User needs for a standardized CO2 emission assessment methodology for Intelligent Transport Systems

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Abstract

The Amitran FP7 project will define a reference methodology to assess the impact of intelligent transport systems on CO2 emissions. The methodology is intended to be used as a reference by future projects and covers both passenger and freight transport. The project will lead to a validated methodology, described in a handbook and complemented by an online checklist. The current paper focuses on the user needs assessment. To ensure the usefulness of the future methodology for potential users, the user needs are identified with the use of interviews, a survey and a workshop. This analysis unveils the demand for a standardised procedure for the assessment of impacts on traveler behaviour and CO2 emissions related to the deployment of ICT in transport. Stakeholders from all fields related to ITS development, deployment, and use from all over Europe are included in the analysis.

Keywords:

User needs, CO2 emissions, assessment methodology, ITS

Introduction

Intelligent Transport Systems (ITS) is a rapidly growing field in which numerous technologies and applications are under development, and a substantial number is already on the market. Despite this, there is no consistent methodology allowing scientists to estimate the potential CO2 emissions reductions resulting from the deployment of ITS technologies. At the same time, this information is of greatest importance for decision makers, for example, in the context of climate change agreements.

Project objectives

The Amitran FP7 project aims to develop a framework for the evaluation of the effects of ICT measures in traffic and transport on energy efficiency and CO_2 emissions. The main objectives of the project are the following:

- Develop a CO_2 assessment methodology for ICT measures that includes multimodal passenger and freight transport and takes into account the whole chain of effects (from user behaviour to CO_2 production);
- Design open interfaces for models and simulation tools implementing the project's methodology;
- Establish a generic scaling up methodology and publicly available database with statistics to translate local effects into the European level;
- Validate the proposed methodology and its implementation using data available from other projects or studies;
- Produce an online checklist and a handbook that can be used as a reference by future projects.

User needs in the Amitran project

The Framework Programme 7 (FP7) project, which started in November 2011, will only reach its ambitious goals, if the needs of the potential users of the methodology are known and formulated as requirements for the development of the assessment framework. The activities in the first part of the project, hence, concern the identification of user needs and use cases, which are related to the CO_2 assessment methodology to be developed during the project. Two steps are necessary for the user needs assessment; firstly, the potential stakeholders have to be identified; secondly, the needs of these stakeholders with regards to an assessment methodology for CO_2 emissions have to be analyzed. The objectives of the project will become feasible when the knowledge of the existing, most often used assessment models and their importance for the stakeholders is available. Innovation, technological developments and other drivers may affect the performance of the transport system and create new potential for better use of ICT. The methodology for the user needs assessment with its different steps is illustrated in **Figure 1** and explained in the following section.
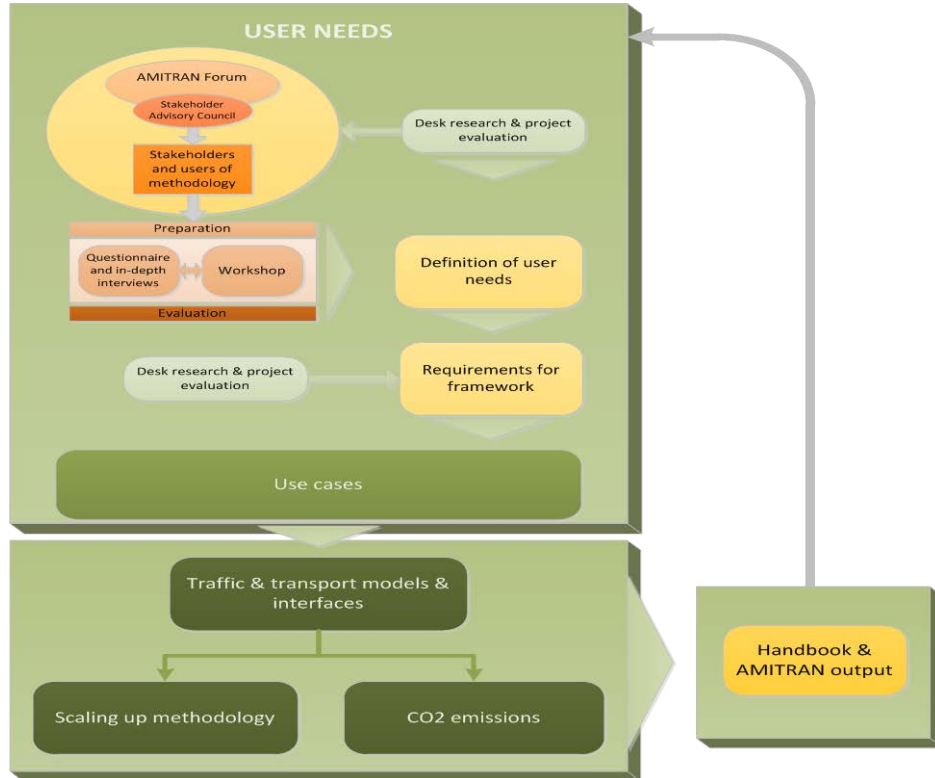
Figure 1- User needs in the AMITRAN project approach

Methodology for user needs assessment

The methodology for the user needs assessment was divided in two main parts:

1) *User needs identification*

- an initial workshop with selected stakeholders - The workshop served as the foundation for further user needs assessment. The Amitran outline underwent the first screening in order to identify crucial issues as well as identify the key stakeholder groups.

- a broad stakeholder survey - A broad audience of potential stakeholders has been addressed with the use of an online survey. More than 300 potential stakeholders received invitations to fill in the online questionnaire. More than 60 completed questionnaires were received and evaluated.

- interviews with stakeholders of particular relevance - Following the online survey, interviews were conducted with selected stakeholders. The main aim of the interviews was to gain deeper insight into specific topics from the questionnaire. Additionally, the stakeholder groups underrepresented in the online survey were addressed more

thoroughly.

- desk research and inputs from other related FP7 projects – In parallel to the workshop, survey and interviews, an analysis of the existing relevant projects was done and links to the user needs were made.

2) *Derivation of requirements for the assessment framework*

Next step was analysis of the results of the questionnaires, interviews and workshop. This step resulted in guidelines for developing the CO_2 assessment framework later in the project.

Key issues

The user needs assessment tackled five topics of key importance to Amitran:
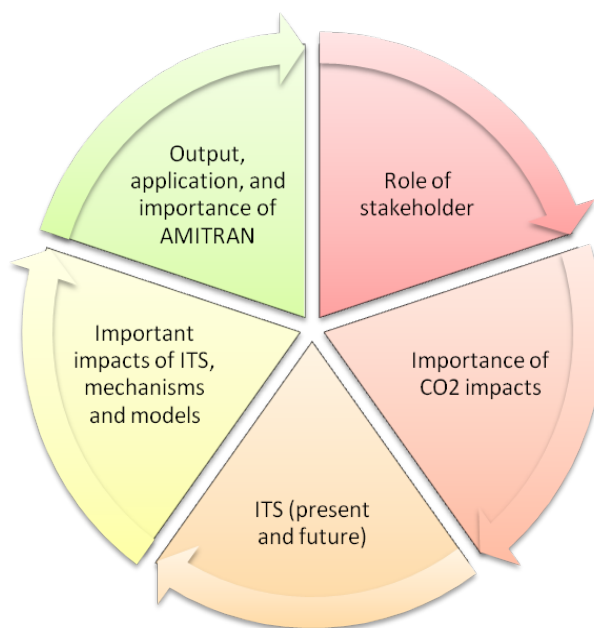

Figure 2: User needs assessment topics

- Stakeholders: Who are the major stakeholders and what are their major needs for Amitran?
- Importance of CO_2 impacts: In which context does Amitran have to be seen? Should Amitran focus on CO_2 only, or could it be advisable to make the methodology open for extensions to other types of emissions and highlight potential synergies to issues like traffic quality (efficiency) and economic appraisal?

- ITS (present and future): Which ITS are of particular relevance for the CO_2 assessment? Are any changes expected that should be considered by Amitran?
- Important impacts of ITS, mechanisms and models: Which mechanisms leading to CO_2 emission are changed by the deployment of ITS and how are they reflected in the Amitran methodology?
- Output, application, and importance of Amitran: The result of Amitran and its' application has to be presented in a useful way for the users. What should the output look like and how should tools be designed to meet the users' demands

Discussion on the roles of stakeholders

The user needs assessment identified three categories of stakeholder groups (as presented in Figure 2):

- Stakeholders requiring the use of Amitran (e.g. public authorities).
- Stakeholders influenced by the output of Amitran (e.g. ITS End Users).
- The actual users of the methodology (mainly research and consulting).

Some stakeholders can belong to several of these categories (e.g. ITS Developers).

Stakeholders related to the development and production of ITS can play different roles: they might ask for the application of Amitran to test their systems (similar to authorities), they might conduct the assessment themselves, and they may be influenced by the results of Amitran (at least indirectly by either legislation, subsidies, or the end users).

High level decision makers in policy and ITS development and deployment are expected to benefit most from Amitran. They are expected to use the Amitran output to compare different measures involving ITS or to compare competing systems. These decision makers will most likely not conduct the assessment themselves, but grant contracts to consultancies or research facilities for the application of the methodology. All geographical scales (from local to European) and all categories of ITS are of potential relevance to these decision makers and have to be addressed by Amitran. Cooperative systems and intermodal systems will gain importance.
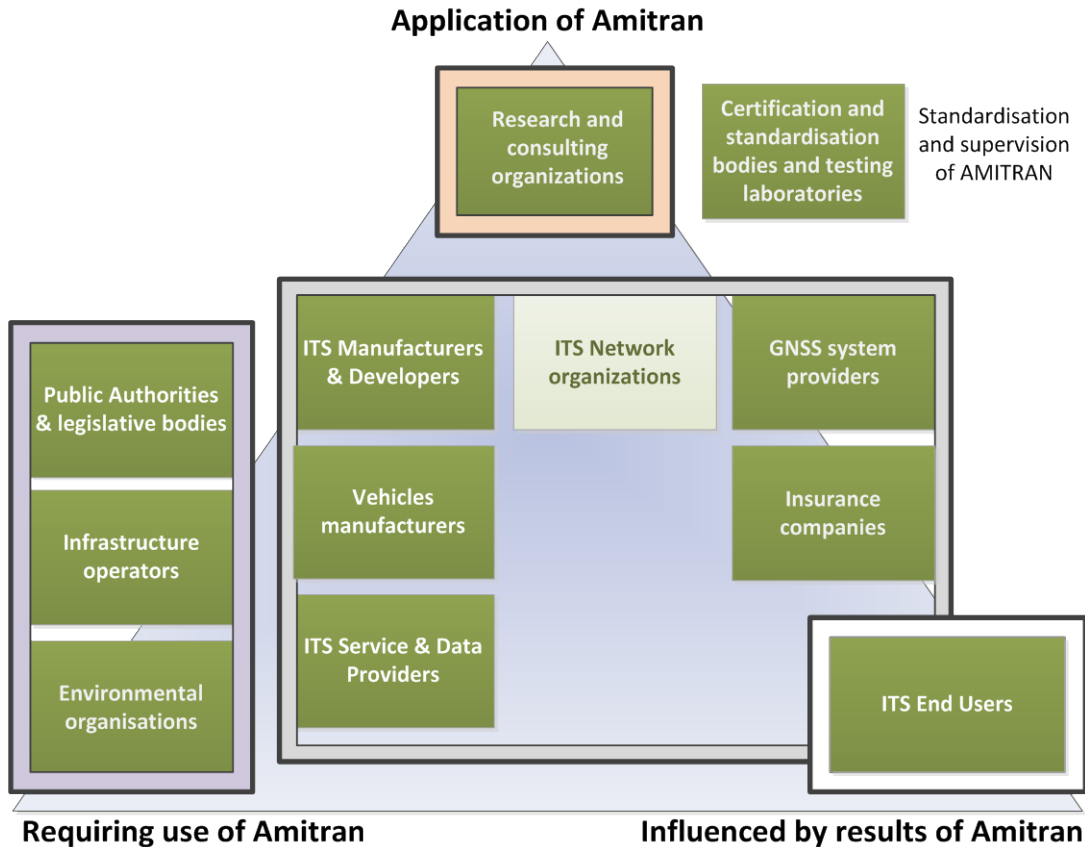
Figure 3 - Stakeholder groups and their role in relation to Amitran

Amitran framework and methodology user needs

The variety of stakeholders participating in the user needs assessment resulted in varying emphasis on certain points. The user needs assessment generally supports the high relevance of a CO_2 emission assessment methodology for ICT in transport. There are high expectations for such a methodology. Most important appears to be the definition of a standardised methodology which is accepted by all relevant stakeholders (as described above). It should be transparent and accurate. The reliability and standardisation of assessment methodologies is seen as even more important than the reduction of CO_2 emissions itself, i.e. Amitran could provide the basis for extrinsic motivations to reduce CO_2 emissions (e.g. financial incentives for proven reductions). At present, the decisions on ITS development and deployment cannot be easily justified. A forum for experiences with such a methodology (Amitran Forum) is welcomed, but not of particular importance to most stakeholders.

The primary users of Amitran are foreseen to be high level authorities and decision makers,

who have to compare different measures aiming at CO2 emission reductions. This also stresses the importance of agreeing on the methodology that enables the comparison of assessments from different systems and areas. While the assessment is initiated mainly by decision makers, the results of Amitran have to be accepted and regarded as relevant also by ITS End Users. The decision makers requiring the application of Amitran will commonly contract the assessment itself to research and consulting organisations.

No clear preference was observed with regard to systems and geographical scales. Amitran should cover all ranges of ITS and all spatial dimensions of emissions from local to national and European level, as well as all transport modes. Cooperative systems and the opportunities arising from the Internet of Things will determine the ITS landscape of the future. Intermodality and multimodality will gain increasing importance.

It is also apparent that by focusing on CO2 emissions only, Amitran addresses one aspect of system assessment relevant to the stakeholders. The survey respondents indicated that traffic quality and safety will remain a top priority, though emissions, both locally relevant and globally relevant, will get increasing attention in the future. For companies in the freight sector, efficiency gains are of primary importance. These usually come along with CO2 emission reductions. Since CO2 emission calculations require also the estimation of changes in the transport process, usually many of these other aspects will be produced as a side result of Amitran.

A major part of stakeholders use models to assess CO2. They have occurred, however, problems when using models. It is concluded, therefore, that Amitran should open new opportunities to the use of these models. A wide range of gaps is detected when dealing with models. Examples of such gaps include among others the lack of methods and models to assess the impacts in CO2 reduction including long term effects of specific ITS (e.g. cooperative systems or systems addressing driver/user behaviour change), the estimation of changes in emissions due to a specific measure, models chaining different transport modes, insufficient harmonisation and standardisation of different essential CO2 assessment resources at the European level, data accessibility, reliability and accuracy. The development of interfaces seems to be a pertinent goal to achieve easier integration of different models. This goal clearly contributes to a higher use of more complex and ambitious models. This need fits well into the design of Amitran.

Several concerns have been raised on the suitability of available models to assess the ITS impacts on CO2 emission. Some of the aspects will be addressed by Amitran.

Finally, low costs of the methodology are the least important aspect according to the

stakeholders. An extensive and high quality methodology is required rather than a quick-and-dirty approach. However, it was not assessed to which extent the users would be willing to cover the resulting costs.

User requirements

All in all, the user requirements on the framework and methodology of Amitran are in line with the project goals. From the stakeholders' input, the following points can be extracted which have to be addressed during the Amitran development:

- Standardised and accepted CO_2 assessment methodology
- Broad scope concerning geographical scale and transport modes
- Particular attention to cooperative systems and intermodality
- Transparent and flexible interfaces to support best use of available and future models used for the assessment
- Consideration of the achievable accuracy of models and possible gaps in the assessment due to insufficient assessment tools.
- Stakeholders have different needs, which should be addressed in a dedicated manner.

Next steps

The requirements on the assessment framework identified in consequence of the user needs evaluation will be a guideline for the further steps in AMITRAN. The project will address these requirements in the framework definition. The objective of defining the framework is to develop a methodology for the classification of ITS, an ITS typology, based on the affected parameters and process stages. Use cases will be derived for and applied to the modeling framework. Furthermore, these use cases will be used for the validation of the findings of both the modeling framework with the integrated models as well as of the ITS typology developed. The results of the user needs assessment will be summarized in the project handbook. Finally, the project outcomes will be aimed at addressing the current stakeholder needs and serving as decision support to stakeholders.

References

1. Annex 1 Description of Work (DoW) AMITRAN project (2011).
2. AMITRAN project factsheet (2011). Available at www.amitran.eu
3. Amitran Consortium (2013). Fullpaper Format. Amitran Project. Available at www.amitran.eu.