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Life cycle engineering for roads (LCE4ROADS), the new sustainability certification system for roads from the LCE4ROADS FP7 project

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Abstract

There are many initiatives in the market capable to assess some aspects of sustainability for roads (mainly environmental). For instance, in America it should be noted the Greenroads, Envision and Invest certification systems. In Europe, it must be highlighted some sustainability assessment systems such as Ceequal in UK as well as rating and awards scheme for civil engineering or many tools to evaluate CO₂ and Carbon Footprint, for example, the Dutch CO₂ Performance Ladder.

However, a complete evaluation of sustainability has not been implemented yet as a consequence of that some approaches do not cover all life cycle phases or all sustainability pillars. What is more, there is a lack of regulation in terms of a framework for sustainability assessment of civil constructions, for instance, CENTC 350 is still under development. In addition, there are regional peculiarities which are not always considered in the evaluation systems and sometimes there are some stakeholders refusing the idea of road comparison. The EC by means of the Joint Research Centre (DG-JRC) is developing the Green Public Procurement Criteria (GPP) for design, construction and maintenance of roads, as useful method for the pre-selection criteria for contractors and for ensuring compliance of performance.

This paper summarizes the new sustainability certification system for roads named “LCE4ROADS”, under development as part of the FP7 project: “Life Cycle Engineering approach to develop a novel EU-harmonized sustainability certification system for cost-effective, safer and greener road infrastructures”.

LCE4ROADS will integrate by a Life Cycle Engineering (LCE) approach, all the aspects of sustainability (Environmental, Economic, Social, Technical) to assess roads projects and works (both new construction and rehabilitation/maintenance) with the final goal of creating a holistic and EU-harmonized methodology to increase the sustainability roads.

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The certification system developed is based on current EN and ISO standards for sustainability in construction (EN15804) and LCA and LCC (ISO 14040-44 and ISO15686) and considers previous developments from other research projects like MIRAVEC, EVITA, COST 354 among others.

Key aspects at European level like the adaptation and resilience to Climate Change and the implementation of freight corridors (the so called TEN-T: Trans European Transport Network) will be considered in this new certification system.

With the goal of refining the certification system and the parameters and key performance indicators to be considered, it should be mentioned that LCE4ROADS has been already presented to different key stakeholders such as:

- National and Regional Road Authorities in six EU countries (France, The Netherlands, Spain, Germany, Sweden, Poland) and in Turkey (The Turkish Ministry of Transport (KGM) is partner of the FP7 Project).
- The European Commission (DG Research, DG Environment, DG JRC, and DG Move-Transport)
- Sectorial Platforms and Associations like the European Committee for Standardization (CEN), The European Road Federation (ERF), the Spanish Construction Technology Platform (mirror of the European ECTP) among others.

The US Federal Highway Administration (FHWA) is also interested in this topic and is working closely to the FP7 project team (the EC selected the project to collaborate with the most important transport research center in America).

The feedback received for future implementation from the key stakeholders has been taken into consideration to modify the scope of the certification system, the phases covered and the certification moments.

This system, together with a guide for application and a multi-criteria software tool to be developed could be really useful for future procurement and GPP processes in Europe.

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1. Introduction

The concept of the LCE4ROADS sustainability certification system arises from the necessity of a holistic and EU-harmonized certification system that includes the three pillars of sustainability (environmental, economic and social), and all the phases of the road lifespan, from planning to design & construction, operation (use), maintenance and end of life.

The integration of all these aspects and phases was carried out in this research following a Life Cycle Engineering (LCE) approach, which includes the assessment of environmental impacts in conjunction with the economic ones under consideration of technical boundary conditions.

This will be useful for the assessment of the sustainability of future and existing road infrastructures:

- Future because following the developed certification system it will be feasible to assess road projects from the very beginning.
- Existing because in an aged road network like the European, maintenance and rehabilitation projects will be more than necessary in the very short term, and it will be again feasible to assess their sustainability at an early stage.

This paper summarizes the methodology developed to create this new certification system (which will be refined and improved as part of the FP7 LCE4ROADS “Life Cycle Engineering approach to develop a novel EU-harmonized sustainability certification system for cost-effective, safer and greener road infrastructures” project development: www.lce4roads.eu), the collaborations and links created and the main results achieved so far: definitive methodology, first version of the multi-criteria software tool, the standardization activities and roadmap towards the extension of the project.

It should be mentioned that one of the topics under discussion in the project is the introduction of the operation phase (also known as use phase) in the assessment carried out. This task is under development and is linked to the American National Sustainable Pavement Consortium (NSPC) where Virginia Tech, the Federal Highway Administration and the Virginia Department of Transportation are collaborating with the project coordinator ACCIONA Infraestructuras, and the LCE4ROADS partners: BAST (The German Federal Highway Research Institute), TNO (Netherlands Organisation for Applied Scientific Research) and IFSTTAR (French Institute of Science and Technology for Transport Development and Networks).

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