Amitran
CO₂ Assessment Methodology for ICT in Transport

Assessment Methodologies for ICT in multimodal transport from User Behaviour to CO_2 reduction

European Commission
Information Society and Media

The Amitran project will define a reference methodology to assess the impact of intelligent transport systems on CO_2 emissions. The methodology shall be used as a reference by future projects and covers both passenger and freight transport through a comprehensive *well-to-wheel* approach. Different modes are addressed: road, rail, and shipping (short sea and inland navigation).

At a Glance

Project type:
Collaborative project (generic)

Programme:
7th EU Framework Programme

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Project partners:
- DLR
- Tecnalia
- PTV
- ERTICO - ITS Europe
- ECORYS
- TEAMNET

Duration:
30 months (1/11/ 2011 to 30/4/2014)

Total cost and EU funding:
€2,63 Million
(EU contribution: €1,9 Million)

Project website:
www.amitran.eu (available soon)

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Assessing CO_2 emission reductions from ITS

The calculation of CO_2 emissions arising from the transport sector is a challenging task. The mobility system has numerous components (driver, vehicle, infrastructure, traffic centre, operator, etc.) and stages (energy production, vehicle operation, maintenance, etc.), each with an associated carbon footprint. Adding up individual emissions requires a rigorous approach.
The Amitran project aims to "connect the dots" by developing a reference methodology to correctly estimate *well-to-wheel* emission reductions achieved by information and communication technologies (ICT) applied to the transport sector, known as "intelligent transport systems" (ITS).
Specifically, Amitran aims to:

- 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.

Although there are several models already available, these tools usually concentrate on specific components of the mobility system and are not able to provide a holistic picture.

For example, VISSIM is a microscopic multimodal traffic flow simulation model that can be used in conjunction with an emissions model to estimate CO_2 emissions based on the characteristics of individual road users and vehicles. Although assembling the two models can yield very precise and intricate emission estimations, these tools are not suitable to model changes in human behaviour brought about by the deployment of intelligent transport systems. Other models would need to be added in order to achieve a comprehensive framework capable of addressing the whole chain of effects.

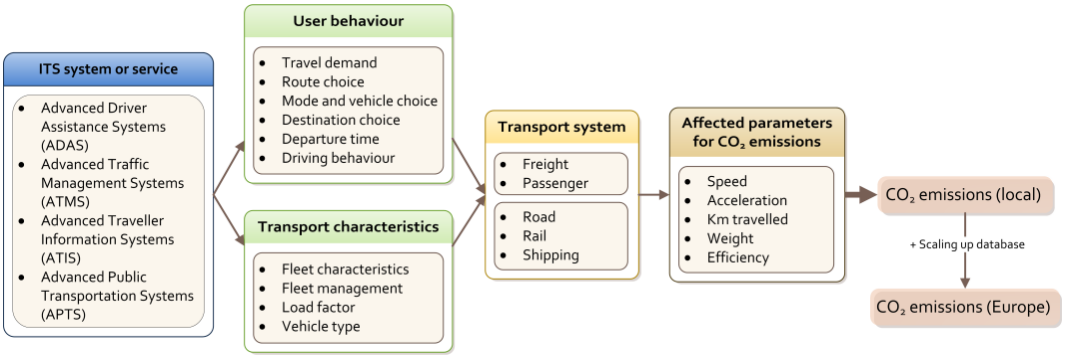
This is the challenge Amitran proposes to solve: to develop the interfaces between existing models so they can "communicate" with each other and so enable the development of a standard methodology to assess CO_2 reductions achieved by ITS on a *well-to-wheel* basis.

An inclusive framework

One of the innovations in Amitran is its encompassing scope. The CO_2 assessment methodology for ITS will address both passenger and freight transport through a multimodal approach that includes road, rail, and ship transport (specifically, short sea and inland navigation; long-haul maritime transport is excluded).

ICT may impact transport CO_2 emissions through multiple pathways (see figure below, which portrays some examples of ITS systems and the CO_2 related factors they influence). Starting from the pre-trip phase, ICT might influence destination choice, route choice or even trip generation altogether. Mode choice is also subject to change, as public transport, for example, usually becomes more appealing once passengers are aware of expected schedules, fares and routes. During the on-trip phase, a driver with a navigation device might be prompted to adjust his or her route, or receive advice on how to adopt a more environmentally friendly driving style. Similarly, a public transport user who misses a transport connection will be informed about the next departure or be suggested to switch to another line or mode if such a strategy saves time. Several ITS applications, particularly those that link infrastructure with vehicles and users, also influence CO_2 emissions. Green waves at intersections, for example, result in 5% to 10% reduction in emissions, particularly if compact platoons are formed. For the freight sector, factors such as vehicle choice, load factor and, more importantly, the whole fleet management, have a substantial effect on fuel consumption and carbon emissions. Lastly, in the post-trip phase, the user receives feedback about his or her performance and recommendations on how to tackle driving inefficiencies.

Because this web of relationships is so complex, developing a sound framework is vital. System boundaries have to be defined: which components should be included or excluded from the modelling framework? While the impact of different powertrains is obviously needed (CO_2 emitted during electricity generation required by e-cars vs. exhaust emissions produced by internal combustion engines), the carbon footprint of the infrastructure, which is similar regardless of the vehicle type, should not in principle be included in the model.



Project work plan

Amitran's work plan follows the system engineering V-model path.

- The project starts (work package 2, WP2, led by DLR) with the definition of user needs and use cases based on the active participation by relevant stakeholders.
- In WP3, led by DLR, ITS applications will be grouped into categories according to the strength of their effect on CO_2 emissions and according to the parameters through which their influence is exerted.
- Based on the results from these WPs, the next stage (WP4, led by TNO) involves the definition of the framework architecture and related model requirements. In addition, a methodology to scale up local results to the European level is proposed.
- Led by PTV, WP5 extends WP4 by developing the interfaces between existing models and by identifying any gaps to be filled.
- Validation tasks are coordinated by Tecnalia in WP6 by comparing Amitran results with those from selected research projects dealing with ITS. An impact assessment is then performed using the methodology developed in WP5 to demonstrate the effects of ITS on CO_2 emissions, energy efficiency, driver behaviour, and traffic flow.
- Led by ERTICO, the final result of Amitran will be a checklist and a handbook to be used for methodological reference by future projects when assessing ITS benefits, as well as guidelines on how to conduct cost-benefit and cost-effectiveness analyses of ITS deployment. These documents will be publicly available online along with supporting materials.