shelter for wildlife is considered);
- Specialist bat and squirrel/mice aerial bridges; and
- Volunteer approaches, such as amphibian rescue and transport across roads (the safety and support for participants needs to be assessed).

²⁷ Delivering Alien Invasive Species Inventories for Europe (DAISIE) Website <http://www.europe-aliens.org>

7.1.8 Resources and Waste

NRAs use materials across their activities, from the purchase of office furniture to street lighting and aggregate. By far the most significant use of materials by an NRA is in the construction and maintenances of the highway network. These resources are finite and their use is determined by their properties and characteristics. These characteristics and the production process define the cost of the materials; where they are found, the required level of processing and how and where they are used determines their impact on the environment, society and the overall economy both locally and globally. The quantity and types of materials that are used are often defined by specifications which ensure a standard for safety and durability. The application of these specifications however is determined by the choice of scheme and outline design.

Waste is material that is intended to be discarded. It is again the construction and maintenance of the highway network by an NRA that produces the most waste. The intention to discard this material comes from the fact that it cannot be used on site. This material can be reused elsewhere or recycled. As it continues to become more expensive, environmentally and socially damaging to win new (virgin) material, making the most out of waste materials is essential. The waste hierarchy is the starting point for efficient resource and waste management; waste prevention, waste reduction, reuse, recycling, recovery and disposal as a last resort. Waste should be avoided where possible through effective design, accurate ordering of materials and good onsite practice, reusing materials such as excavated material as fill, recycle i.e. crushed concrete, and avoiding disposal. Following this principle demonstrates effective waste management and will save costs by reducing the need to order materials, reduce handling costs and disposal costs. The greater opportunities for cost savings are found higher up the waste hierarchy and it is a legal requirement for waste producers in EU countries that have translated the Waste Framework Directive 2008/98/EC into local law to demonstrate that the waste hierarchy has been implemented.

Because of the opportunity to reuse and recycle material within the construction sector, the use of materials is interconnected with the waste produced from construction activities. Waste sent for recycling on one site can end up in products and materials used on another. Optimising the material used in construction and maintenance should reduce the waste that is produced but also identify reuse and recycled material for use on site. Using reused or recycled material can be cost effective and has a proven track record in highways works. The idea of creating a stable closed loop society where materials are reused without the need for extraction is not here yet but NRAs can contribute significantly to this principle through how they manage the construction and maintenance of roads.

7.1.8.1 Construction and maintenance materials and waste

Different types of materials are used in different activities by an NRA. The UK Highways Agency Resource Efficiency Portal supported by the Waste and Resource Action Programme suggests the following materials and actions to reduce waste:

Earthworks: This involves large quantities of soil and aggregate and is a great opportunity for the use of recycled materials. The use of binders can enable in situ material to be used instead of importing aggregate.

Drainage: Material used for drainage construction includes concrete, clay, iron or plastic and aggregates. The choice of project and the potential refurbishment of existing drainage can have an effect on resource efficiency. Gully waste in the maintenance phase can also be significant and new techniques can be used to recycle this material.

Pavements: Pavements consist of bound and unbound aggregates in different layers. The layers require different properties and the composition of the pavement depends on the type (often dependent on the use, conditions and location). There is opportunity to use recycled material in the bound and unbound layers and it is becoming more common to recycle material in the same layer.

Structures: Bridges, tunnels, culverts, retaining walls and other structures require structural materials such as concrete, steel, iron and brickwork. The use of these materials will be determined by specifications for safety and durability and as such it is the initial design that will have the greatest effect. The source of materials can also have an effect on sustainability.

Maintenance: The use of materials to repair pavement, drainage systems, structures, lighting, traffic signs, crash barriers, fences and soft estate will depend on the works and the extent of the repairs. The same principles apply to minimise material use, optimise the materials used and minimise waste. Considerations of whole life costing can minimise unplanned maintenance and upfront cost can reduce the overall economic, social and environmental impact of this phase.

There are a number of European legislative drivers that effect material and waste use by NRAs. The Waste Framework Directive²⁸ is the principle European Legislative driver. It describes the basic concepts and definitions relating to waste management and principles such as the waste hierarchy. The recent update to the directive which is currently being translated into local law now makes it a requirement to follow the waste hierarchy and as such prove that appropriate actions have been taken. The Landfill Directive²⁹ has imposed technical restraints on the use of landfill and set targets on the amount of biodegradable municipal waste sent to landfill by member states. This has reduced the impact of landfill on the environment. The EU Directive on Hazardous Waste³⁰ provides the list of hazardous waste and the required controls and the Mining Waste Directive³¹ has an indirect effect on NRA material and waste use as many of the waste materials from the mining industry can be used in construction.

The earlier in the construction process that the materials and waste are considered, the greater the opportunities to optimise material use and utilise waste management methods that are higher up the waste hierarchy. Figure 1 shows indicatively how the potential to influence material and waste changes over the lifecycle of a project.

²⁸ 2008/98/EC

²⁹ 99/31/EC

³⁰ 94/31/EC

³¹ 2006/21/EC

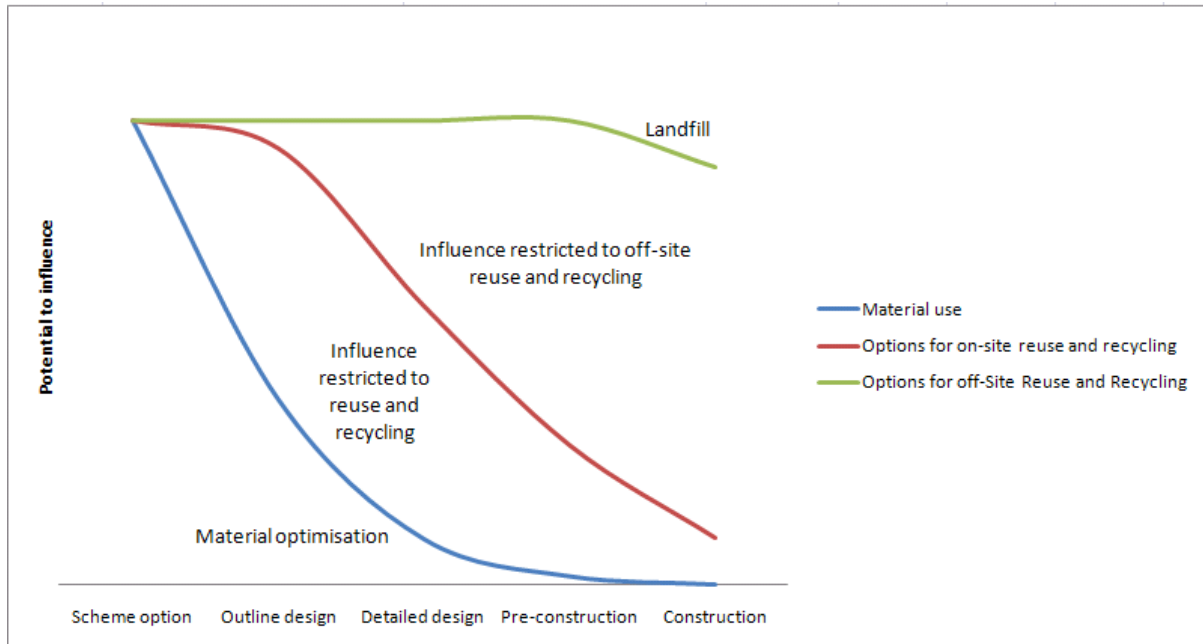


Figure 1 Demonstration of the indicative potential to influence the materials used and the waste options at different stages of the project

The key to optimising material use is therefore to consider it early in the project lifecycle and in the maintenance programme. The opportunity to optimise the use of materials reduces as the project moves closer towards construction, the options to reuse and recycle also reduce if they are not considered early leaving only the options to reuse and recycle off site and if this is not addressed can leave the only option as final disposal or landfill.

NRAs should identify how considerations of materials and waste can be implemented as early on in the construction process as possible and ensure that specifications allow for material optimisation, the use of recycle products and effective implementation of the waste hierarchy. The NRA can save costs through effective material management and can implement this through procurement, guidance and specification.

7.1.8.2 Improving sustainability

To improve sustainability through materials and waste NRAs are required to improve the following three factors:

- Optimise the materials used;
- Minimise transport of materials where possible;
- Encourage the use of reused and recycled material; and
- Application of the waste hierarchy.

The KPIs associated with these are therefore:

- The percentage of construction spend that can demonstrate material optimisation has been considered during scheme option or outline design;
- The percentage of recycled content in purchased construction materials; and
- Percentage of waste diverted from landfill.

7.1.9 Soil and Geology

7.1.9.1 Designated soils and geology

Soils and geology are not necessarily a high priority for NRAs however there may be some sites on the NRA road network which may be considered significant in terms of soil and geology and may have a national designation for protection. If a soil type is rare in a country or region, for example peat bog soils, then they may need to be protected.

NRAs can have geological features within their network, such as cuttings, which may also be protected. An example of this in the UK is where a chalk escarpment has been cut through to provide a gradient for the M40 motorway. This site is now a rare example of a chalk soil which has not been fertilized and thus has rare flora growing on it.

7.1.10 Light Pollution

Light pollution may occur due to NRAs road and junction lighting or from lighting of road signage. Light pollution can have many impacts these include:

- Wildlife disturbance, for example, disturbing bats and other nocturnal wildlife;
- Sleep disturbance for people in residential areas close to lit roads and junctions;
- Light pollution into sky reducing view of stars and other astronomical phenomena; and
- Use of energy and climate change impacts.

New developments such as LED lamps and optimised lamp reflectors provide an opportunity for NRAs to reduce light pollution and to improve the quality of light for new schemes and lighting refurbishments.

NRAs need to consider the following in relation to lighting:

- Will new lighting schemes have significant benefits over the disbenefits?
- Can existing lighting be removed or switched off with little or no disbenefit?
- Can existing lighting be refurbished to reduce energy consumption and to reduce light pollution impacts to humans and wildlife?
- Can lighting timings be changed when existing lighting is on to reduce energy consumption and to reduce light pollution impacts to humans and wildlife?
- Can lighting be run at a reduced voltage to reduce light output and energy use?

7.2 Social

The activities of an NRA may have an impact on a number of social topics. Some of these areas may be the legal responsibility of other national, regional or local bodies. If this is the case it is very helpful to identify the contacts within these organisations to enable better coordination of social activities with the NRA where this is appropriate.

Many of the social areas (see below) will be managed in different ways by each NRA. It would be good practice for an NRA to map their responsibilities for social issues and identify where other stakeholder organisations have a role.

Social Impacts can be difficult to develop into a KPI for an NRA as the impacts may be over a considerable period of time and impact on the physical or mental wellbeing of a number of people and these impacts can be dealt with by other organisations such as health agencies etc.

Social Issues may relate to:

- NRA Staff;
- Contractors and the Supply Chain;
- Road Users;
- Residents local to the NRA road network;
- Specific groups of people; and
- The wider regional or national population.

The following is a description of social topics which may have relevance to NRAs but the overall importance of these topics will depend on the circumstances of individual NRAs and the needs of their stakeholders. The significance of social topics could also change overtime due to breakthroughs in scientific understanding of social issues or changes in society. For further information on social issues related to NRAs see the SUMMA Project³²

7.2.1 Safety

7.2.1.1 KSI

KSI stands for “Killed and Seriously Injured” and is used as an existing Key Performance Indicator by a number of NRAs. For NRAs good design of road schemes and timely maintenance can make a significant contribution to reducing road casualties

³² Ahvenharju, S.; Könnölä, T.; van Grol, R; Walker, W.; Klautzer, L.; Röhling, W; Burg, R; Arend, M; Steiner, P.; Bickel, B.; De Ceuster, G..2004. Operationalising Sustainable Transport and Mobility: System Diagram and Indicators. SUMMA. Deliverable 3 of Workpackage 2 <http://www.tmlleuven.be/project/summa/>

This includes:

- Use of central reservation barriers to prevent or reduce traffic crossing incidents;
- Preventing access to high speed roads by pedestrians especially in urban areas;
- Providing safe crossing points for venerable road users;
- Providing information or running safety campaigns to educate road users and young people on risks such as walking onto the road network, or driving whilst using a phone etc.; and
- Removing street furniture or redesigning street furniture to eliminate or lessen the impact if hit by a vehicle.
- Removing trees and bushes with large trunks that can cause a serious impact if hit.

There is no standard definition across Europe at present of how KSI data is collected or what represents a serious injury³³.

7.2.1.2 Road Operator/contractor safety – EU Legislative

Both the NRA's staff and contracted road workers are at significant risk of injury when undertaking road construction and/or maintenance activities. The NRA in conjunction with its contractors must meet European Health & Safety law³⁴ to assess the risks of the work to be undertaken and aim to minimise any significant risks identified.

Measures to make construction and maintenance safer include:

- Road or lane closures to prevent access to vehicles during maintenance and construction (this is not always possible where the time needed to conduct the work is needs more than a few hours the road flows are high and alternative route are not available);
- Temporary barriers to prevent vehicle to crashing into the area being worked on;
- Speed restrictions for contractor vehicles entering road work areas;
- Speed restrictions for road users in road work sections which can be enforced by speed cameras;
- Appropriate high visibility clothing and other safety equipment for contractors;
- Safely and first aid training for contractors/staff on site; and
- Appropriate safety signage to provide information to contractors and road users.

7.2.2 Education

7.2.2.1 NRA staff (environmental/social training)

Environmental and social education can be very helpful in providing staff with a balanced (sustainable) view of what is significant in managing a strategic road network, often in the past the main emphasis is on engineering and economics and whilst this is very important it can distort how a

³³ International Road Traffic and Accident Database (IRTAD)

³⁴ European Agency for Safety and Health at Work Website: http://osha.europa.eu/en/legislation/index_html/

strategic road network is managed so that environmental and social considerations have a much lower priority than they should have when considering what is significant.

Areas that a NRA could consider providing training for staff include:

- Customer service i.e. meeting customer and stakeholder needs and expectations;
- Introduction to environmental management and implications for the road network; and
- Staff safety training.

7.2.2.2 Local communities (outreach)

Providing support for local education can be beneficial to NRAs in providing a positive message about its involvement with society.

Types of community educational outreach can include:

- Visits to schools or local colleges by NRA staff;
- School or college trips to the site; and
- Providing support for school projects on road construction or maintenance schemes or the management of associated green estate.

7.2.2.3 School/ college (possible future NRA employees)

If key skills are needed by the NRAs, such as highway engineers or other staff, which are difficult to find coming out of education the NRA has two main routes to try and gain staff. One of these routes is to attract foreign workers who have these skills; if they are rare global skills then these staff may come at a premium or may be difficult to employ due to restrictions in national labour laws.

An alternative but longer term proposition is to encourage school children, young adults and others in further education to consider careers in the areas where the skills shortages are occurring. This may require working with educational establishments and universities so that they are providing courses that have relevance to the skills required.

Possible actions include:

- School visits to road and maintenance schemes (where it is safe to do so);
- Providing school children, those in further education, undergraduates and post graduates with appropriate work experience;
- Working with further education colleges or universities on developing appropriate courses which can provide the skills needed; and
- Encourage senior staff to work part time in further education colleges as lecturers or those staff in semi-retirement.

7.2.3 Society and community

7.2.3.1 Community involvement on road projects

If the NRA has the remit of working with local communities when conducting new road building or significant maintenance this can bring significant benefits both to the NRA and the local community.

Listening actively to the local community and responding positively to their inputs at all stages of a project from design to construction can reduce community complaints and the risk of project disruption.

Types of community outreach can include:

- A visitor centre for larger builds where locals can visit and speak to staff on project progress and voice concerns;
- Regular presentations to local community groups on the project;
- The use of a website and/or newsletter that identify community comments and responses or to provide specialist information such as project archaeology finds;
- Visits to schools to talk about a project and school trips to the site;
- Providing a unique event for local people such as a sponsored walk along nearly completed stretches of a road, a picnic in a new road tunnel a visit to part of the managed green estate not normally accessible or whatever may be suitable within the project; and
- Providing support financially or voluntary staff time to help local charitable projects.

7.2.3.2 Communication and feedback

NRAS should provide regular communication on their performance to stakeholders, to ensure that stakeholders are able to understand the NRAs activities and be able to provide feedback on these activities.

Communication routes include:

- Written responses to postal and telephone queries from the public;
- Written responses to representatives of government and their elected representatives;
- Press notices and responses to journalists;
- Responses to regulators and enforcement agencies;
- Responses to representative organisations and special interest groups;
- Appropriate electronic responses to individuals i.e. feedback to comments made by e-mail or social media sites; and
- Web based information which may include information on roadworks and construction and maintenance projects and information on performance, policy, procedure and practice.

7.2.3.1 Equality and Gender Issues

NRAs need to be aware of equality and gender issues. There are significant European requirements³⁵ as well as significant stakeholder expectations that organisations will not discriminate on issues such as gender and gender balance, race, minority groupings, age, religious or sexual orientation.

NRAs need to manage their internal responsibilities to staff and contractors according to European law and their Stakeholder expectations but the NRA will also need to check on a regular basis that their own policies, procedures, practices or construction or maintenance activities are non-discriminatory to external stakeholders as well.

NRAs may need to consider positive actions which may improve equality and accessibility for staff and stakeholders examples of such actions include; having access to a local crèche facility for staff with children or providing in a website or printed information on NRA activities in more than one language.

7.2.3.2 Community health

The roads managed by NRAs have the potential to impact the health of local communities and whilst NRAs cannot control all of the potential impacts it is important that they are aware of what they can manage. The table below outlines a few of these issues.

Issue	Identifying issue	NRA interventions
Sleep deprivation/disturbed sleep	Complaints, noise mapping, noise surveys	Noise barriers Low noise road surfacing Hard landscaping i.e. earth banks, Soft landscaping i.e. planting Road modifications to prevent high acceleration gear changing etc. Sound proofing houses
Ill health due to poor air quality	Air quality monitoring	Difficult issue due to most air quality issues being due to vehicle use and design. Planting may help manage air quality in some areas. NRA may need to work with other stakeholders to help reduce air pollution problems.

³⁵ Council Directive 2000/78/EC of 27 November 2000 establishing a general framework for equal treatment in employment and occupation

Preventing injuries and accidents on the roads

Incidents occurring, reports from law enforcement

Fencing to prevent access to roads
Protecting bridges so that objects cannot be thrown from them**7.2.4 Accessibility****7.2.4.1 Access to the road network by vulnerable groups**

The strategic road network should be accessible to all parts of society therefore NRAs should consider how this can be achieved. People with disabilities have need to access appropriate crossing points, such as bridges and underpasses, and to have the right tactile information at crossing points to enable safe use.

7.2.4.2 Reduction in community severance

Major roads with high levels of traffic can sever communities leading to a lack of community cohesion and potentially leading to increased accidents as residents try and get from one side of the community to the other.

Communities which are severed in this way should be identified by the NRA either directly through examination of the road network or through complaints and other feedback from local communities.

Where this issue has been identified there are several responses that can be taken, including:

- Identifying if in the future a bypass or road realignment may be necessary;
- Identifying if new infrastructure bridges or underpasses may be a solution; and
- Considering pedestrian crossings or centre refuges if traffic flows permit.

7.2.5 Relations to other sectors**7.2.5.1 Development/Demand management**

Some NRAs in Europe may be able to comment directly on planning applications for development schemes where these will have a direct impact on the traffic flows on the Strategic Road network. If a scheme could bring significant congestion to the road network NRAs may be able to work within the planning authorities to identify ways in which the extra traffic flows can be reduced to lessen the impact on the strategic road network, examples of this include encouraging the authority to use local green travel plans to reduce private vehicle use.

7.2.5.2 Collaboration with other networks (rail, waterway etc)

Some NRAs will be multimodal in character and will therefore be able to co-operate internally with the teams involved in rail or other modes or transport. For other NRAs this may be more difficult as

other agencies, parts of government or the private sector will be responsible for other modes of transport.

There will be some similarities between modes of transport for example road, rail and waterways are examples of linear networks and often face similar environmental and social issues. Collaborative forums can be set up to identify issues where there is significant scope for sharing resources to achieve outcomes which are beneficial to the collaborating organisations.

Potential areas for collaboration could include:

- Shared research programmes into environmental/social issues;
- Collaboration at a national, regional or local level to help meet legislative requirements such as in water management catchment areas;
- Sharing staff resources, monitoring equipment and data; and
- Developing transport models that can identify the sustainability benefits of modal shifts.

7.2.6 Poverty reduction/job creation & development

7.2.6.1 Jobs created/protected

When new roads are constructed new employment opportunities are often created or existing employment is preserved. New roads or bypasses may speed up the delivery of goods and services which can make business more competitive and thus be able to expand. For developing economies or regions which have poorer economic performance, the economic implications of a road construction project become more significant this can be interpreted as both a social and economic indicator.

Appendix B: Key Performance Indicators

Environmental and Social KPIs for NRA Trial

The trial is being undertaken as part of a project entitled “Strategic Benchmarking and Key Performance Indicators” (SBAKPI) which is being funded under the ERA-NET ROAD programme “Effective Asset Management meeting future Challenges”. The objective of SBAKPI is to develop a set of key performance indicators (KPIs) which would allow National Road Administrations (NRAs) to measure their Environmental and Social Performance and to gain an insight into the performance of other NRAs with the aim of driving up environmental and social performance in Europe. Further information on SBAKPI and ENR-NET ROAD can be found on www.eranetroad.org.

The KPIs selected for the trial are:

Topic	KPI	KPI basis
Environmental		
Noise	Option 1 Noise complaints	NRA databases or other sources
	Option 2 Number of dwelling exposed to excessive noise	Mapping based in EU legislation
Air Quality	Road network within zones and agglomerations exceeding Air Quality Limit values	Air quality planning based in EU legislation, or model calculations
Water Quality	Managed drainage of roads	NRA databases or other sources
Natural Resources	Waste (or recycling) data	NRA databases or other sources
Climate Change	CO ₂ emissions from NRA activities	NRA databases or other sources
Biodiversity	Wildlife crossings	NRA databases or other sources
Social		
Stakeholder Satisfaction	Stakeholder engagement	NRA complaints procedures
Safety	Killed and Seriously Injured	Road accident statistics
Development	Growth of the NRA Network	NRA databases or other sources
Travel	Congestion and Journey time Reliability	NRA databases or other sources

The purpose of the trial is to identify:

- the most useful KPIs for reporting and engagement with strategic stakeholders
- the availability and quality of environmental and social data

- the resources (time/effort) needed to generate the KPIs i.e. values populate the KPI
- a network of interested parties from European NRAs with an interest in strategic environmental and social issues

It is envisaged this KPI trial will provide an initial set of European reporting on KPIs and establish a basis for a future benchmarking programme.

The following sections describe each KPI and the data required for its calculation. Blank reporting forms are provided in the Appendix. The examples provided are based on a fictional European NRA and illustrate how to calculate the KPI. When completing the reporting forms, the sources of data should be included for your future reference. Please use the comments box to provide additional information, in particular to comment on:

- how easy or difficult it was to collect the data required to calculate the KPI
- what, if any, problems were encountered such as no data available, or low reliability or consistency of data, unable to get data from 3rd parties.
- whether the KPI will be useful
- how could it be improved.

For a number of the KPIs two or three different KPIs with different data detail are presented; the selection of the KPI used by the NRA will depend on the level of data available i.e the NRA should chose a KPI based on its available data.

The KPIs relate to the total road network for which the NRA is responsible. It would also be possible to calculate them for regional data or for the different types of roads managed by the NRA e.g. TERN, roads with two or more lanes, etc. Feedback on the further development and usefulness of such approaches would be welcomed.

These KPIs were developed from literature review, stakeholder consultation and feedback, however the aim of this trial is to see how these initial KPIs work practically and bring together people interested in KPIs from European NRA to develop these further.

The blank reporting forms in the Appendix should be completed and returned to dbond@trl.co.uk by 15th January 2012. It is expected that not all KPIs will be able to be completed by all NRAs but it is requested that each form is returned with an explanation for any incomplete tables.

Noise - Option1**Indicator**

Number of noise complaints about the NRA road network received by the NRA or passed to the NRA from other sources (i.e. Government) per year/ 1000km of the NRA's road network.

Rationale

The KPI provides an indication of the level of nuisance from noise caused by the NRA road network.

Formula

Complaints per year / 1000km of road

Definitions

Complaint = An identifiable individual or organisation (i.e. with name/address/telephone number/email) making a complaint about a noise nuisance caused by the NRA road network. Criteria for identifying a complaint may vary for each NRA it will be helpful to identify any specific NRA definitions.

Worked example

During the period January to December 2010, a NRA received 274 complaints on road noise directly by post, email, social networking and telephone. It was also informed by government officials of 67 complaints sent to government and has evidence of 86 complaints sent to a special interest group with the group sending in an overall complaint. Therefore, in total it has received 427 complaints about noise issues from the public. The NRA manages 10,000 km of road therefore their KPI is calculated as **40 complaints per 1000km/year**

Noise KPI (Option 1)		
Data Collection	Data	Data Breakdown (if known/available)
Complaints		
Received directly by NRA	274	26 from letters 203 from e-mails 41 from logged telephone calls 4 others i.e. Fax
Received from Government sources	67	45 via Dept for Environment 22 from elected representatives
Received from Local Government sources	0	Not applicable

Received from Special interest Groups	86	37 from town noise action group 13 from owl protection group 20 from village noise action group 16 from Insomnia League
Other (Define)	0	Not applicable
NRA network Length		
NRA road length (km)	10,000km	
Calculation		
Complaints (per calendar year) divided by road kilometres multiplied by 1000	$(427 \div 10,000) * 1000 = 40$	
Noise KPI		
For the calendar year 2010 there have been 40 Noise complaints per 1000km / year		
Comments		
NRA will examine noise maps and potentially undertake further analysis of noise using Option 2 in the next financial year.		

Good performance

The aim is to show an overall reduction in the KPI on an annual basis.

Collection interval

Annually, as part of the NRA's complaints procedure and annual reporting processes.

Data Sources Required

- Internally collected complaints (with date of complaint)
- Complaints passed on by government/elected officials
- Complaints/ petitions from special interest/action groups (note there should be some verification that complaints are from individuals' i.e. individual names, contact details).
- Current length of NRA network (NRA data).

Noise – Option 2

Indicator

Number of dwellings exposed to road noise >55dBA/ km of the NRA's road network for roads with >6 million vehicles per year.

Rationale

The EU Noise Directive ³⁶ requires the level of noise to be assessed on all roads with more than 6 million vehicle passages per year. This KPI will identify the number of dwellings exposed to noise levels above 55dBA due to the NRA's road network.

Definitions

55 dBA is the current WHO Interim Guidelines night-time level. However, this level may be reduced in the future to 40dBA, in line with the longer term recommendations of the World Health Organisation.

The KPI is based on the number of dwellings; however if this is not available, the number of properties should be used but this should be clearly noted.

Formula

Number of dwellings over 55 dBA threshold / km NRA road network (for roads with >6 million vehicles/year).

Worked example

An NRA reviewed the national noise maps and identified 34 maps including sections of their road network. From the maps, the NRA calculated the total length of NRA roads mapped and then identified the number of dwellings where noise levels exceeded 55dBA. This information was extracted from the noise maps using standard functions within the GIS mapping system.

Noise KPI (Option 2)		
Data Collection	Data	Data Breakdown (if known/available)
Noise Maps		
Total number of noise maps covering NRA roads	34	5 Maps Region A 6 Maps Region B 7 Maps Region C 4 Maps Region D

³⁶ The European Environmental Noise Directive (END) (Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise)

		12 Maps Capital City Area
Dwellings identified from each noise map exposed to noise levels > 55 dBA	5536	Region A Map 1 = 12 Dwellings Map 2 = 6 Dwellings Map 3 = 23 Dwellings Map 4 = 0 Dwellings Map 5 = 107 Total from all Maps Region A =148 Total for other regions Region B =376 Region C =1486 Region D =78 Capital City=3448
NRA network Length		
NRA road length (km) covered by noise mapping requirements	2,700km	
Calculation		
Dwellings affected/NRA roads mapped	$5536 \div 2,700 = 2.05$	
Noise KPI		
2.05 dwellings over 55 dBA night threshold / km of NRA noise mapped roads		
Comments		

Good performance

The aim is to show an overall reduction in the number of dwellings over the 55 dBA threshold per km, over time.

Collection interval

Annually, taking account of any changes made to the national noise maps.

Data source

Noise maps, under the EU Noise Regulations these are required to be publically available in each European Member State.

Air Quality KPI

Two levels of KPI for Air Quality are proposed, both relate to the extent to which the NRA road network is responsible for air quality issues. The level adopted will depend on the information available:

- 1) Number of Air Quality Zones and Agglomerations³⁷ (AQZA) or equivalent, through which the NRA's road network passes / 1000km of NRA road network.
- 2) Length (km) of NRA road passing through AQZA s where traffic has been identified as the main cause of the AQZA / 1000km of NRA road network.

Rationale

The European Air Quality Framework Directive 2008/50/EC on ambient air quality and cleaner air for Europe set a framework for Member States to set standards for a series of air pollutants. AQZA s, or their equivalent, are declared where these standards are exceeded. Transport emissions (NO_x and PM₁₀) are a major contributor to air pollution and are frequently responsible for causing AQZAs. This KPI will provide a measure of the level of air pollution related to the NRA road network.

Definitions

- 1) Number of Air Quality Zones and Agglomerations AQZA or equivalent, through which the NRA's road network passes / 1000km of NRA road network.
- 2) Length (km) of NRA road passing through AQZA where traffic has been identified as the main cause of the AQZA / 1000km of NRA road network

Worked example

Level 1: Identify the number of Air Quality Zones and Agglomerations along the NRA's road network and the total length of the NRA's road network to calculate the KPI.

Level 2: Use the AQZA documentation (as prepared by local or national government) to identify those AQZA s resulting from traffic emissions on the NRA's road network. Then calculate the length of the NRA's road network within these AQZA s.

Air Quality KPI		
Data Collection	Data	Data Breakdown (if known/available)
Air Quality Management Areas		
Number of Air Quality Zones and Agglomerations along NRA road network	47	3 AQZA s Region A (3 NO _x) 5 AQZA s Region B (4 NO _x 1 PM ₁₀) 12 AQZA s Region C (12 NO _x)

³⁷ Directive 2008/50/EC on ambient air quality and cleaner air for Europe, Terms used in the present Directive are 'zones', meaning part of the territory of a Member State which has been delimited by the country for the purpose of air quality assessment and management, and 'agglomerations' which are urban zones with more 250 000 inhabitants.

		12 AQZA s Region D (12 NO _x) 15 AQZA s Capital City Area (14 NO _x 1 PM ₁₀)
Length of network impacted by Air Quality Zones and Agglomerations	121.6km	Region A AQZA 1 = 1.4km AQZA 2= 5.2km AQZA 3 = 0.5km Total Region A =7.1km Total for other regions Region B =45.2km Region C =23.4km Region D =24.0km Capital City=21.9km
NRA network Length		
NRA road length (km)	10,000km	
Calculation		
Level 1: Number of AQZA s per 1000km NRA road network	$47 \times 1000 / 10,000 = 4.7$	
Level 2: Length of NRA road network within AQZA s caused by traffic related air pollution per 1000km NRA road network	$121.6 \times 1000 / 10,000 = 12$	
Air Quality KPI		
For the calendar year 2010 there have been 1) 4.7 Air Quality Zones and Agglomerations / 1000km NRA road network. 2) 12 km of road within an Air Quality Zones and Agglomerations / 1000km NRA road network		
Comments		
Use Air Quality Zones and Agglomerations Plans and associated GIS maps to derive data.		

Good performance

- 1) Reduction in the number of Air Quality Zones and Agglomerations
- 2) Reduction in the proportion of the NRA's managed network passing through traffic related AQZAs.
- 3) Ideally Air quality standards not exceeded along NRA road network

Collection interval

Reviewed annually

Data source

Air Quality management information, from Local Authorities or any other authorities responsible for compliance with air quality objectives.

Water KPI

Indicator

Three levels of KPI are proposed, all relate to the extent to which run-off from the NRA's road network is controlled. The level adopted will depend on the information available:

- 1) Proportion of NRA road network with managed drainage.
- 2) Number of NRA managed drainage outfalls/ km of NRA road network.
- 3) Number of managed drainage outfalls with water quality treatment / km of NRA road network.

Rationale

Run-off from the road network is a potential source of pollutants to controlled water. Hence, to meet EU water quality regulations, it may need to be managed and then discharged as point source inflows to controlled waters. This indicator has been developed to help identify progress towards managing drainage and improving water quality of controlled receptors such as rivers, coasts and lakes.

Definitions

NRA's managed drainage is defined as where the surface water runoff from its roads or managed land is either processed (i.e. to a balancing pond) or transferred to a point outside of NRA management i.e. to municipal drainage systems, river, ditch pond, coastline etc.

Drainage Outfall = The place where a sewer or drain discharges into a body of water i.e. stream, river, lake, the sea etc.

Formula

- 1) Proportion of NRA road network with managed drainage
- 2) Number of managed drainage outfalls / km of NRA road network
- 3) Number of drainage outfalls managed for water quality / km of NRA road network

Worked example

Water Quality KPI		
Data Collection	Data	Data Breakdown (if known/available)
Water Quality Data		
Proportion of NRA road with managed drainage	8900km	700km to treatment works 2000km to retention ponds 4500km to surface waters/coast 1700km to soak away 1100km unknown
Number of managed	2302	Region A

drainage outfalls		Road 1: 17 managed discharge points: 3 to water treatment, 4 to balancing ponds, 5 oil inceptor to surface water 5 others Road 2: 45 managed etc Total from all roads Region A =678 (Similarly for other regions) Region B =489 Region C =1012 Region D =47 Capital City=76
Outfalls with water quality treatment	2157	480 discharges to water treatment works 1100 to surface water with oil interceptors 500 to balancing ponds 77 to other water quality treatment process.
NRA Network Length		
NRA road length (km)	10,000km	
Calculation		
Proportion of NRA road with managed drainage	$8,900 \div 10,000 = 0.89$ of NRA road network	
Number of managed outfalls per km	$2302 \div 10,000 = 0.23$ managed outfalls per km NRA road network	
Number of managed outfalls with water treatment per km	$2157 \div 10,000 = 0.22$ managed outfalls with treatment per km NRA road network	
Water Quality KPI		
In 2010 there are: <ol style="list-style-type: none"> 1) 8900km (89%) of NRA roads with managed drainage. 2) 0.23 managed outfalls / km of NRA network 3) 0.22 managed outfalls with water treatment / km of NRA network 		
Comments Box for KPI		
Outfalls identified via asset management register.		

Good performance

An increase in the proportion of the NRA network with managed drainage and the extent to which run-off is treated prior to discharge to controlled waters.

Collection interval

Annually

Data sources

- NRA asset management registers
- NRA road mapping/GIS databases
- Water treatment agencies/companies

Natural Resources KPI

Indicator

Total waste generated by maintenance and new road construction activities per year/ km of NRA road network. Due to the different nature of activities, wastes from maintenance and new road building should also be considered separately.

Rationale

The level of waste generated during construction and maintenance activities provides an indication of the level of natural resources consumed. Generally, higher levels of waste, suggest that waste has not been reduced in the design phase and less reuse and recycling of materials.

Definition

Waste is defined as material which is sent to landfill by the NRA and its contractors/supply chain. It does not include materials which are reused or sent for recycling or energy recovery.

Formula

- 1) Tonnes waste arising from road maintenance / km of NRA road network undergoing maintenance
- 2) Tonnes waste arising from new road construction/ km new road constructed
- 3) Total waste arising from NRA's maintenance and construction activities/ km NRA road network (note: once 3 years of data have been collected it should be converted into a 3 year rolling average to deal with investment/economic fluctuations)

Worked example

Waste KPI		
Data Collection	Data	Data Breakdown (if known/available)
Waste Data		
Maintenance	94,012 tonnes	Maintenance Area A 10,000 tonnes Maintenance Area B etc. Total = A+B+.... = 94,012 tonnes
New road construction	34,087 tonnes	Project X 5,000 tonnes of waste Project Y 17,000 tonnes of waste Project Z

		12,087 tonnes of waste Total = X+Y+Z = 34,087 tonnes
NRA Network Length		
NRA road length (km)	10,000km	
New road construction length (km)	15km	2km Project X 8km Project Y 5km Project Z
Calculation		
Waste arising from road maintenance / NRA network	$94,012 \div 10,000 = 9.40$ tonnes of waste/ km of road network undergoing maintenance	
Waste arising from new road construction / km new road	$34087 \div 15 = 2272$ tonnes of waste/ km new road	
Total waste / km NRA road network	$(94,012 + 34,087) / 10,000 = 12.8$ tonnes waste / km road network	
Waste KPI		
For 2010 there have been: 1) 9.40 tonnes of waste / km generated by maintenance of NRA network 2) 2272 tonnes of waste / km from new road built by the NRA network 3) 12.8 tonnes of waste / km NRA network		
Comments		
Future project contract terms & conditions will require data to be collected by contractors and their supply chains.		

Good performance

A reduction in waste per kilometre per year compared to previous years.

Collection interval

Annually

Data source

Waste data collected from:

- NRA workforce
- Contractors & their supply chains

Climate Change KPI

Indicator

Carbon Dioxide (CO₂) emitted by NRA and contractors per year/ km NRA road network.

Rationale

Climate change has highlighted the importance of carbon dioxide CO₂ emissions and their measurement, and a reduction is recognised as good practice.

Definition

The carbon dioxide emissions to be considered are those relating to the NRA's (and their contractors) maintenance and construction activities and the operation of their road network. Emissions from NRA's office activities (e.g. lighting, heating/cooling, office equipment) should be included. Emissions related to the use of the road network by other road-users should not be included.

All emissions should be expressed as tonnes of carbon dioxide. Carbon Equivalent C can be calculated by dividing the total tonnes by 44 and multiplying the result by 12.

Worked example

Climate Change KPI		
Data Collection	Data	Data Breakdown (if known/available)
Carbon Data		
Corporate sources (offices)	97.7 tonnes carbon dioxide	Head Office Heating/Ventilation/Cooling 15 tonnes Lighting 4 tonnes Appliances/Plant 4.3 tonnes Vehicles 34 tonnes Regional Office A, B, C etc Total all offices 97.7 tonnes
New road building	30,476 tonnes carbon dioxide	Project X Transport (fuel use for construction) 300 tonnes Energy used for construction/plant 350 tonnes Site (temporary) lighting 70 tonnes Energy used by plant i.e. concrete

		6000 tonnes Site offices 14 tonnes Total Project X = 6734 tonnes of Carbon Dioxide Projects Y, Z etc
Operation of network	39,020 tonnes carbon dioxide	Region A Road lighting 8000 tonnes Power for communications, signage and data collection 900 tonnes Traffic officers (managed by NRA) 0 tonnes Fuel for NRA salting /litter pick vehicles etc 640 tonnes Total Region A = 9540 tonnes Carbon Dioxide Similarly for other regions Total all regions = 39,020 tonnes carbon
Maintenance of network	59,875 tonnes carbon dioxide	Maintenance Team 1 Transport (fuel use) 2101 tonnes Energy used for construction/plant 4560 tonnes Site (temporary) lighting 312 tonnes Energy used to create material i.e. concrete 2156 tonnes Site offices 12 tonnes Total 9,141 tonnes Carbon Dioxide Maintenance Teams 2, 3 etc. Total all teams = 59,875 tonnes carbon
NRA Network Length		
NRA road length (km)	10,000km	
New Road construction Length (km)	15km	2km Project X 8km Project Y 5km Project Z
Calculation		
Total carbon dioxide	(97.7+ 30,476 + 39,020+ 59,875)	

emissions / km NRA road network	$\div 10,000 = 12.9$ tonnes of CO ₂ per km	
Carbon dioxide emissions/ km new road constructed	$30,476 \div 15 = 2032$ tonnes of CO ₂ per km	
Climate Change KPI		
For the calendar year 2010 there have been 12.9 tonnes of CO₂/ per km NRA road network		
Comments		
Need to change future project contract terms and conditions to require data to be reported by contractors/supply chain.		

For an example of NRA Climate change reporting see the UK Highways Agency's carbon reporting process, www.highways.gov.uk/business/31530.aspx

Good performance

Overall reduction in carbon dioxide emissions.

Collection interval

Annually.

Data source

NRA's own data collection and data collection by contractors and supply chain.

Biodiversity KPI

Indicator

Number of wildlife crossings on the network / 1000km NRA road network.

Rationale

Identifying the level of wildlife connectivity over the NRA network to reduce severance and encourage the use of wildlife corridors by wildlife. These crossings should be evaluated after placement to determine their effectiveness they should not be counted if they are not effective in allowing wildlife to cross.

Definition

Wildlife Crossing – a NRA intervention designed to assist the transit of wildlife across a network whether this is an underpass or culvert, an otter ledge or a bat/mammal bridge, an annual collect and cross scheme for amphibians or other activity designed to reduce wildlife corridor severance issues. Structures can be dual use i.e. designed for human crossing as long as the provision for wildlife crossing has also been designed into the structure.

BAPS- Biodiversity Action Plans - local or regional plans designed to support the habitat of species NRAs may be stakeholders in these BAPs.

Formula

Number of wildlife crossings on the network / 1000km of NRA road network.

Worked example

Biodiversity KPI		
Data Collection	Data	Data Breakdown (if known/available)
Wildlife Crossing Points		
	76	Region A 2 bat bridges 14 culverts designed to encourage wildlife access 1 amphibian collection scheme 1 bridge with margins designed to help wildlife cross Total Region A 18 interventions Similarly for other regions Total all regions = 76
NRA network Length		

NRA road length (km)	10,000km	
Calculation		
Wildlife connectivity interventions / 1000km road network	$(76 \div 10,000) * 1000 = 7.6$ crossings / 1000km	
Biodiversity KPI		
For 2010 7.6 wildlife crossing points / 1000km road		
Comments		
Limited requirement for wildlife crossing points in capital city area. Region B may need additional points to help wildlife cross main east west road E 11 if they can be designed into future schemes.		

Good performance

Connectivity should be judged in conjunction with Biodiversity Action Plans (BAPS) and an evaluation on the overall effectiveness of the crossings in helping wildlife access habitat.

Collection interval

Annually.

Data source

- NRA records
- BAPs

Stakeholder Satisfaction KPI

Indicator

Two KPIs are proposed:

1. Number of complaints to NRA / km NRA road network
2. Number of responses from NRA / km NRA road network.

Rationale

To identify the overall level of satisfaction/dissatisfaction from stakeholders.

Definition

Complaint – An enquiry related to the responsibilities and work of the NRA requesting some form of action or intervention that the NRA could conceivably act on.

Responses - Direct responses to individuals and organisations e.g. personal reply (not standard copy) emails, telephone calls, letters. Plus other types of responses may be applicable e.g. website update, newsletter, press release.

Formula

1. Complaints / km NRA road network
2. Responses / km NRA road network

Worked example

Stakeholder Satisfaction KPI		
Data Collection	Data	Data Breakdown (if known/available)
Complaints		
To NRA Directly	3756	274 about noise 1297 about litter 67 about graffiti 15 about air quality 970 about road surface quality (potholes) 677 about new road development 456 (other)
Received from Government sources	257	77 about noise 180 about road surface quality
Received from Local	126	126 petition received by regional

Government sources		Council A about lack of crossing point in town A
Received from Special interest Groups	496	86 about noise 34 about general environmental issues 155 about road kill of species 221 about lack of road salting road safety group
Other (Define)	0	Not applicable
NRA Response level	4121	4001 direct responses to individuals (3012 emails, 500 telephone calls, 489 letters) 56 responses to organisations (letters, email, telephone calls) 120 other responses, website updates, newsletters, press releases etc
NRA network Length		
NRA road length (km)	10,000km	
Calculation		
Complaints / km road network	$4635 \div 10,000 = 0.46$	
Responses / km road network	$4121 \div 10,000 = 0.41$	
Stakeholder Satisfaction KPI		
For the calendar year 2010 there have been 0.46 complaints / km 0.41 responses / km		
Comments		

Good performance

Reducing complaints based on identifying likely causes of complaint and acting on them where possible.

Collection interval

Annual as part of annual reporting processes.

Data source

From NRA complaints procedure and external sources

Safety KPI

Indicator

People killed or seriously injured in road traffic accidents.

Rationale

To measure the total number of people killed or seriously injured (KSI) in road traffic accidents. This will contribute to national casualty reduction targets.

Definition

The percentage change in the number of people killed or seriously injured based on a three year rolling average.

Include all killed or seriously injured in road traffic accidents on the NRA's network.

Formula

Calculate the percentage change (to 1 decimal place) to the last reported three year rolling average compared to the previous three year rolling average (e.g. 2009/10/11 compared to 2008/09/10).

E.g.

Three year rolling average for 2008 to 2010 - $a = (2008 + 2009 + 2010) / 3$

Three year rolling average for 2009 to 2011 - $b = (2009 + 2010 + 2011) / 3$

Change in three year rolling average = $((a - b) / a) * 100$.

Worked example

In 2007, a NRA had 100 KSI in road traffic accidents. For 2008, 2009 and 2010 the figures were 95, 90 and 85, respectively.

Total casualties for 2007, 2008, 2009 = 285

So 3-year rolling average $a = 285 / 3 = 95$

Total casualties for 2008, 2009, 2010 = 270

So 3-year rolling average $b = 270 / 3 = 90$

Change in three year rolling average = $((95 - 90) / 95) * 100 = 5.3\%$

Safety KPI		
Data Collection	Data	Data breakdown (if Known/Available)
Safety Data		
KSI	2007	100 KSI
	2008	95 KSI
	2009	90 KSI
	2010	85 KSI
Calculation		

Average 2007-9	$285 \div 3 = 95$ KSI	
Average 2008-10	$270 \div 3 = 90$ KSI	
Change in three year rolling average	$((95-90)/95) * 100 = 5.3\%$	
Safety KPI		
5.3% reduction in KSI 3 year rolling average		
NRA User Comments Box for KPI		
Reduction linked to safety programme identifying accident clusters.		

Good performance

Good performance is typified by a positive percentage change towards zero.

Collection interval

Annually.

Data source

Statistics are collected from law enforcement authorities or other law or local authorities.

Development KPI

Indicator

Three indicators are proposed:

1. population / km new road constructed
2. population / km new lanes constructed
3. population/ km ITS/ICT constructed

The first indicator will be most appropriate for countries with extensive road construction activities whereas the second will be more appropriate for those with a mature network where the emphasis is on widening existing roads to increase capacity by the addition of further lanes or the use of measures such as 'hard-shoulder running'. The third indicator identifies the development of more intelligent interaction and road management between road user and the NRA.

Rationale

New and improved roads can significantly contribute to reducing poverty and increasing economic and social development by allowing improved and faster access to services and new markets for goods. Where regional development plans are in place it may be most appropriate to calculate the KPI on a regional basis.

Definition

ITS intelligent transport systems such as those used to vary speed limits due to congestion.

ICT Information communications Technology such as variable signage.

Formula

1. population / km new road constructed
2. population / km new lanes constructed
3. population/ km ITS/ICT constructed

Worked example

Development KPI		
Data Collection	Data	Data Breakdown (if known/available)
Development and Managing Growth		
New road construction	15km	Region A Total Region A 2 X 1 km Region C 5km

		Region D 8km
Hard shoulder running/extra lanes	250km	Capital City 250 km
ITS/ICT Constructed	300km	Capital City 250km Region D 50km
NRA network Length		
NRA road length (km)	10,000km	
NRA total lanes (km)	69,000km	30,720km lanes on roads with two lanes 38,280 other
Population of Country / Region		
Population size	1,258,000	
Calculation		
Population / new NRA road kilometres	$1,258,000 \div 15 = 83866$ people per new km of NRA road	
Capita per new road lanes	$1,258,000 \div 250 = 5032$ people per new km of lanes or hard shoulder running on NRA road	
New ITS/ICT	$1,258,000 \div 300 = 4193$ people per new km of ITS/ICT	
Development KPI		
For 2010: 83866 people / km of new road 5032 people / km of new lane opened		
Comments		
Calculated on national basis. Future KPIs should be calculated on regional basis.		

Good performance

Depend on the country concerned and the national / regional development plans

Collection interval

Annually.

Data source

- National or EU data sources of population

- Annual data on new road construction.

Travel

Indicator

The length of road affected by schemes to reduce congestion and improve journey time reliability per 1000km of the NRA road network per year.

Rationale

Unreliable journey times can cause significant frustration for road users, making it hard to plan a journey. The purpose of this KPI is to obtain a measure of the actions being taken by the NRA to reduce congestion and improve journey time reliability.

Definition

Schemes aimed at reducing congestion and improving journey time reliability could include the construction of additional lanes and the provision of managed sections of road.

Formula

Length of road affected per year multiplied by 1000 divided by the length of the NRA road network.

Worked example

An NRA manages 10,000km of road and has undertaken 47 schemes to improve journey time reliability or congestion (note the schemes could also be undertaking other work other than these two issues). The total length of road affected by the schemes is 80km, thus the KPI is 8km per 1000km of road per year

Travel KPI		
Data Collection	Data	Data Breakdown (if known/available)
Length of road affected by schemes to reduce congestion and improve journey time reliability		
	150km	Scheme 1 15km Scheme 2 25km Scheme C, D....etc Total all schemes 80km
NRA network Length		
NRA road length (km)	10,000km	
Calculation		
Km of road affected / number of schemes per year	(80÷10,000)*1000=8km / 1000km	

multiplied by 1000		
Travel KPI		
For 2010		
8km per 1000km of road		
Comments		

Good performance

A longer length of road affected is better.

Collection interval

Annually

Data source

NRA and supply chain data

Blank Reporting Forms

(Expand Boxes as required to fit data)

Noise 1 KPI		
Data Collection	Data	Data Breakdown (if known/available)
Complaints (add rows as required)		
NRA network Length		
NRA road Length (km)		
Calculation		
Complaints (per calendar year) divided by road kilometres multiplied by 1000		
Noise 1 KPI		
For the calendar year 2010 there have been x Noise complaints / 1000km		
Comments		

Noise 2 KPI		
Data Collection	Data	Data Breakdown (if known/available)
Noise Maps		
Total number of noise maps covering NRA roads		
Dwellings identified from Noise Maps affected by > 55 dBA		
NRA network Length		
NRA road Length (km) covered by noise mapping requirements		
Calculation		
Dwellings affected/NRA roads mapped		
Noise KPI		
x Dwellings over 55 dBA night threshold / km of NRA Noise Mapped Roads		
Comments		

Air Quality KPI		
Data Collection	Data	Data Breakdown (if known/available)
Air Quality Management Areas		
Number of Air Quality Zones and Agglomerations (AQZA) along NRA road network		
Length of Network impacted by Air Quality Zones and Agglomerations (AQZA)		
NRA network Length		
NRA road length (km)		
Calculation		
Level 1: Number of AQZA s per 1000km NRA road network		
Level 2: Length of NRA road network within AQZA s caused by traffic related air pollution per 1000km NRA road network		
Air Quality KPI		
For the calendar year 2010 there have been 1) X Air Quality Zones and Agglomerations / 1000km NRA road network. 2) Y km of road within an Air Quality Zones and Agglomerations / 1000km NRA road network		
Comments		

Water Quality KPI		
Data Collection	Data	Data Breakdown (if known/available)
Water Quality Data		
Proportion of NRA road with managed drainage		
Number of Managed Drainage Outfalls		
Outfalls with water quality treatment		
NRA Network Length		
NRA road length (km)		
Calculation		
Proportion of NRA road with managed drainage		
Number of managed outfalls per km		
Number of managed outfalls with water treatment per km		
Water Quality KPI		
In 2010 there are: <ol style="list-style-type: none"> 1) X km (XX%) Proportion of NRA roads with managed drainage. 2) Y managed outfalls / km of NRA network 3) Z managed outfalls with water treatment / km of NRA network 		
Comments		

Waste KPI		
Data Collection	Data	Data Breakdown (if known/available)
Waste Data		
Maintenance Activities		
New Road Construction Activities		
NRA Network Length		
NRA road length (km)		
New road construction length (km)		
Calculation		
Waste arising from road maintenance / NRA network		
Waste arising from new road construction/ km new road		
Total waste / km NRA road network		
Waste KPI		
For 2010 there have been: <ol style="list-style-type: none"> 1) X tonnes of waste / km generated by maintenance of NRA network 2) Y tonnes of waste / km from new road built by the NRA network 3) Z tonnes of waste / km NRA network 		
Comments		

Climate Change KPI		
Data Collection	Data	Data Breakdown (if known/available)
Carbon Data		
Corporate Sources (Offices)		
New Road Building		
Operation of Network		
Maintenance of Network		
NRA Network Length		
NRA road length (km)		
New road construction length (km)		
Calculation		
Total carbon dioxide emissions / km NRA road network		
Carbon dioxide emissions/ km new road constructed		
Climate Change KPI		
In 2010 there were:		
X tonnes of carbon dioxide/ per km NRA road network		
Comments		

Biodiversity KPI		
Data Collection	Data	Data Breakdown (if known/available)
Wildlife Crossing Points		
NRA network Length		
NRA road length (km)		
Calculation		
Wildlife connectivity interventions / 1000km road network		
Biodiversity KPI		
For 2010:		
X wildlife crossing points / 1000km road		
Comments		

Stakeholder Satisfaction KPI		
Data Collection	Data	Data Breakdown (if known/available)
Complaints		
To NRA Directly		
Received from Government sources		
Received from Local Government sources		
Received from Special interest Groups		
Other (Define)		
NRA Response level		
NRA network Length		
NRA road length (km)		
Calculation		
Complaints / km road network		
Responses / km road network		
Stakeholder Satisfaction KPI		
In 2010 there have been X complaints / km Y responses / km		
Comments		

Safety KPI		
Data Collection	Data	Data Breakdown (if known/available)
Safety Data		
KSI		
Calculation		
Average 2007-9		
Average 2008-10		
3 Year Rolling Average		
Safety KPI		
X.X% reduction in KSI 3 year rolling average		
Comments		

Development KPI		
Data Collection	Data	Data Breakdown (if known/available)
Development and Managing Growth		
New Road Construction		
Hard Shoulder Running/Extra lanes		
ITS/ICT constructed		
NRA network Length		
NRA road length (km)		
NRA total lanes (km)		
Population of Country / Region		
Population Size		
Calculation		
Population / new NRA road kilometres Population / new road lanes Population/ITS/ICT constructed		
Development KPI		
For 2010: X people / km of new road Y people / km of new lane opened Z people / km ITS/ICT constructed		
Comments		

Travel KPI		
Data Collection	Data	Data Breakdown (if known/available)
Length of road affected by schemes to reduce congestion and improve journey time reliability		
NRA network Length		
NRA road Length (km)		
Calculation		
Km of road affected / number of schemes per year multiplied by 1000		
Travel KPI		
For 2010 Length of road affected / 1000km road		
Comments		

Appendix C: SBAKPI Workshop Feedback Table - Key Performance Indicators

KPI Description	Environmental KPI Topic Areas								
	Climate/ Carbon	Air	Water	Noise L EU Limits T Tranquillity V Vibration	Landscape	Cultural Heritage	Resource/ Waste/ Energy	Nature and Bio Diversity	Soil and Geology
KPI Priority									
<i>HA (England)</i>	High	Very High	Not discussed at workshop	High (L) Low (T) Low (V)	Medium/Low	Low	Very High	High	Low
<i>BASt (Germany)</i>	High	Medium		Very High (L) Low (T) Low (V)	High (Region dependant i.e. Rhine)	High (Region Dependant)	Very High	High	None
<i>Maa'tz (Israel)</i>	(Not scored)	(Not scored)		High (L) Low (T) Low (V)	High (Due to special interest groups)	Medium (Religious Heritage)	(Not scored)	Not scored (Legislative concern)	Not scored
<i>Agency for Roads and Traffic – Road Engineering Division (Belgium)</i>	Low	High		High (L) Low (T) Medium/Low (V)* (Concrete roads)	High (for New Roads)	Low	Very High	Low	Low/Medium
KPI Characteristics									
Representation									
<i>Validity</i>		HA - May become a lower priority in future dependant on	Not discussed at workshop				Need to Consider LCA		HA Really an issue related to others such as Biodiversity.

		vehicle power sources and Design							
Reliability									
Sensitivity									
Operation									
Measurability					Low Measurability Qualitative				
Data Availability	HA - lack user Data Reasonable Corporation and Network data	Israel Data available at Government level but not used/Provided at NRA level					From Legislation Such as SWMP Site Waste Management Plans Belgium - monitoring recycled concrete brick asphalt		
Ethical Concerns									
Policy Application									
Transparency									
Interpretability									
Target Relevance	HA - Definite Relevance to NRAs	HA - Definite Relevance		EU Noise maps, similar not available in Israel	Can be mitigated Land take an Issue for HA re Managed Roads Mitigation land can require 10x Land take area.		Car Tyre Use Check ISO 14040 LCA HA Concern Cost of materials such as steel. Need to Extract material use from projects		

Actionability		Road users hard to mitigate. approaches include Alternate Odd Even Number plate driving during high emission days BG. London Low Emission Zone UK							
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KPI Description	Social KPI Topic Areas						
	Safety K User KSI O Operator Safety	Education	Society And Community	Accessibility	Spatial Planning	Poverty	Development
KPI Priority		Considered to diverse a topic Potential for Focused KPI	Very High		Potential for Focused KPI?	Consider Merging with Development Limited issue for UK/Germany/Belgium Need to Check with Other NRAs	Consider Merging with Poverty
<i>HA (England)</i>	Very High K Very High O Target Aiming for Zero	Community Outreach on Safety HA Academy	Very High	Medium High	HA has Input into planning	A Regional Development focus	Linked to national economic growth
<i>BAST (Germany)</i>	Very High K High O - own KPI Rear end shunts		Very High	Medium High	High Linked to road user charging		High
<i>Maa'tz (Israel)</i>	Very High K		Community Not involved in road decision making			Poverty reduction a consideration	
<i>Agency for Roads and Traffic – Road Engineering Division</i>	Very High K	Low	Very High	High Not KPI need to measure			

<i>(Belgium)</i>							
KPI Characteristics							
Representation							
<i>Validity</i>		Israel – Need to attract /develop road Engineers	Legal Requirements?		Linked to other Transport Networks i.e. Rail and local Road networks		
<i>Reliability</i>							
<i>Sensitivity</i>							
Operation							
<i>Measurability</i>	KSI Very Strong Check European/World KSI are directly comparable						
<i>Data Availability</i>	KSI Very Strong Israel Data from Police and National Statistics office						
<i>Ethical Concerns</i>			Social and Distributional Impact a potential issue				
Policy Application							

Transparenc y							
Interpretabili ty							
Target Relevance	A High priority Action			Urban vs Strategic			
Actionability							