The impact of ITS on CO_2 emissions – An analysis of effect chains

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1. INTRODUCTION

Information and communication technologies (ICT) applied to the transport sector are expected to play a significant role in reducing the carbon dioxide (CO_2) emissions emitted by the transport sector. To foster the development and deployment of these technologies, known as “intelligent transport systems” (ITS), and direct the development into promising tracks their potential impact on CO_2 emissions needs to be known in advance. Therefore a methodology for a reliable environmental evaluation is crucial.

Transport and traffic models are already used to analyse impacts of ITS. They can be combined with emission models to estimate the impact of ITS on CO_2. A framework architecture, including the necessary models and specific interfaces between them, would help in applying such an assessment in a standardised way. To develop such an assessment methodology is the aim of the European project Amitran (“Assessment methodologies for ICT in multi-modal transport from User Behaviour to CO_2 reduction”), a project partly funded by the European Commission within the 7th Framework Program.

In contrast to existing approaches, Amitran offers an improved assessment methodology for assessing the effects of ITS on energy efficiency by looking at the effect chains and by offering one standardised methodology for all existing or conceivable ITS, for all surface transport modes, freight and passenger traffic, and on all geographical scales (regional,

national, European). To address effects on different geographical scales, Amitran includes a scaling up methodology to translate local effects to the European level. To make the methodology as general as possible, the models needed as part of the methodology and the interfaces between them are described in a generic way. Due to these open interfaces different models can be used within the framework.

The basis for the Amitran framework is to understand the mechanisms by which ITS act upon the traffic and, hence, on emissions. These mechanisms have to be identified and assessed regarding their impact on CO_2 emissions. Therefore a methodology has been developed, which takes into account the whole effect chain from the impact of ITS on transport demand and traffic flow to the resulting changes in CO_2 emissions. Additionally a classification of systems with respect to their potential impact on CO_2 emissions has been derived from an expert survey. These outcomes are the objectives addressed in this paper.

2. METHODOLOGY

Intelligent transport systems are not influencing CO_2 emissions directly but exert their influence indirectly by influencing certain transport characteristics like traffic demand, vehicle conditions, driver behaviour, and, thus, also traffic flow. In order to understand how the influence takes place these traffic and transport characteristics are separated into so called *transport processes*. These processes can be described by factors and parameters, which can be distinguished into four groups:

(1) parameters describing traffic demand,
(2) parameters describing driving behaviour and vehicle conditions,
(3) indirect factors, and
(4) long term effects.

By splitting the effect chain of ITS on CO_2 emissions into its parts, a more detailed assessment and – later on in the Amitran methodology – modelling is possible.

Starting point for such an assessment is a collection and classification of ITS. A review of available evidence for impacts of ITS served as the basis for the definition of factors and parameters. To make sure that all relevant influences of ITS are identified, an expert survey was conducted with some 20 experts judging the impact of more than 50 ITS. Finally, the impact of all ITS was discussed by selected experts.

The outcome of this process, which will be described in more detail in this technical paper, is a list of ITS, assigned to the six categories suggested by the ECOSTAND project (a Joint Task Force of Europe, Japan and USA on setting a common research agenda for assessing impact

of ITS on energy efficiency), and divided into sub-categories according to their function and application area, a list of factors and parameters which describe the transport processes potentially influenced by ITS, and an estimate of the severity of the impact of ITS on specific parameters and factors. The principle is illustrated in Figure 1.

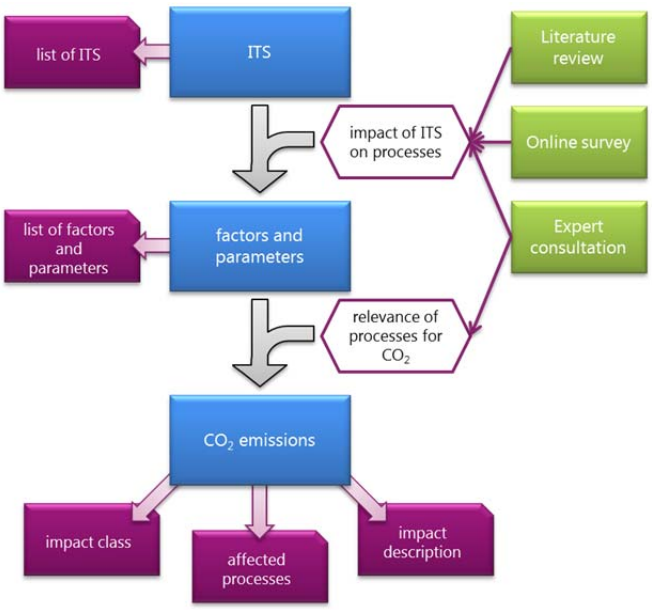

Figure 1: Illustration of system assessment

3. OUTLOOK

The analysis of effect chains of ITS with respect to transport processes and CO_2 emissions described in the paper serves as the basis for the development of a general and standardised assessment methodology for ITS. The EU project Amitran involves stakeholders involved in the development, deployment, and assessment of ITS, ITS end users, and other decision makers related to ITS in this development process to achieve a sound and broadly recognised and accepted methodology. The project is currently in its crucial stage to specify and implement the methodology and will introduce the results in a workshop in 2014.

4. ACKNOWLEDGMENT

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