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Phase:	**3.2 Analysis of existing innovative applications in weak demand areas**
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Action 3.2 Analysis of existing innovative applications in weak demand areas – Info-Mobility

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Executive Summary

Action 3.2 will investigate existing innovative applications in weak transport demand areas developed across Europe. During this task, data concerning the practice conditions of already existing innovative applications (both qualitative - user perception - and quantitative - number of trips, demand attracted, etc.) will be collected and analysed. When possible, data pre and post-implementation will be collected and analysed. The aim of this task is to evaluate the impacts (especially on the mobility demand) produced through the implementation of innovative transport systems in weak demand areas and to identify eventual barriers to the implementation and conditions for the transferability of solutions in other regions.

The consortium of LimIT4WeDA is entirely composed of Mediterranean municipalities. The members of the consortium are collaborating so as to set up a common implementation framework. In this manner the project can add value to the identified and researched solutions. One of the barriers affecting the implementation of innovative transport applications is the lack of experience with the implementation process. This phase can contribute to the setting up of a common framework for development stages that can be scalable whilst guaranteeing guidance for the transferability of solutions for different regions within the European states. Following this report, Phase 3.3 will analyse the legal framework for the business models such that we can elaborate a method how to harmonize local rules within a common framework.

1 Introduction

The LiMIT4WeDA project, being part of the MED Programme, aims to enhance mobility between rural and urban areas. This is being carried out through research and analysis of the possible technologies and their application for innovative transport solutions. An overview of existing solutions that could be implemented in the weak transport demand areas will be provided. The analysis will cover eight different innovative transport application technologies. Each partner within the consortium of LiMIT4WeDA will tackle two applications in the aim of examining a wide spectrum of alternative transport applications.[1]

The first application is 'integrated ticketing' which consists of the availability of ticketing for different modes of public transport. These can be characterized by the type of service being offered, tariffs and tickets. Such solutions are attainable via information technologies such as smart cards and real-time data

The second solution is 'info-mobility' which is composed of statistics, logistics and real time data describing the trip for a particular vehicle. This can also be developed through the support of information technology. Additional details related to pre-trip and on-trip information about mobility services are provided.

The third alternative is 'transport at call or on-demand' – such public transport services are managed through a phone call from a centralised control room.

The fifth form is 'Multiform transport' consisting of the deployment of various forms of transport during the coverage of a single trip.

[1] LiMIT4WeDA Application form, submitted version

The sixth mode is 'Car Pooling or Sharing' entailing the sharing of rides such that the carbon per capital per unit distance is reduced.

The seventh mode is referred to as 'Energy efficient transportation systems' which features vehicles working at relatively high efficiencies thus resulting into lower carbon emissions.

Penultimately, 'Private business initiatives' consist of the promotion and dissemination of improved transport solutions within businesses.

Finally, 'Innovative tariff systems and financing' requires the setting up of a flexible tariff system supporting the economic viability of transport systems. Such systems result in better services at the minimum cost.

1.1 *Overview of the project as applied to Malta*

Issues related to transportation congestion in the Maltese Islands are a continuous threat. Although Malta is a very small island, it has a relatively high density of private cars and this leads to traffic congestion and also high carbon emissions. The public transport system is not equally efficient, especially in remote areas and this leads to a widespread use of privately owner vehicles. First and foremost, local public transport should be made more efficient such that it could reach and motivate the public.

In the case of Malta, buses usually operate between the centre of a village and the capital city Valletta. The bus terminus is usually located in the square near the church and then there are bus stops along the way to Valletta. This implies that people living on the outskirts are required to walk until they arrive to the closest bus stop. This is quite inconvenient, especially in the morning, when people are rushing to work or school. When looking through this

perspective it is very clear that new solutions are required in the aim of making public transport more flexible. Such a goal requires the introduction of new ideas and technologies that can help at achieving a system which is both convenient and cost-effective. [2]

1.2 *Aim of the Report*

At the end of the day, LiMIT4WeDA will have:

- highlighted issues related to sustainable mobility - economically and environmentally
- outlined the most feasible application technologies
- scrutinized their scalability, feasibility and transferability
- set up a pilot project with the aim of analysing its viability, scalability and transferability
- brought support to the application of innovative public transport
- motivated and support the stakeholders

Such throughput can be achieved by relating the transport applications with the characteristics belonging to each region participating in this project. These include but are not limited to diverse users, low population densities, variable dispersion of housing, inconsistent transport demand and overwhelming use of private cars. In this light, the classic public transport options are stereotypically regarded as impractical thus requiring alternative choices whose effectiveness can impact local economies and transport impediments. [3]

[2] http://www.miema.org/site/index.php?option=com_content&view=article&id=103&Itemid=78

[3] LiMIT4WeDA application form, the submitted version

Phase 4 of LiMIT4WeDA will tackle the design and setting up of pilot projects which will be operated for a defined stretch of time. This component will involve promotional and dissemination events intended at raising awareness and informing the key actors about innovative transport systems. The scrutiny of the activities itself and ex-post assessment will be carried out in order to check the effectiveness of the application technologies and to examine the public's feedback.

Any success factors brewed during these tasks will be identified such that the transferability of each solution, at transnational level, can be assessed.[4]

1.3 Structure of the Report

Following from the introductory section;

Section 2 goes into scrutinizing the various forms of Info-Mobility. Cutting edge applications can exists on different platforms such as the Internet, GPS, GSM and much more. This section will analyse the pros and cons for each of them. The main highlights of the technologies are discussed.

Section 3 relates to the feasibility and effectiveness of geographic information services (GIS) in our daily life. The main focus of such systems is aimed to offer coverage all over the world.

Section 4 is the penultimate section dealing with Malta's energy situation. The main highlights are the economic turmoil brought by the country's dependence on crude oil, the 2020 environmental goals as defined by the European Union and the National Energy Efficiency Action Plan.

Ultimately, section 5 describes how LiMIT4WeDA aids at overcoming the barriers obstructing the implementation of each of the transport applications.

[4] LiMIT4WeDA Application form, submitted version

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This part of the report describes how, in the light of the 2020 goals, the input from each partner in the consortium, can aid at reaching these targets.

2 Info-Mobility

Young-Ji Byon et al. (2009) analyses how the use and availability of geographic positioning systems presents a methodology for identifying travellers' transportation modes by tracking Global Positioning System (GPS)-equipped mobile devices in the traffic stream. Various mobile phone service providers have location-based services (LBS) that track the locations of their mobile phones. One major concern in using mobile phones for traffic monitoring is that the phones are not necessarily in passenger vehicles. The mobile device can be in a car, bus, or other modes that have distinct speed and acceleration profiles. In addition, querying the mobile device has monetary cost implications, and the higher the number of location queries from the server the higher the associated cost.

Young-Ji Byon et al. (2009) focuses on the feasibility of using the characteristics of the trail of GPS data stream to identify the mode on which the mobile device is located. Currently, LBS in Toronto can only provide GPS data once every 5 min. Because of the sampling limitation, a GPS data logger is used to collect the trip data and the logged data is sampled at varying frequencies as if they are coming from the mobile phones. The analysis is conducted using neural networks (NN) to determine the transportation mode.

Young-Ji Byon et al. examines the impact of varying sampling rates (number of pings per unit time) and monitoring duration (time length of data trail) on mode classification accuracy. In total, 60 hours of GPS data were collected while travelling on various transportation modes throughout the Greater Toronto Area. Results confirm the potential of neural networks to successfully detect transportation modes from GPS data, both in peak and non-peak periods. The results indicate that higher sampling frequency and longer

monitoring duration result in higher mode detection rates. In addition, the route-specific neural networks perform better than the universal neural networks." [5]

2.1 *Info-Mobility enabled ride-sharing systems*

Nowadays, the general public's social life can be heavily influenced by virtual social networks such as Twitter, Facebook and Hi5. Unexpectedly these may sum up for a substantial amount of one's social interaction during one's life. Such a phenomenon can be attributed to the simplicity and their coverage following the diffusion of Internet hot spots. This communication link infrastructure can survive various natural elements much better than other communication technologies.

[5] Real-Time Transportation Mode Detection via Tracking Global Positioning System Mobile Devices. Young-Ji Byon1 youngji.byon@utoronto.ca Abdulhai,Baher2 Shalaby, Amer1 Journal of Intelligent Transportation Systems; Oct-Dec2009, Vol. 13 Issue 4, p161-170, 10p, 1 Diagram, 2 Charts, 1 Graph, 3 Maps

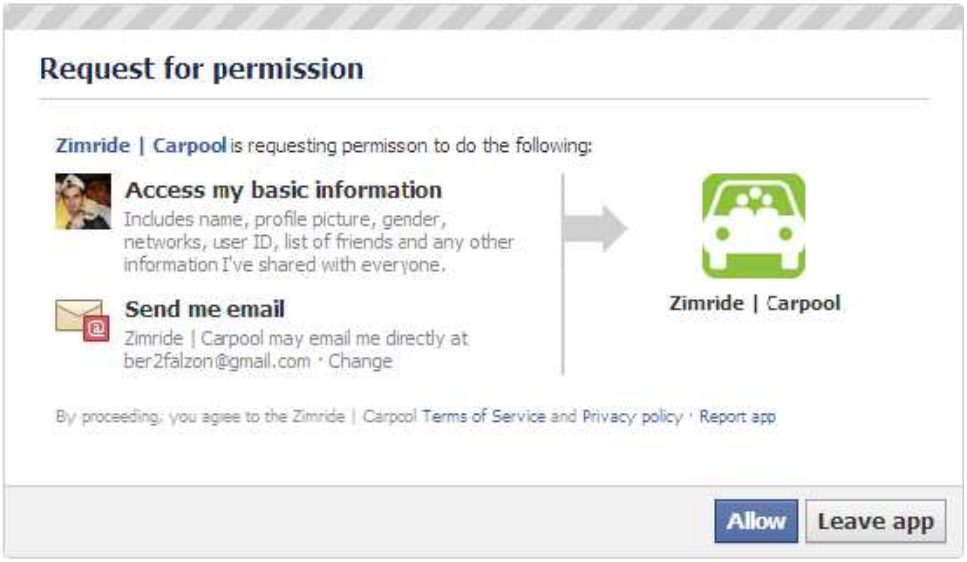

Figure 1 The Zimride online application being hosted on social network[6]

Zimride, as shown in figure 1, set up a car-sharing software application within Facebook. Users can search or offer rides using this application. Besides, anyone utilising this platform can interact with commuters through the social network itself so as to ensure a safe journey.

2.2 *Disaster relief ride-sharing systems*

The dissemination and effectiveness of social world wide networks results from the availability and robustness of the Internet. On the 15th of April of 2010, volcanic eruptions in Iceland disrupted air traffic all over the world. At this stage thousands of travellers were stranded everywhere. Such an incident resulted in the flooding of virtual social networks with content related to their frustration and their location. The Internet's infrastructure proved itself very effective for those travelling by car to share their car with those left stranded.

[6] http://apps.facebook.com/carpool/user/redirect acessed on April 2011

The availability and coverage of Internet has resulted in the diffusion of this practice world-wide. The setting up of groups on social networks made it possible for drivers to correspond and meet stranded travellers. Apart from sharing the vehicles, passengers can share the time behind the steering wheel so that long journeys become less tedious and frustrating. Effective usage of empty car seats by ride-sharing may represent an important opportunity to increase occupancy rates, and could substantially increase the efficiency of urban transportation systems, potentially reducing traffic congestion, fuel consumption, and pollution. Moreover, ride-sharing allows users to share car related expenses, which can be substantial, especially since the price of oil has doubled over the past five years (IEO, 2009). While ride-sharing is not a new idea, recent technological advances may increase its popularity, as explained further on in this report[7].

2.3 *Car sharing Internet portals*

Following this phenomenon, various entities related to transport envisioned the possibility of setting similar ride sharing services and techniques over the Internet. Roadsharing.com has set up a virtual social network for those interested in sharing their vehicle or hitch hikers. The car sharing platform is scalable for all of the 5 continents. Registered users can input any amount of trips in which one is required to input:

- Type- offer or request a lift
- Departure time and location
- Arrival Time and location

[7] What E-Tailers Can Learn From Airline Pricing. Agatz, Niels Campbell, Ann Fleischmann, Moritz Van Nunen, Jo Savelsbergh, Martin Wall Street Journal - Eastern Edition; 7/7/2008, Vol. 252 Issue 5, pR6, 0p

- Commuter
- Cost
- Optional Notes

One can either produce a ride or search through already sub-metering fitted ones. All the data input while surfing through the website. The hitch hiking portal comes at no cost. All the data input is logged in aim of maintaining the safety and prestige of the ride sharing service.

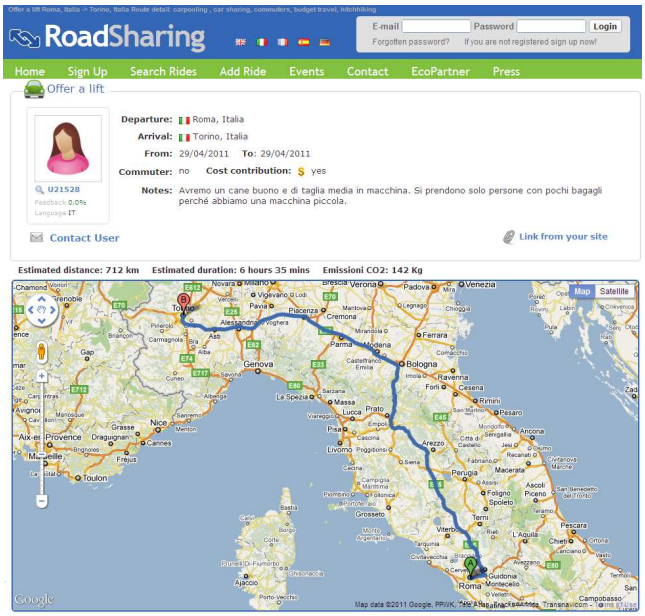

Figure 2 Geographic Information Services at Roadsharing.com

Source: Roadsharing.com (2011)

Kyriacos C. Mouskos et al. (1999) highlights that a recent popular development is the availability of traveller information through the Internet. The primary services that are provided through ATIS are traffic conditions, bus and train schedules (including arrivals and departures from stations), and route-planning information between an origin and a destination. The principal

components of such systems include the communication system, the traffic surveillance system, and the data-processing system. The majority of the current systems provide information that is targeted to the general public; however, they do not provide information that is personalized to the needs of the individual user. A limited number of systems provide individual route-planning information that is usually based on historical traffic information or simply the shortest distance from an origin to the destination.

3 Active geographic information services

Nowadays GPS devices are easily available on the market. GPS receivers come in a variety of formats and are integrated in most of modern mobile phones. The prices of receivers are relatively cheap although smart phones with GPS capabilities are still quite expensive. Modern devices are compact and light making them very portable. They usually make use of a touch-screen and are very user friendly. Some new car models also have a GPS incorporated in their console.

Figure 3 GPS enabled device [8]

Source: dreamstime.com (2011)

GPS receivers make use of navigation software. Different software exists. A very common type of software performs route calculation and gives directions to the user and is based on a vector-based map. Navigation tracking usually has a background map and shows the complete route that has been taken

[8] Dreamstime (2011) available at www.dreamstime.com (accessed on February 2011)

during a journey. This software has the advantage of route pre-programming capability and gives a line on the map which can be easily followed.

A very useful feature of modern GPS devices is guided user interface which allows the user to listen to the directions without having to look at the device's screen. This increases safety since a driver can keep looking at the road ahead and still follow the directions.

Glen M. D'Este et al. (2002) foresees how traffic system performance can be measured in various ways, but from the user perspective, congestion is the major criterion. Glen M. D'Este et al. (2002) examines some novel uses of GPS in the measurement of vehicle speeds and travel times and their synthesis into measures of congestion and ultimately of the performance of the urban road system. He also discusses the integration of GPS-based congestion measures into an ITS framework, techniques for implementing a congestion-monitoring system, and implications for urban road system planners, managers, and users.[9]

3.1 *Traffic Assistance using Mobile Phone tracking*

Another system which is being used to facilitate transport and reduce traffic congestion is mobile phone tracking. Such a system tracks the current position of a mobile phone which is either stationary or on the move. The system works by contacting antenna towers to perform GSM localisation based on the signal strength. Thus mobile phone tracking can be used to detect traffic congestion in a particular area by locating the mobile phones in that area.

[9] Using GPS to Measure Traffic System Performance Glen M. D'Este, Rocco Zito & Michael A. P. Taylor ¤ Transport Systems Centre, University of South Australia, Adelaide, South Australia 5000, Australia

This system is based on the concept that a mobile phone always communicates with one of the closest base stations. The power emitted by each mobile phone is detected by base stations. In turn the base stations can deduce the location of the mobile phone by measure the power patterns detected by their antennas. The precision of this system depends on the distance between adjacent antenna towers and the number of signals transmitted. The closer the antenna towers the more precise the location of the phone. Thus in urban areas where mobile traffic and density of base stations is high the precision is also high. On the other hand in rural areas, location is determined less precisely. This is not a problem since traffic congestion is likely to occur in urban areas.

There are different types of localization systems. These can be divided into:

- Network based
- Handset based
- SIM based
- Hybrid

Network-based techniques utilize the service provider's network infrastructure to identify the location of the handset. These can be implemented without affecting the handsets. The accuracy of these techniques varies and is dependent on the concentration of base stations and the implementation of timing methods. One of the key challenges of network-based techniques is the requirement to work closely with the service provider, as it entails the installation of hardware and software within the operator's infrastructure.

Unlike network based techniques, handset based one require the installation of a software on the handset to determine the location. In these techniques the location is determined by computing the location by cell identification and signal strengths. The disadvantage of this kind of system is the necessity of

installing the required software on the handset. Not all mobile phones can support such software. However, most smart phones can run such software, depending on their operating system. If the mobile phone is equipped with GPS the location can be determined much more accurately.

The SIM used by mobile phones can also be used for mobile phone tracking. Using the SIM in GSM and UMTS handsets, it is possible to obtain information from the handset. The type of information obtained via the SIM can differ from what is available from the handset. Hybrid positioning systems use a combination of network-based and handset-based technologies for location determination.

3.2 *Modelling and active distribution of traffic*

Chun Liu et al (2008) describes that the acquisition of accurate and timely traffic information is a vital precondition to rational traffic decision making. Intelligent Transportation Systems (ITS) are bound to be the outcome when modern traffic systems develop to a high degree. In ITS, instantaneous traffic information can be collected by the Floating Car Data (FCD) method. Based on the establishment of the Shenzhen Urban Transportation Simulation System (SUTSS) in China, the authors explored how to use 4000 taxis as the data collection sensors in Shenzhen, a southern city in China which borders Hong Kong. The authors introduce the procedures and algorithms for the computation and map-matching of road segment velocities to a digital road network. To superimpose the near real-time traffic information onto a digital map, coordinate transformation is required and the transformation precision is analyzed using field testing data. Due to the nature of FCD, continuous GPS data such as routing velocities and coordinates can be collected by any GPS equipped vehicle. Therefore, relevant algorithms are developed and utilized

for the map-matching according to probability and statistical theories. To evaluate the reliability of proposed map-matching method, the confidence levels are calculated statistically, from which it can be determined whether the positioning data is valid or not with predefined threshold values.

Furthermore, Chun Liu et al (April 2008), claims that road segment velocity matching methods based on the Metropolis criteria is extended and relevant validation is carried out through the comparison of estimated and measured results. The major objective of this method is to obtain more accurate road segment travel time through the combination of those estimated by FCD and historical ones. This can significantly improve the reliability of instantaneous traffic information before its web publication. The final part of this paper introduces the architecture and the realization of a web Geographical Information System (GIS) and FCD-based instantaneous traffic information dissemination system for the whole of Shenzhen City.[10]

3.3 *Prospective barriers to the implementation*

Mike Haney (May 2010) describes two new GPS systems, Garmin's nüLink and LiveTraffic from TomTom, instead use the cellular network to beam alerts to the nav units. That means you can receive updates more frequently and in a wider area, and you can find out details such as whether the slowdown is due to construction or an accident. But the service will incur a monthly fee.

[10] Determination of Routing Velocity with GPS Floating Car Data and WebGIS-Based Instantaneous Traffic Information Dissemination Chun Liua1, Xiaolin Menga2 c1 and Yeming Fana3

Figure 4 Navteq online platform describing the traffic distribution in Sicily[11]

Source: Navteq (2011)

Moreover Mike Haney insists that if GPS makers and cellphone carriers can reach an agreement, we could eventually have a system like the one being rolled out in Europe that gets information from every idle cellphone on the road, providing truly ubiquitous traffic coverage."[12]

ToMASZ IMIELINSKI et al. (1999) sustains Mike Haney's point of view since he supports the idea that GPS cards will soon be included in cars manufactured in the U.S. and Europe and possibly in every other form of mobile computer as well. A user's location will be another piece of information—as common as the date is today—getting input from the GPS when outdoors and from other location-providing devices when indoors. The availability of location information will have a broad effect on both application-

[11] http://www.navteq.com/ [January 2011]

[12] IS IT WORTH PAYING EXTRA FOR A GPS UNIT WITH TRAFFIC INFO? By: Haney, Mike, Popular Science, 01617370, May2010, Vol. 276, Issue 5 - Mike Haney

level and network-level software. Possible new services and functions include geographic messaging, advertising, and resource discovery.”[13]

[13] ToMASZ IMIELINSKI AND J U L IO C. NAVAS GPS-Based Geographic Addressing, Routing, and Resource Discovery April 1999

4 The Maltese Energy Situation

Following the latest economic turmoil, more and more people are becoming aware of our society's dependence on fossil fuels. The economic crisis set off in December 2007 as a result of the mortgage-backed securities in the United States was exacerbated by the instability in the price of crude oil and led to an increase in the prices of energy, food and water.

More than two years of economic crisis have brewed the strategy for Europe 2020, in which the objectives is to enable the European Union to become stronger following the financial recovery. This involves the adoption of a new framework of thought incorporating a sustainable economy.

The European Commission has agreed to reach tough environmental targets on the reduction of fossil fuels to mitigate the negative effects of climate change, by the year 2020[14].

The main aims are to:

- Reduce the global greenhouse gas emissions by 20 percent;
- Reduce the electrical load by 20 per cent by using energy efficient solutions;
- Increase the production of electricity using renewable sources by 20 percent.

4.1 *Malta gets an F in climate report*

The European Union has commissioned The Climate Policy Tracker to issue a report on the greenhouse gases emitted by each member state. The Climate

[14] EUROPE 2020 A European strategy for smart, sustainable and inclusive growth (2010)

Policy Tracker report examines all EU countries on areas such as transport, buildings, and renewable energy, giving them an overall grade of A to G, with A being the best score grade, and G the worst. The report graded Malta as an F on this scale.

The quantification of the CO2 per capita for each country has been used as a benchmark to rank each country in terms of percentage distance from the Kyoto targets. Malta has been given the F ranking due to a Carbon footprint per capita of 7.37 tonnes each year. This study has expressed its mixed feelings about the fulfilment of the 2020 deadlines in spite of the national strategy and the energy put into formulating its future. The report highlighted the lack of any Greenhouse Gas (GHG) emission targets for the country's carbon footprint[15].

4.2 *National Energy Efficiency Action Plan*

In the light of the 'F grade' and the 2020 goals, an action plan was formulated. The National Energy Efficiency Action Plan (NEEAP) fulfils the provisions of Art. 14 (2) of Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services. It was published in November 2008 by the Ministry for Resources and Rural Affairs.

The Action Plan takes into account other initiatives that are being or have been developed at Community level, including legislative instruments. The European Community, together with Member States, is working to improve energy efficiency in all sectors whilst at the same time increasing the use of

[15] Malta gets an F in climate report, The Times of Malta, Thursday, November 25, 2010 , by Ivan Camilleri, Strasbourg

renewable energies. The Green Paper on Energy Efficiency points to the fact that the EU could save at least 20% of its present energy consumption in a cost-effective manner.

In order to support better integration of energy efficiency measures into national legislation the European Commission has adopted several directives now in force. These concern broad areas where there is significant potential for energy savings, such as: End-use Efficiency & Energy Services; Energy Efficiency in Buildings; Eco-design of Energy-Using Products; Energy Labelling of Domestic Appliances; Combined Heat and Power (Co-generation); Vehicle emissions[16].

Energy efficiency is regarded as a principal objective in Government's energy policy, primarily in view of its impact on the demand for energy and its propensity to reduce the country's fuel bill and its carbon footprint. The NEEAP has as its main aim the identification of the most economically viable opportunities for savings, and their propagation for eventual adoption and exploitation in the field.

It is also a declared policy objective of the plan to find synergies between energy efficiency and the overall Government's energy policies, particularly as an opportunity for economic growth, as well as the various ramifications in spheres of social development and the environment. When compared to measures of alternative and renewable energy sources, energy efficiency is variously considered more of a viable option for improved energy security and the reduction of carbon emissions.

[16] National Energy Efficiency Action Plan, 2008

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4.3 *Year 2020 within NEEAP's action plan*

The Plan generally purports to identify those measures deemed to be most cost-effective and that will optimise energy efficiency in a number of contexts. The Plan further aims to denote a way forward for the rational implementation of these measures.

The NEEAP is to be implemented in a structured holistic manner, in line with the following strategy:

- Ensure that the public sector becomes a role model in energy efficiency;
- Promote increased awareness and behavioural change by consumers on an individual level;
- Adopt financing tools and economic incentives targeting all sectors, implemented in full compliance with the applicable State aid rules, that will stimulate take-up of more efficient technologies;
- Take advantage of, and support, international efforts – in particular at EU level – to ensure that more efficient energy-using products become available to the consumer;
- Use legislation and fiscal instruments judiciously, for example by setting standards for energy performance in buildings or for providers of energy services such as auditors or installers;
- Carry out research in energy efficient technologies and practices suitable for adoption in Malta; and
- Create the organisational structures necessary to support the achievement of these objectives[17].

[17] National Energy Efficiency Action Plan, 2008

5 Conclusions

In spite of the fact that information technology enables various new and exciting transport application, the man in the street may still feel reluctant to invest in such technologies. In fact Mike Haney (May 2010) believes that its viability depends on where you live and what kind of unit you're looking at. Most GPS devices that show traffic get their data from a handful of providers like Clear Channel and Navteq, which collect their information from numerous sources. News of a coming pileup reaches your dashboard as text data over FM airwaves and updates every five to 15 minutes. This system works great for major free-ways in big cities, but neither the network nor the data services cover rural areas and side roads, and the FM signal can't deliver much beyond basic information.

In this light, the studies and implementation of the pilot studies within phase 4 will help at analysing the most feasible solutions. The pilot projects will provide substantial feedback from the public so that the best practices can be identified. Finally, the fifth phase of the project will scrutinize what it takes to implement the best applications in Europe. This phase will include the design of an implementation and transferability programme.

In this manner the results yielded from LimiT4WeDA will not be limited only to the Mediterranean partners taking part in the project. On the other hand, the horizontal activities will act as the vital tool for the dissemination and implementation of the guidelines for each of the transport applications.

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