1.1 Publishable summary

The EC has funded in the last years several research projects on automated vehicles and transport systems, among which CyberCars, CyberCars-2, EDICT, CyberMove, NetMobil, CityMobil, CityNetMobil, CATS, and at least partly NICHES+. CityMobil, a large IP of the sixth framework programme, was completed end of 2011. It demonstrated how automating road vehicles can lead to different transport concepts, from partly automated car sharing schemes through cybercars and PRT, to Advanced BRT (Bus Rapid Transit) which, together with other measures (from conventional Public Transport to parking pricing and access restriction), can combine to make urban mobility more sustainable.

However, CityMobil, CityNetMobil and NICHES+, also highlighted the main barriers that are hampering the deployment of automated road vehicles and the transport systems depending on them.

- the legal framework, which does not allow self-driving vehicles on normal roads
- the implementation framework which makes consensus building, procurement and installation of the system much more complex than conventional vehicles
- the uncertainty of the wider socio-economic impact of this technology following take up

The main objective of CityMobil2 is to remove such final barriers to the implementation of automated transport systems in cities.

The CityMobil2 approach to changing the legal framework will be to draft a proposal for a European Directive that the European Commission can adopt to set a common legal framework to certify automated transport systems. Such a Directive proposal will be written incorporating the common local practice and with the help and the consensus of the national ministries so to simplify its adoption.

For the implementation process, the CityMobil2 project objective is to implement and demonstrate large-scale pilots of Automated Road Transport System platforms in different cities, in order to validate the process and to evaluate the technical and socio-economic performance of automated transport systems in urban environments.

Furthermore research activities into technical, financial, cultural, behavioural aspects and effects on land use policies and how new systems fit into the existing infrastructure in different cities will be performed, using the pilot demonstration test bed.

To measure the wider socio-economic impact of automated vehicles is also an objective of the CityMobil2 project, which will be reached through a socio-economic study to forecast the future transport markets and the effect of road vehicle automation on the overall European economy.

1.1.1 Description of the work performed since the beginning of the project and the main results achieved so far

The CityMobil2 work plan is organised in two phases: Study and demonstration preparation from M1-M18 and demonstration from M19 to M48. The project started by defining a common methodology for the cities to study and select the kind of transport service that would be demonstrated. The outputs of WP1 were used by the 12 cities to refine their mobility plans focusing on the new technology and particularly on the transport system to be demonstrated; furthermore WP15, which defined the technical specifications of the automated road transport systems, received in input the outcomes of WP1.

The 12 city workpackages (from 2 to 13) provided their result to WP14 which selected the cities to host demonstrations and two to host showcases. However, after the city selection plan[4], there were several changes to the demonstration schedule, mainly the transformation of Trikala's small demonstration proposal into a large scale one. This simplified the confirmation of the shortlisted cities for the 2016 demonstrations. At the moment of writing, this is the CityMobil2 demonstration schedule:

- Large-scale demonstrations:
    1. La Rochelle (December 2014 - April 2015): Completed
    2. West-Lausanne (April – August 2015): Completed
    3. Trikala (September 2015 – January 2016): Under preparation
- Small scale demonstrations:
    1. Oristano small scale demonstration (July - August 2014): Completed
    2. Vantaa small demonstration (July - August 2014): Completed
    3. San Sebastian (March-June 2016)
    4. Sophia Antipolis (January-March 2016)
- Showcases:
    1. Leon (Spain) – September 2013
    2. Bordeaux (ITS World Congress) – October 2015
    3. Warsaw (TRA conference 2016) – April 2016
    4. An additional showcase site to be decided

WP15 provided the technical specifications to WP161 and WP171, which designed and started procuring 2 sets of 6 vehicles (one set from each of WPs 161 and 171) to be used in the second project phase, in WP162 and WP172 respectively.

WP18 follows the technological progresses (and challenges) of the vehicles during the demonstration with a specific focus on human factors (how do people on-board and outside the automated vehicles reacts to them) and on the reliability, performances and costs of the different technologies used for navigation and obstacle avoidance. This work started in M19 with the selection and integration of a new partner to the CityMobil2 consortium (Vislab) to provide three video-recording devices that were installed in the Robosoft fleet, and that have recorded video data in the Oristano and La Rochelle's demonstrations, with due consideration and management of the recorded images in order to avoid violating the public's privacy.

WP19 is La Rochelle Automated Road Transport System demonstration, one of the three large demonstrations and one of the most important Work Packages. Its goals were to manage and coordinate the local partners with the project and the ARTS provider (Robosoft in this case), and to integrate the system from the legal, infrastructural and operational point of view, as well as to integrate it with the local public transport system. Finally, the Work Package aimed at implementing public awareness and to collect all the data during the demonstration operation necessary for its evaluation. La Rochelle demonstration was successfully completed, although it suffered from the delays caused by

[4] Five cities to host large scale demonstrations, four cities to host showcases.

Induct's bankruptcy, as well as the complexity of the setup, which took three months instead of one as initially expected. Ultimately, the demonstration was extended to compensate for the delays.

WP20 is West Lausanne Automated Road Transport System demonstration, second of the three large demonstrations and one of the most important Work Packages. Its goals were to manage and coordinate the local partners with the project and the ARTS provider (EasyMile in this case), and to integrate the system from the legal, infrastructural and operational point of view, as well as to integrate it with the local public transport system. Finally, the Work Package aimed at implementing public awareness and to collect all the data during the demonstration operation necessary for its evaluation.

WP25 will evaluate together the results of showcases and demonstrators and receive in input the interim results of WP 18 and its technical and human factor assessment and will complement the socio-economic study of WP 27 as main evaluation output of the project.

WP26 is the WP dedicated to change the legal framework. It established a workgroup led by ERTICO featuring the scientists who mostly contributed to the technological developments, system builders, cities and the national authorities competent for the certification of transport systems. The workgroup is about to complete a first draft of a proposal for a European Directive to set the legal framework for the certification of local transport systems based on automated road vehicles. Such draft has been in test in the demonstration sites and has been discussed with the national authorities to be finally delivered to its political path in the European Commission.

WP27 has the main task of evaluating the industrial and economic effects of the uptake of the new technology will have on Europe and the rest of the world; it drafted a blueprint with three possible scenarios for the automation technology take-up in city transport, and is discussing such scenarios and their consequences with experts. As part of these exchanges, WP27 organized an online survey followed by a workshop on the socio-economic impact of road vehicle automation in March 2015 in La Rochelle, alongside with the ARTS demonstration. The event attendees included transport planners and experts, car manufacturers' representatives, as well as local and national transport authorities from Japan, U.S. and Europe, making it a sound success.

Finally WP28 is in charge of dissemination and exploitation, and has produced the necessary dissemination materials (leaflet, presentation template…) and means (website). Besides, this, several partners have published articles in books and conferences, and the project coordinator has participated in several international instances to present the project's achievements, so much that the project has become a reference for road vehicle automation

The CityMobil2 approach is revolutionary. It keeps many open possibilities (for vehicle manufacturing and for city demonstrations) instead of selecting just a few at the beginning. This offers two main advantages: the chance of a collaboration between cities and manufacturers to arrive at shared intents and standardised technologies; and an ample reservoir of alternative possibilities should the first choices fail. It places however a larger burden on the coordination team which had to keep constant monitoring of all the activities to detect risks of shortfall.

1.1.2 Expected final results - potential impacts and use

Mobility plays a key role in making a city and its life-style sustainable. If on one hand mobility allows people to have a good quality of life and makes a city alive, on the other

hand mobility is the cause of congestion, accidents and pollution. These problems cannot be solved simply by electrifying mobility, since one of the main causes of such problems, not addressed by any green-car initiative, is the continuously growing car-ownership rate which, is expected to grow another 30% in the next forty years (European Environmental Agency projections). Only a combination of measures featuring efficient public transport, real-time information, priority for human centred modes, restrictive-car-use-policies and some innovative form of transportation to provide public transport with the same comfort of private cars can hope to invert the growing trend of car-ownership rate and its consequences. Taxi-like (or collective-taxi-like) public transport services without the costs of taxi can only be provided using automated road transport systems.

CityMobil2 will take a major step toward the diffusion of automated road transport systems by demonstrating their feasibility in urban environments, by drafting the European directive which will allow them to be accepted and fully certified, and by demonstrating that the loss due to the restriction of the car in cities should be more than made up for by the automated vehicle economy that will be generated. In detail CityMobil2 will progress in the following.

Standardizing these innovative transport systems. Today each manufacturer has its own technology and communication system but the first step in CityMobil2 will be to establish the minimum common requirements to have the systems fully interoperable on common infrastructures.

Transport planners and local politicians around the world know that a metro network, for example, costs between 60 and 100 M€/km and can carry between 20 000 and 50 000 passengers per hour per direction. But they have no idea where a cybercar or other new transport system performs best, how much it costs, or how to design it; though CityMobil and NICHES+ made significant progresses in this direction, CityMobil2 will synthesize (out of city studies and demonstrations of the same technology in different cities) a methodology to design them for the use of cities henceforth.

Technology for automated transport systems is presently “off the shelf” but it has not yet reached the necessary industrialization level to be tested in all weather conditions nor the necessary mass production to lower prices; CityMobil2 will give the chance to manufacturers to thoroughly test their technologies in urban environments and to cities and citizens to try the new transport systems without the huge financial investments normally necessary.
In order to summarize the progresses due the project, the following indicators will be measured at the end of the project, each one with a threshold for success:
► Technological progress: the threshold for success is reached if the automated transport systems serve all the user demand in all the possible conditions, if used as conventional systems.
► Maturity of automated transport system: the threshold for success is reached if at the end of CityMobil2 at least a city decides to implement on full scale the automated transport system tested during the project.
► Automated transport system acceptance: the threshold for success is reached if more than 50% of
interviewed users provide good feedback on the automated transport systems tested.
► Legal framework progress: CityMobil2 will be successful if a common European legal framework for automated transport systems will be in place at the end of the project.
► Socio-economic success: the CityMobil2 project will be successful if it demonstrates how the

economic benefit from products and services generated from automated vehicles take up substitute the consequent fall in the private car-market.

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