ICT-Emissions

Draft Exploitation Plan

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Document Control Page

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Contents

List of tables

Executive Summary

The draft exploitation plan (D9.7.1) details approaches, target groups and objectives identified by the consortium for the exploitation of the project main results on a longer term after the end of ICT-Emissions.

ICT-Emissions has developed and validated a set of products and innovative services for end-users active in the field of transport and environmental impact assessment. These products are here briefly described, including what end users can benefit from them.

We deem that the capacity to assess the real-live impact of ICT/ITS applications on CO_2 emissions holds the potential for a substantial exploitation and market penetration. The consortium acknowledges that various kind of stakeholders can benefit from ICT-Emissions products in their actual business or for future use. Their exploitation needs may largely differ though, for their intentions vary according to their organisational structure (e.g. universities, commercial companies, cities, etc), and commercial strategy (e.g. software developer, automotive industry, etc).

Building upon the Exploitation strategy as defined in the Dissemination strategy of the project, this Exploitation plan identifies exploitation opportunities by various target groups, type of products and components of the transport systems: infrastructure, vehicle, systems.

The exploitation target groups addressed are:

- Public authorities;

- OEMs and the automotive industry;

- Software companies.

In addition, further potential exploitation groups have been here identified and are addressed. These groups are:

- System suppliers;

- Research and universities.

Exploitation needs have been investigated on two levels:

- among ICT-Emissions consortium members; and

- external stakeholders: Exploitation Advisory group members.

Further to two Exploitation group meetings hold in 2012 and 2013 with consortium partners and external stakeholders, a number of interviews were carried out in the month of October 203 via telephone. Interviews proved that there is a broad potential for the exploitation of the ICT-Emissions products by a broad range of actors.

Exploitation intentions are reported in this document per target group in Chapter 3. An overview of exploitation opportunities and interest in the products of various type of stakeholders is presented in a matrix format in chapter 4.

An updated version of this document D7.9.2 Final exploitation Plan will be produce in Month 36.

1 Exploitation approaches

1.1. ABOUT EXPLOITATION

ICT-Emissions is producing knowledge and know how while developing concrete outputs. This capacity to assess the real-live impact of ICT/ITS applications on CO_2 emissions has the potential for a substantial exploitation and market penetration.

Various kind of stakeholders can benefit from ICT-Emissions products in their actual business or for future use. Their exploitation needs may largely differ though, their intentions vary according to their organisational structure (e.g. universities, commercial companies, cities, etc), and commercial strategy (e.g. software developer, automotive industry, etc).

In this document, the exploitation of the ICT-Emissions products is considered in several ways:

- The direct commercial exploitation of the ICT-Emissions products;

- The integration of the ICT-Emission product into a commercial product;

- The use of ICT Emission product to upgrade, develop and market third products;

- Policy and research exploitation of ICT-Emissions results.

Depending on the type of product from the project and on the type of exploitation considered, various type of entities may be involved in the exploitation.

For that reason we have identified those target groups who might directly benefit from ICT-Emissions products with the aim to investigate their real intentions towards exploitation and future use of these products as such.

Building upon the Exploitation strategy as defined in the Dissemination strategy of the project, this Exploitation plan identifies exploitation opportunities by target groups, type of products and components of the transport systems: infrastructure, vehicle, systems.

The establishment of the Advisory group as part of the Exploitation group has contributed to enable the identification of exploitation opportunities.

It should be noted that ICT-Emissions is releasing publicly most of its finding without restrictions and little barrier for their reuse involving intellectual and property rights for instance. In consequence, this will limit the possibilities to exploit the ICT-Emissions products in a pure commercial or monetary sense.

1.2. EXPLOITATION STRATEGY

1.2.1. EXPLOITATION GROUPS

The ICT-Emissions exploitation groups have been identified in the dissemination strategy (D7.1). These groups are:

- **Public authorities**. Cities are primary beneficiaries of the ICT-Emissions methodology for they have to comply with more stringent EU limit values of CO_2 emissions from the transport sector. This group comprises also the three partner cities in the consortium (Madrid, Rome, and Turin). National and European authorities are also interested in exploiting the results of the projects.

- **OEMs and the automotive industry**. This target group can benefit from developing the simulation tools and methods for powertrain development, but also to obtain knowledge and new R/D capabilities in this new world of vehicle/traffic interface. Automotive manufacturers can see the benefits in maintaining their profile as a low CO_2 manufacturer.

- **Software companies**. For this target group building new tools to be linked to ICT technologies is key in further business development.

In addition, further potential exploitation group has been identified and are addressed here. We are now building a list of contacts for consultation follow up. These groups are:

- System suppliers;

- Research and universities.

Two levels of exploitation have been identified. These are:

- ICT-Emissions consortium members.

Consortium members have a direct interest in the exploitation of the ICT Emissions results. As they represent some of the key target groups for exploitation, their expectations are particularly important to define an exploitation plan. They allow assessing how the different groups they represent (e.g. Universities, commercial companies) have very different exploitation objectives and approaches.

- External stakeholders: Exploitation Advisory group members.

The exploitation advisory group members is made of individuals representing companies and organizations from the main exploitation groups.

To build the exploitation plan, we have consulted directly each contact in our target groups asking them to describe what are their specific exploitation intentions for each of the products (or what their intentions might be).

It should be noted that the exploitation of ICT-Emissions products can - in some cases - be part of a future commercial strategy of a given company and as such not all companies may wish to share information as to their intention in this respect.

1.2.2. EXPLOITATION CONSULTATION

All partners and external stakeholders are asked to identify the product(s) they are interested in and what exploitation/marketing intentions they envisage to adopt in their organisation after the end of the project.

For example, we want to know if cities are really interested in CO_2 benefits of ITS; if ICT-Emissions products can be promoted internally in consortium partner organizations (IVECO, Fiat); if software developers foresee to integrate ICT-Emissions solutions into existing traffic models (AIMSUM, VISSIM) or whether they can use the ICT-Emissions methodology and the enhancements of traffic model functions, etc.

The consultation process was carried out in the month of October 2013. We have conducted short telephone interviews with the contact persons that have been identified in this document for each target group. The response from each interview is summarised per target group in Chapter 4.

2 ICT-Emissions products

Several activities of ICT-Emissions contribute to deliver "products" which are considered lasting outcomes of the project and that can be exploited beyond the life of the project by partners and interested stakeholders.

These are:

- Methodology on the analysis of ICT impacts on road transport emissions;

- Submodules and software interfaces;

- Database (Library) of already simulated situations.

1. The ICT-Emissions methodology on the analysis of ICT impacts on road transport emissions is the first methodology as such to give recommendations on how to enhance simulation modeling tools existing on the market. The methodology consists of a set of guidelines and technical recommendations aimed at improving integration between traffic and emission simulations and validation.

The ICT-Emissions methodology identifies what exact data is needed for the simulations and who can provide these data. How to create a model with the right approach and how to integrate the micro and macro simulations.

The methodology enables third parties to assess the impact on CO_2 emissions of the following ITS systems:

- Traffic management and control;

- Driver behavior change and eco-driving;

- Demand & access management;

- Navigation and travel Information;

- Advanced driver assistance system (ADAS) and other measures.

This methodology can be directly used by traffic experts, city authorities, road operators and other interested parties to develop their own tools and modules in order to assess the impact of ICT measures. It may be also used by university instructors in both transport and engineering sciences to educate new engineers on forthcoming technologies and their impacts. It may be finally used by researchers in the industry and other institutes to understand the impact of their products and further improve their properties. Finally, it can be used by commercial firms developing emission and traffic models in order to further enhance the capability of their models.

2. <u>Submodules and software interfaces</u> of generic application are also expected to be exploitable results of the project. The description of methods and procedures for several of the submodules developed by the project, including the parameterization, the driver simulator, and the energy/emission submodules, as well as interfaces for the communication of traffic and emission models, will be made available to other experts.

    <u>Who can benefit from it</u>? These submodules can either be integrated to transport systems owned by city authorities, tools developed by different researchers, or can be further developed by commercial firms for implementation in their own models, e.g. the partner BM will use the traffic emission modeling for its automotive evaluation and test tools.

    These submodules can be linked to existing traffic models to enhance their modeling capabilities for ICT-relevant energy and emission calculations, and should therefore be of interest by companies developing these models as well as directly by their customers.

3. <u>The database (Library) of already simulated situations</u> is another important result of interest for a large group of actors outside and beyond the project. A number of baseline and ICT-affected situations will be simulated with the modeling structure to be developed for this project.

    <u>Who can benefit from it</u>? The database will be already useful as a guide of the impact of ICT measures for policy makers and cities/operators who do not have the capacity to invest in detailed modeling approaches. In particular the driving patterns included in the database will be an important input to other traffic micro-models, either for application or commercialisation point of view.

4. <u>ICT-Emissions know-how</u> is gained by partners of the projects as well as stakeholders who would follow and study closely the work of the project. This know-how can be offered to third parties lacking these skills for the use and implementation of the above mentioned products.

5. <u>ICT-Emissions results assessing the impact of ITS systems on CO_2 emissions</u> will be of direct interest. They will allow for commercial companies to integrate this results to steer their activity aimed at reducing CO_2 emissions.

    They are of direct interest for authorities at local, national and European level to assess the impact of systems on CO_2 emissions but also to evaluate the relevance and impact of policies and therefore assess the opportunity to define further regulations on CO_2 emissions and road transport.

3 Exploitation opportunities

Exploitation opportunities are assessed for all products in relation to the components of the systems and for all potential exploitation groups.

The identification of the opportunities leads to the identification of some possible activities supporting the preparation of the exploitation of the products beyond the end of the projects. This part of the plan will be significantly strengthened in the final version of this document due in month 36.

3.1. PUBLIC AUTHORITIES

Public authorities at the local, national and European level can have an interest in the exploitation of ICT-Emissions results.

3.1.1. LOCAL AUTHORITIES

The following contact persons have been identified for the local authorities target group:

Table 1: Target group local authority's contact persons

Target group	Name	Organisation
Public authorities	Marco Cianfano	Agenzia Roma Servizi per la Mobilità Srl (representing Rome)
	José del Pino Álvarez	Calle30 (representing Madrid)
	Massimo Cocozza	5T (representing Turin)
	Christian Heimgartner	City of Zürich
	Anton Ruiter	City Rotterdam

The consultation of several local authorities, including some partners of ICT Emissions, show that they have a broad but heterogeneous interest in the exploitation of the projects products.

- **Methodology, Traffic models and CO$_2$ emissions**

Local authorities have a dual interest in the use of traffic models to assess the impact of ITS systems on CO$_2$ emissions.

Their first interest is in the support to build a case for demonstrating the case for investing in ITS towards decision makers. This is in particular true for adaptive traffic control, signal timing and in general **traffic management and control.**

Consultation shows that the interest of the city is directly related to the perspective for investing in ITS systems. If there is a clear perspective, there is a greater interest.

Cities with clear objectives in terms of reduction of CO$_2$ emissions are particularly interested in applying the methodology and using upgraded models to their own local situations. In this respect, it can be expected that all cities which signed up to the **Covenant of Mayors,** and which therefore have committed to reduce by at least 20% their energy efficiency and their CO$_2$ emissions, have a potential interest in the use of the CO$_2$ emissions methodology and the upgraded models.

The increasing importance of energy efficiency challenges and CO$_2$ emissions reduction on the political agenda give tools to practitioners to assess and evaluate the efficiency of the ITS systems in place, including traffic control systems.

It is considered by partner cities that the methodology is sufficient to enable city with in-house modeling know how to implement it on their own. The software development kit provides them support for this. However this cannot be expected by all cities and there will also be a need for consulting services for the implementation of the methodology, either by ICT Emissions partners or by third parties such as simulation software companies.

There is a clear interest from local authorities to exploit the methodology to assess the impact **of demand and access management** policies on CO$_2$ emissions.

Unlike for traffic management and control, the interest of local authorities lies in their ability to assess the impact of a demand and access management policy. This is in this case more a policy decision support tool than and investment decision tool. It is therefore of direct interest for decision makers which creates an extra incentive to exploit the methodology and traffic models for many local situations.

One can expect local authorities to have a significant interest in navigation and travel Information though they may not be the exploitation group which will steer the exploitation of the ICT Emissions methodology for this type of ITS systems.

The interest of local authorities in exploiting tools to better assess the impact of ITS on CO$_2$ emissions is also driven by the competitive advantage it creates for them in

attracting national and supra national financing through schemes which increasingly require to demonstrate the impact on greenhouse gas emissions.

- **Assessment results**

A number of cities express their concern with the difficulty of calibrating traffic models and their inability to reach validated results through modeling. They are in this respect particularly interested by the validation through use cases in ICT-Emissions.

This will increase their interest in exploiting not only these results but the other products of the project.

- **In-vehicle systems: Adaptative cruise control, cooperative adaptative cruise control and adaptative cruise control + car to traffic light communication**

ICT-Emissions work on assessing the impact of adaptative cruise control and the introduction of cooperative mobility in this system is of interest for cities and could make a business case for investing in these system from the perspective of the infrastructure manager.

A small number of front runner cities are considering investing in cooperative systems, i.e. investing on equipping their infrastructure to enable such systems. ICT-Emissions works on modeling the impact of adaptative cruise control, and introducing cooperative systems to support, it may be decisive in validating or not the case for this investment.

There is obvious interest from the local authorities perspective on the methodology and the results of the simulation of the impacts of adaptative cruise control + car traffic light communication. In this case, there is interest in exploiting the results of the simulation but also in the methodology.

The challenge for cities will be their ability to replicate the simulation in their own environment or to hire the competency to do so.

► *Polis will support the exploitation of ICT-Emissions results following the analysis performed above by:*

- *Identifying more cities directly interesting in exploiting these results during and after the project;*

- *Assessing the possibility for cities and local authorities to directly use the ICT-Emissions products or assess their need for support for this exploitation;*

- *Promoting it to local authorities across Europe, directly and via initiative such as the Covenant of Mayors.*

3.1.2. NATIONAL & EUROPEAN AUTHORITIES

ICT-Emissions results can be exploited by national, and above all European authorities in two ways:

- They contribute to assess the real potential from ITS, and in particular in vehicle systems, to reduce ICT-Emissions. This will build an important body of knowledge to assess the opportunity of further regulations.

- They provide a methodology and an upgrade of models to better measure CO_2 emissions from vehicles. This can be used as a reference for further work on refining guidance on testing CO_2 emissions from vehicles.

Exploitation requires the appropriate promotion of these opportunities to European authorities (and national when possible) and the correct presentation of the project results.

The contribution of ICT Emissions results to International standardization, in particular on the evaluation of the impact of ITS on CO_2 emissions, but also on the impact more broadly on ICT, is significant.

3.2. OEM AND AUTOMOTIVE INDUSTRY

The following contact persons have been identified for the OEMs and automotive industry target group:

Table 2: Target group OEM's and automotive industry's contact persons

Target group	Name	Organisation
OEMs and automotive industry	Silvana Toffolo	IVECO S.p.A
	Muriel Desaeger	Toyota Motor Europe
	Winfried Keiper	Bosch
	Denis Bollea	Magneti Marelli
	Roberto Tola	Centro Ricerche Fiat (CRF)

3.2.1. OEMs

Some **OEMs** have demonstrated so far a keen interest in ICT-Emissions.

They are directly interested in testing and validating the emissions of their vehicles in real traffic situations, integrating driver behavior profiles, as allowed by the ICT-Emissions methodology.

This produces several interesting results for them:

- Better knowing the impacts of the systems they equip their vehicle with;

- Better evaluating the real CO_2 emissions of their vehicle in various situations in traffic, and therefore anticipating the required efforts to comply with potential legislation. ICT-Emissions is particularly interested for the vehicle manufacturers for the possibility to use input data from traffic lights to assess the impact of some system on CO_2 emissions.

- Better understand in which traffic situations emissions are the highest. This is of importance for future developments which may include advanced energy management systems for hybrid vehicles leading to an optimization of each the use of the propulsion systems in hybrid vehicles, including for heavy vehicles such as buses.

In addition, there a certain interest in using subjective data for optimising simulation techniques in support of automated driving conditions in vehicles characterised by "high degree of rationality".

The knowledge gathered in exploiting ICT-Emissions results can be part of the development strategy of vehicle manufacturers to improve their products. There is also a significant interest in demonstrating, through this activity, the leading edge of the OEMs involved with ICT-Emissions in tackling the challenge of CO_2 Emissions. This is used through marketing activities.

► The results of ICT-Emissions are promoted for exploitation towards OEMs through direct contacts with several of them and through promotion with associations such as EUCAR/ACEA.

3.2.2. SUPPLIERS

The **suppliers** of the automotive industry have a direct interest in the improvement of the emission models and the methodology to assess the impact of their in-vehicle systems on CO_2 emissions.

Exploiting CO_2 emissions results profile them better towards OEMs which are their customers. It also leads to improving the development of the systems they provide.

Finally, the exploitation of the methodology for cooperative mobility application such as CACC and ACC-C2TL can lead to the progressive deployment of a market for cooperative mobility which would benefit them significantly.

In this respect, both OEMs and suppliers have a strong interest in the results of ICT-Emissions which can help them assess the required rate of vehicle penetration to achieve significant results with cooperative mobility.

► The results of ICT-Emissions are promoted for exploitation towards suppliers through direct contacts with several of them and through promotion with associations such as CLEPA.

3.3. SOFTWARE COMPANIES

The following contact persons have been identified for the software companies target group:

Table 3: Target group software company's contact persons

Target group	Name	Organisation
Software companies	Jordi Casas	Aimsun/TSS
	Ahmed Nasr	Nokia
	Christian Vock	AVL LIST GMBH
	Werner Maier	Berner&Mattner Systemtechnik GmbH
	Thomas Benz	PTV[1]

Automotive research organization and automotive software developers are listed in this exploitation category though they also do products in some cases which classifies them as suppliers for the automotive industry.

Traffic simulation software producers are expected to confirm their interest in ICT-Emissions results and to exploit them. One of the expected development outcome of the exploitation of the results is the development of APIs enabling the integration of vehicle emissions simulation with traffic simulations, following the ICT-Emissions methodology.

Their interest is also expected to lie with the further knowledge developed by ICT-Emissions to calibrate and further develop models. ICT-Emissions results contribute to this by using high quality data from the partner cities and validating the simulation with real life data.

There is strong interest in API for driver control: open interface for ADAS simulation products to connect to traffic simulators.

► *The main traffic simulation software producers are members of the ICT-Emissions exploitation group. Efforts to engage them in the exploitation of the projects results are made in parallel through direct exchanges and contact with the two main ones, TSS and PTV.*

For developers of drivers interaction simulation softwares, ICT-Emissions offers the possibility to connect these simulations to traffic simulators. This can be exploited to improve the quality of the simulators, in particular in relation to ADAS.

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[1] PTV is partner in the AMITRAN project.

It also allows benefits from the increased knowledge on the driver and vehicle behaviour in a given traffic situation. This enables additional features to simulation softwares and additional applications. These cannot be marketed separately from the software but are rather additional packages integrated in the main software.

There is interest from **vehicle simulation tools developers** to add ICT Emission emissions models to their software.

They have also a strong interest in exploiting the methodology to establish an interface with traffic models (from TSS and PTV in particular), and to use this additional feature to make their software more attractive on the market.

This interface could be exploited by the whole sector.

One of the objectives with ICT-Emissions is to gain know how on ADAS and ACC modeling, including cooperative mobility. This is important to win contracts with OEMs for some suppliers as knowledge on the impact of these systems on the environment, including CO_2 emissions, is often required.

The know-how gathered in ICT Emissions can also be used to train young professionals in hose, increasing the competitiveness of the company on the market but also its attractiveness towards young professionals.

The provision by ICT Emissions of a methodology for assessing the impact of navigation and route guidance systems on CO_2 emissions is closely monitored by **the suppliers of navigation systems.**

They are actively considering the opportunity to exploit this product of the project to assess the impact of their service on CO_2 emissions and integrate the result of this assessment in the marketing strategy directly towards the consumer but also beyond towards other actors to raise support for their approach.

It also reinforce the suppliers of such system in establishing their legitimacy to provide traffic and navigation services in an independent way.

This important interest for the exploitation of the ICT Emissions results is potentially shared by all the major players of this industry, from Tom Tom to Nokia.

► *Direct contacts with navigation systems suppliers are established to promote exploitation. This will also be supported by ICT-Emissions presence at the ITS Congress Europe in Helsinki and ITS Worl Congress in Detroit in 2014.*

3.4. UNIVERSITIES AND RESEARCH CENTRES

The following contact persons have been identified for the universities and research centres target group:

Table 4:Target group universities and research centres' contact persons

Target group	Name	Affiliation
Research centers and universities	Prof. Zissis Samaras	LAT, Aristoteles University
	Biagio Ciuffo	European Joint Research Center
	Prof. Andres Mozon	TRANSyT -- Universidad Politecnica de Madrid

The interest of research centres and universities in exploiting the results of ICT-Emissions is confirmed for several elements and products of the project.

The research results are of great interest for further research work and identifying further research needs. They are used by the research community to feed in related work supporting the formulation of recommendations to policy makers.

The library of case studies allows a broad exploitation of the work by researchers across the world.

One of the potential further work to be considered is the extension of ICT-Emissions work to in depth analysis of local emissions.

3.5. SYSTEMS SUPPLIERS

Systems suppliers have a direct interest in the methodology which allows assessing the impact of ITS systems on CO_2 emissions.

This is particularly important for Traffic management and control and for Demand & access management.

The suppliers of these systems have to demonstrate their positive impact on the policy objectives of the local authorities for the cities to implement the policies enabled by the systems and buy the systems.

They are therefore directly interested in using the methodology for modeling the impact of their system and improved its development, as well as for marketing their systems

This is relevant for suppliers of all systems related to traffic management, but also for access restriction, cordon tolling, congestion charging, etc.

We are building a list of contact persons for this target group.

► *Direct contacts with some systems suppliers will support the exploitation of the ICT-Emissions results.*
These will be carried with companies providing systems for traffic control and access restriction in particular.

Efforts are made in promoting the exploitation of ICT-Emissions by systems suppliers at international events such as the ITS Europe and ITS World Congress in 2014. Specific efforts will be made towards the Amsterdam group which gather the actors involved in the deployment of cooperative mobility and towards the International Road Federation which involves several of the main suppliers.

4 Overview of Exploitation opportunities and interest

Exploitation opportunities and interest by consortium partners and external stakeholders have been reported in the table below. The matrix indicates for each project product what is the level of interest (moderate, confirmed, high) expressed by each target group.

Table 5: Overview of exploitation opportunities and interest

ICT-Emissions products	Opportunities for exploitation				
	Local , national and European authorities	OEMs and automotive industry	Software companies	Systems suppliers	Universities and research centres
Methodology	+++	+++	+++	+++	+++
Traffic management and control	+++	++	+++	+++	
Driver behavior change and eco-driving		+++	+++	+	
Demand & access management	+++		+++	+++	
Navigation and travel Information	+		+++	++	
Advanced driver assistance system (ADAS) and other measures	+	+++	+++	+	
Traffic models	++	++	+++	+	++
Emissions models		+++			++
Know how	+	++			+++
Library Database		++		+	+++
Assessment results	++	+++		++	+++

+   : moderate interest in exploitation of the product
++   : confirmed interest in exploitation of the product
+++ : high interest in exploitation of the product

5 Conclusions and outlook towards the final exploitation plan

There is a broad potential for the exploitation of the ICT-Emissions products by a broad range of actors.

As the products and the results of the project become available, efforts towards exploitation are intensifying.

This document is a draft of the final exploitation plan due in month 36 of the project.

The preparation of the final version of the deliverable will involve several activities. It will include a validation of the analysis made in this draft, which is based on the consultation of organizations and companies potential interest in exploiting the products.

More will be consulted to validate these results. This will also be done through intensified exchanges with the exploitation group.

The final version of this plan will include recommendations for exploitation of ICT-Emissions to partners and the European Commission.