Labelling Smart Roads

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1. Introduction

Road infrastructures must adapt their role in a smart, green and integrated transport system that today faces a number of challenges: efficiency, safety, security, congestion, climate change and budgetary tightening.

This Discussion Paper sets out a number of recommendations for the deployment of Smart Roads by proposing a comprehensive **labelling system** that measures the **sustainability performance** of a road infrastructure: in other words, its social, environmental and economic implications in the framework of an integrated transport system.

This paper analyses the potential suitability of such labelling; the challenge now lies in implementing it from a scientific and technological perspective.

2. The Smart Roads of the Future

Smart Roads stand at the core of the 'Smart Transportation Infrastructures of the Future'. Once the concept has been theoretically formulated, it is necessary to develop strategies, tools and means leading the change from the existing road network to the Smart Roads of the Future.

First, it is crucial to consider the entire road network as a heterogeneous network. Roads must secure the flow of goods and people within and between countries – as they are essential for the accessibility of citizens and businesses -, and they must do this using a wide range of assets, from motorways to local roads. Therefore, the concept of 'Smart Roads' should take into account the diversity 'nature' of road networks.

The **Smart Roads** concept can be promoted by means of i) dissemination and communication activities, ii) high-level contacts in international organizations, or iii) networking amongst road stakeholders. Decision-makers should also count on a certification system that allows them to 'measure' the performance of both Road Authorities and private stakeholders when making roads 'smarter'.

At its highest level, the Smart Road Labelling system proposed in this paper will pursue the following objectives:

- Assess the achievements of the road community towards a safer, smarter and more sustainable road network.
- Support Road Authorities in the choice of road products, services and equipment more suitable for the environmental protection, generating social benefits, improvement of road safety, etc.

- Create an atmosphere to improve the performance of road stakeholders: a labelling system would push road contractors to innovate and improve their products and services using diverse approaches.
- Generate social benefits: emission reductions, decrease in road accidents, improving the quality of road services via their infrastructures, etc.
- Build the foundations for 'Smart Public Procurement' worldwide, the natural evolution of the existing 'Green Public Procurement' towards a broader vision of Smart Roads.

As a first stage, the Smart Road Labelling will focus on three issues – to be extended in the future -:

- **Sustainability labelling** of road infrastructures, taking into account the three pillars of sustainability: environmental, social and economic.
- Sustainability **labelling of mobility management practices**, from a similar three-pillar perspective.
- **Safety labelling** of road infrastructure management and equipment.

Although it is well known that mobility and road safety are included within the social aspects of sustainability, the author supports addressing them individually.

3.   Labelling Smart Roads: Sustainability of road infrastructure

Environmental labelling is, according to ISO 14020, a set of voluntary tools aiming at stimulating demand of products and services with minor environmental costs offering relevant information on its life-cycle in order to satisfy environmental information demand from the purchasers' side. The environmental impact and effects of products requesting eco-labelling are determined through a Life-Cycle Assessment –LCA– (evaluating its interactions with the environment, including energy and natural resources). In short, a voluntary environmental assessment and qualification mechanism officially certifies that a product of service is considered as being more environmentally efficient than others within a certain category.

Several types of eco-labels have been regulated by international and national systems; **none of them for road infrastructure**.

At the EU level, the *European Ecolabel* is the most relevant one. The objective of the EU Ecolabelling System involves promoting products capable of reducing adverse environmental effects, in comparison to other products of the same category, hence contributing to an efficient use of resources and a high level of environmental protection. The European Union created the Ecolabelling voluntary system through the European

Council's Regulation 880/92, of 23 March 1992, relating to an eco-label concession community service (DOCE L 99, of 11-4-1992) that currently covers 23 different product groups.

A good example beyond Europe is the **Greenroads** initiative (www.greenroads.us). Promoted by the University of Washington and CH2MHill in the US, *Greenroads* is a voluntary classification system. *Greenroads* provides a classification of roads based on environmental conditions and is applicable to new as well as to restored roads (but does not cover the exploitation or de-construction phases). A certain number of points are awarded based on the roads' compliance with an established set of requirements. The overall rating obtained by each road may be used to certify projects with a various levels of "environmental sustainability",

Other administrations such as, 'VicRoads', the Road Administration of Victoria (Australia), have developed a similar sustainability assessment tool for road construction projects called **INVEST** (*Integrated VicRoads Environmental Sustainability Tool*).

So far no effort i) has integrated the three layers of road sustainability (environmental, social and economic perspectives); ii) nor has covered the full life cycle of a road infrastructure (planning & design, construction, operation & maintenance, deconstruction); iii) nor has gained worldwide acceptance.

Labelling the sustainability of Smart Roads is a way to create an appropriate regulatory environment in the long-term, a goal that requires a sustained dialogue with stakeholders, road authorities and standardization bodies.

The spread of a voluntary labelling system in public and private procurement practices in the road sector would bring a **number of advantages**:

- The proposed label would bring to reality a comprehensive road sustainability labelling system **immediately applicable to all types of road networks** and to public procurement practices.
- The new label would allow an **objective ranking** and comparison of road infrastructure sustainability options.
- An international entity, coordinating with national certification agencies, would make the system a global market standard.
- The new label would help road agencies to define road infrastructure planning, traffic and road charging policies at the international and/or national level.
- In addition, this label would provide solid inputs for the further development of green public procurement practices.

- The promoters of such label would exert global leadership in the sustainability labelling and green procurement arena by creating a voluntary certification standard scalable to other regions of the world.

The definition of the labelling process requires the following steps:

1. Definition of indicators and criteria for labelling smart roads on environmental issues & energy consumption during the whole road life-cycle.
2. Definition of indicators and criteria for labelling smart roads on social aspects during the whole road life-cycle.
3. Definition of indicators and criteria for labelling smart roads on economic aspects during the whole road life-cycle.
4. Development of Smart Roads labelling procedure: "how to test" and "how to issue" the label.

4. Labelling Smart Roads: Sustainability in mobility management practices

Following the limitations of the existing labelling procedures, this paper also highlights the importance to develop a 'mobility management' labelling, following a similar approach to the one described earlier.

This labelling would be conceived to advance towards the reduction and internalization of road transport external costs. In short, it intends to develop an innovative system for assessing traffic management strategies, in order to promote active sustainability policies and cost internalization strategies.

The labelling requires collecting a high and accurate flow of information on traffic congestion, emission levels, road incidences and a wide range of sustainability indicators associated to road transport. The information should then be translated into a labelling code consisting of six colours (from the worst possible sustainability conditions to the best possible sustainability conditions) that would serve as a real-time descriptor of the sustainability impact of road traffic in a particular area.

This code aims to become a visual and easy-to-understand way to present technical information to both the general public and the road users, allowing comparisons and conveying expectations about traffic conditions on road networks.

The generalization of the usage of a voluntary certification system in public and private procurement practices in the mobility management sector would bring a number of advantages:

- Bringing to reality a comprehensive system immediately applicable to all mobility management strategies and to public procurement practices.
- An international entity would coordinate national certification agencies to make the system a standard in the market.
- Road operators and environmental authorities to work with more precise and reliable information to reduce congestion and emissions associated with road transport.
- Users could evaluate their traffic sustainability footprint and would be able to choose the most efficient option reducing travel times and fuel consumption.
- Emergency services would act more effectively and transportation companies would be more competitive and environmentally friendly.

The definition of the labelling process requires in this case only two steps:

1. Definition of indicators and criteria for labelling mobility management procedures.
2. Development of Smart Roads labelling procedure: "how to test" and "how to issue" the label.

5.   Labelling Smart Roads: Safety

Although there are some initial approaches for the safety ranking of roads on the way (e.g. IRAP, EURORAP), an all-encompassing procedure for the **safety labelling of a road network is not available yet**.

Safety should be considered in all stages of road life cycle. Tools, strategies and different methodologies have been developed, and successfully tested, for introducing safety considerations and implications during planning, design, construction and management (including operation and maintenance) of roads. Safety management should start with a safety impact assessment before a decision is made to build a new road. Safety audit at the design and construction stage is needed to ensure all aspects of detailed design that might affect safety are addressed.

Once the road is built, road authorities have a responsibility to ensure its safe operation. This is best done through a combination of accident investigation and on-road inspection to enable cost effective remedial programs to be developed; many tools exist to support these activities.

As an example of supra-national approaches, the following EU Directives have been produced in the field of infrastructural road safety:

- Directive 2008/96/EC of the European Parliament and of the Council of 19 November 2008 on road infrastructure safety management.

- Directive 2004/54/EC of the European Parliament and of the Council of 29 April 2004 on minimum safety requirements for tunnels in the Trans-European Road Network.

It is very relevant to develop a safety labelling strategy for Smart Roads, considering not only the fulfilment of the requirements set out by the EU Directives 2008/96 and 2004/54 – both in the Trans European Road Network, where they are compulsory, and in secondary networks -, but also for the provision of high-quality standard road equipment (e.g. the safest barriers, the most advanced road signs, high-durability road markings, new technology lighting, etc.). The process will define a range of labels according to the level of safety that the infrastructure is providing to road users.

The generalization of the usage of a voluntary safety certification system would bring a number of advantages:

- The proposed label would bring to reality a comprehensive safety labelling system immediately applicable to all strategies and to public procurement practices.
- An international entity should coordinate national certification agencies to make the system a standard in the market.
- Road operators would have more precise and reliable information on safety standard of road infrastructure and equipment.
- Users would be able to know the safety ranking of the road network, thus allowing them to choose the safest option which reduces risks.

The definition of the labelling process requires the following steps:

1. Definition of indicators and criteria for consideration of safety in planning process (road safety impact assessment).
2. Definition of indicators and criteria for consideration of safety in design process (road safety audit).
3. Definition of indicators and criteria for consideration of safety in the operation of existing roads (road safety audit and management of safety of roads).
4. Definition of indicators and criteria for consideration of safety in tunnels.
5. Definition of indicators and criteria for consideration of safety in road equipment.
6. Development of Smart Roads labelling procedure: "how to test" and "how to issue" the label.

6. Labelling Smart Roads & Public Procurement

Reviewing the situation in the European Union as an example, it should be noted that labelling and public procurement are closely linked:

- The EU Ecolabel is useful to identify products and services that have a reduced environmental impact throughout their life cycle, from the extraction of raw material through to production, use and disposal. Recognised throughout Europe, the EU Ecolabel is a voluntary label promoting reliable environmental excellence.

- Green Public Procurement (GPP) is a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured. GPP is a voluntary instrument, which means that Member States and public authorities can determine the extent to which they implement it.

Following the existing link between the EU Ecolabel and Green Public Procurement, the Smart Roads Labelling proposed in the previous sections would lead to Smart Public Procurement in the field of road infrastructures.

7. Conclusions

When promoting the 'Smart Transportation Infrastructures of the Future', the Smart Transportation Alliance (STA) has always considered Smart Roads a crucial element of the equation.

In this context, the existence of a Smart Road Labelling System would highly facilitate the achievement of the goals proposed in this document.

In doing so, STA firmly believes that 'measuring' the sustainability performance of road infrastructures will contribute to a safer, smarter and more sustainable transport system.