Study on economic and social impact of the implementation of Directive 2004/52/CE on interoperability of electronic fee collection in Europe

Final Report

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Executive Summary

The present study is aimed at analysing the economic and social impact of the implementation of Directive 2004/52/CE on the interoperability of electronic tolling service in Europe.

To achieve the objective of the study an analysis was carried out basically aimed at collecting opinions and viewpoints of major stakeholders of the electronic tolling service industry such as country administrations, toll chargers, industry representatives, namely the on board unit producers and software integrators firms and financial institutions. The assessment of stakeholders' opinions has allowed us to depict economic and social upshots on the implementation of the "single European Electronic Fee Collection Service". The analysis has showed that:

- the adoption of the Electronic Tolling Services varies among countries, both considering the technology employed and the tolling policies;
- the ETS users are currently represented mainly by light vehicles;
- the EC Directive directly impacts only the vehicles active in the cross border goods transportation, namely heavy goods vehicles;
- the use of the ETS systems is gradually growing in all countries that adopted these systems, independently from the Directive's implementation;

Some variables, used as proxies of the economic and social impact of the Directive 2004/52/CE, have been selected according to information and data gathered during the analysis and the stakeholder consultation process. The outcome of the performed analysis can be summarised by the following items:

- an increase of ETS subscribers has been foreseen, especially in those countries that can be considered as "followers" in the implementation of tolling services. The increase of ETS subscribers will mainly concern light vehicles (basically operating short trips), thus reducing the impact of the Directive in the growth of the ETS usage;
- the increase of ETS usage is the result either of increased traffic flows affecting the motorways infrastructures or of the substitution of the existing manual toll lanes with ETS lanes. It is important to note that this last phenomenon is also strongly influenced by the trend experienced in building new tolled motorways and by the need to improve the effectiveness of toll stations augmenting the number of managed toll lanes, especially the ETS ones;
- the success of the ETS, in terms of subscription volumes, will lead to an increase in revenues of toll chargers;
- the increase in the ETS usage will ask for new skilled job profiles engaged in operating, marketing and managing electronic tolling service (e.g. data management, contact centres, etc.);
- the enlargement of ETS subscriptions will boost the demand of technical equipment (on board equipment and on the road network equipments), needed to operate the system, thus increasing the revenues for the industry;

- the satellite based technology is going to become the most widespread and this could represent a worthwhile element to spread all over Europe the awareness of the value embedded in the satellite based ITS application, promoting the future spread of Galileo based services;
- the ETS interoperability could represent a sensible tool to improve the effectiveness of transportation industry in Europe. In fact, the deployment of EETS will reduce costs for international transportation companies (either improving the operational efficiency or reducing expenses related to the usage and maintenance of on board units needed to exploit the ETS service), improving at the same time the efficiency of traffic flow managed by the toll road service provider and the quality of service received by road users.

The analyses worked out about the direct and indirect impact generated by the implementation of the Directive 2004/52/CE on the electronic tolling services stakeholders (country administrations, toll chargers, on board unit producers, software integrators and financial institutions) has enabled us to highlight that the Directive is not directly responsible for the increase of the ETS subscriptions at European level.

In fact, the Directive 2004/52/CE will only "directly impact" a limited portion of vehicles circulating on the European motorway network, namely the heavy good vehicles operating at cross border level, needing a unique and interoperable system.

Some minor impact could be experienced by collectors, in fact the increase of ETS subscriptions and traffic flows affecting motorways could lead road tolling service providers to increase the implementation of ETS lanes and this could generate, in the short term a slightly negative impact on employment. Nevertheless, it is important to stress the systemic effects that will be generated by the implementation of the Directive, namely the promotion of the ETS interoperability at European level; the promotion of the satellite based technology that could create the basis for the success of Galileo based services; the creation of skilled job profiles to design, manage and operate new ITS services; the improvement of traffic planning and management activities and the improvement of transparency in the natural monopoly markets managed by toll chargers.

1 Reference Scenario

1.1 Purpose of the project

The present study is aimed at analysing the economic and social impact of the implementation of Directive 2004/52/CE on the interoperability of electronic tolling service in Europe.

The aforementioned Directive was announced in the White Paper *European transport policy for 2010: time to decide*. It lays down the foundations necessary for a European Electronic Toll Service (EETS) to be put in place as soon as possible on all sections of the road network subject to tolls. The service envisaged by the Directive will be based on the principle of "*one contract per customer, one box per vehicle*". The Directive is aimed at facilitating the implementation of a Europe-wide infrastructure-charging policy which does not compromise possible future road charging policies. The technologies recommended by the Directive can cover all types of infrastructures (e.g. motorways, roads, bridges, tunnels, etc.) and vehicles (e.g. heavy goods vehicles, light vehicles and motorbikes).

To achieve the previously mentioned objective an analysis was carried out combining the "desk activities" of the study with a "*field analysis*" to gather opinions and viewpoints – via questionnaires and interviews - of major stakeholders of the Electronic Fee Collection industry such as country administrations, the toll chargers, the industry's representatives, namely the on board unit producers and software integrators firms, and financial institutions.

Stakeholders' opinions - filtered by independent analysis - has enabled us to depict scenarios aimed at showing the European Electronic Fee Collection community economic and social upshots on the implementation of the "Single European Electronic Fee Collection Service".

This "*Final Report*" is aimed at showing the results of the analysis about the social and economic impacts of the implementation of Directive 2004/52/CE on the ETS community in Europe. This report follows a "*Progress Report*" aimed at detailing the results of the "*field analysis*" carried out submitting questionnaires and gathering responses and information via interviews with selected stakeholders to depict the authentic viewpoint of the Electronic Tolling Service community in Europe.

1.2 Background

1.2.1 The EC Directive

The Directive 2004/52/CE was adopted in March 2004 by the European Council and in April 2004 by the European Parliament; it has been in force since the end of May 2004.

The objective of Directive 2004/52/CE is the provision of a regulatory framework for the deployment of a unique European Electronic Tolling Service in three stages: first stage, definition of service; second stage, service availability for Heavy Goods Vehicles and Long Distance Coaches (three years after the definition of service); third stage, service availability for all vehicles, two years after the date set for lorries.

The Directive does not interfere with the pricing policies of the Member States, nevertheless the electronic systems implemented should be able to handle any charging policy set at national level. The principles that have inspired the EC directive are: implementation of one single contract - one single onboard unit per vehicle; availability of service on the entire tolled network; service usability for whatever toll, fee or tax; same quality of service in any country, no constraints in relation to the country where the contract for the ETS service provision is signed, nor for the nationality of the vehicle or that of the driver.

The technologies envisaged by the EC Directive are: microwave technology (DSRC 5.8 GHz) and satellite based technology (GNSS/GPRS as a future objective for all systems), plus a link to the digital tacograph and to other technologies allowed provided that they do not discriminate non-equipped clients (e.g. the infrared technologies used for enforcement reasons).

1.2.2 The current status of Electronic Fee Collection in Europe

The need for infrastructures as well as traffic congestion refers to some of the major issues in the transportation field in the European Union. These issues are closely related to other major issues caused by humankind and the transportation of goods, such as environmental nuisance and accidents, that are ever more penalising both road users and the economy in the EU.

In such a framework, the electronic toll services could represent tools enabling us to achieve multiple targets from a strategic and operational point of view. From the strategic standpoint the ETS can be seen as financial means for the building and maintenance of road infrastructures or as tools to implement and deploy policies aimed at “diverting” traffic flows or the “conduct” of inhabitants using vehicles to reduce the environmental impact. Unlike the operational viewpoint electronic tolling services have been implemented to speed up toll collection, thereby increasing road capacity, without any further investment in infrastructure. Various systems have been introduced; both at local

and at national level, but these systems were mutually incompatible[1]. In view of the increase in international traffic and to promote a truly unique European market, it is now desirable for these systems to become interoperable at European level.

The Electronic Tolling Services place the users and their vehicles at the "centre" of the transportation system. They are an excellent tool for reducing congestion - provided that the free-flow systems become more common, or that a sufficient number of equipped lanes are available at toll stations so that a high percentage of road users take out a subscription and consequently a large number of vehicles are equipped with a suitable "on board unit". The ETS subscribers can enter special lanes where they will not have to stop nor perform any transactions, but simply continue to drive at a slower speed[2]. By eliminating these bottlenecks and making traffic flow more smoothly, electronic tolls also help reduce the number of accidents and thus improve road safety. By limiting cash transactions at toll stations, toll chargers (road concessionaries) could even reduce security risks associated with money transportation.

Moreover electronic toll systems also have to be considered as the potential key able to promote the development of "*information society*" in road transport, since the same equipment installed in vehicles will allow the implementation and deployment of value added telematic services and safety systems for travellers (e.g. automatic emergency calls in the event of an accident, real-time information on traffic conditions or journey times etc). The EETS could therefore help consolidate the European ICT industry, which is at the forefront of this technology and is calling for the implementation of technical standards in order to avoid market fragmentation and "propose" a de facto standard over the worldwide market, by focusing on a remarkable European presence.

Electronic toll systems first appeared in just a few countries, but they are now spreading throughout Europe. A number of European countries have introduced electronic tolls as a tool of traffic regulation, either in urban areas (e.g. the Netherlands, the United Kingdom) or for certain categories of vehicles (e.g. heavy goods vehicles in Germany, Austria and Switzerland). Some of these countries are moving towards technological paths, such as satellite positioning (e.g. GPS, GNSS, Galileo) in conjunction with mobile communications (using the GSM/GPRS/UMTS standard). This choice puts an end to the need for costly investments in roadside equipment, and allows the most advanced technology to be used. However, it depends on further developments in satellite navigation systems as well as on telecommunication tariff trends. Other countries have chosen their network typology and have invested in accordance with their road-charging policy model based on "microwave technology". In light of this the Member States have

[1] This has created problems for motorists, who have to affix several tags on the windscreen of their vehicle (sometimes even within a single conurbation) in order to subscribe to the various systems. E.g.: Italy, Portugal, France, Switzerland, Slovenia and Norway have national systems, but they are incompatible.

[2] This is the case even if the lane is equipped with automatic barriers, as the dimensions have been designed for this purpose. While the maximum flow for a lane equipped with a credit card machine or a manual toll is 120 vehicles per hour, a lane with an electronic toll can handle between 200 and 300 vehicles per hour, depending on its configuration.

no plans to introduce new toll systems using technologies which differ from those based on microwaves or satellite/mobile communication combinations.

Therefore given the current situation in European countries, it is necessary to point out that to fully achieve the target mentioned in the 2004/52/CE Directive it is mandatory to manage the ***"interoperability issue"***, on all levels as is the case with:

- **technical interoperability**, intended as a standardisation of the technical features and interfaces of both roadside and on-board equipment;
- **operational interoperability**, intended as a standardisation of all procedures required by toll payment through electronic means, from the distribution to the use of the on board terminal, from the user being charged to the crediting of transport service operators;
- **contractual interoperability**, intended as the settlement of a contractual mechanism to bind upon signatory parties and to provide a service to users in accordance with a common standardised service level.

The management of the "*ETS interoperability issue*" will represent the challenge to accomplish in order to achieve the target set by the EC Directive in deploying the European Electronic Tolling Services.

1.2.3 The scope of the project

In order to evaluate the economic and social impacts of the implementation of the 2004/52/CE Directive over the European area it is important to accurately define the scope of intervention, setting the boundaries of the analysis and defining the players/stakeholders involved in the Electronic Toll Collection field.

The Electronic Toll Services industry comprises all stakeholders involved in the electronic automation of the collection process. The boundaries of the industry have been set identifying the stakeholder typology implicated and defining their role in the ETS field in accordance with the following criteria: served customer typology, product/service features and the technology exploited.

The definition of the industry through the aforementioned criteria will enable us to exclusively focus on the analysis in those market segments considered relevant to the study. The stakeholder categories involved in the ETS industry are:

- *Toll Road Service Provider (TSP)*: the organisation in charge of the management and maintenance of the motorway, through tolls collected according to government concession;
- *Electronic Tolling Services Operator (ETSO)*: the organisation that is empowered by the TSP to collect tolls using means other than cash (e.g. special cards, credit/debit cards or electronic devices). These activities are carried out through a specific Electronic Tolling infrastructure, made of central systems and road equipment, managed by the ETSO;
- *Electronic Tolling Service Provider or contract issuer (ETSP)*: the organisation that is in charge of issuing the ETS contract with the User and is responsible for the payment of its customers in front of the ETSO (or TSP);
- *Payment Service Provider (PSP)*: the organisation that collects the money from the customer, hands the payment of transport services over to the ETSP. Typical

examples of organisations playing this role are credit card companies, petrol card companies and banks;

- *OBU issuer*: the organisation that is in charge of issuing qualified OBUs to road users on behalf of ETSPs. This role is often played by the same subject acting as ETSO and/or ETSP;
- *On Board Unit producers*: the organisation that produces the OBUs qualified to operate in the TSP network and is interoperable with ETSO systems;
- *Software integrators*: the organisation that develops software which manages ETS transactions at vehicle and at the central system level;
- *Truck Manufacturers*: the organisation that produces and sells lorries;
- *Financial Institutions*: the organisations in charge of managing payments, financial clearing and services (e.g. banks, insurance companies, card issuers);
- *Users*: the subjects using motorway networks and paying the tolls via light or heavy goods vehicles.

This analysis has not considered Automated Number Plate Recognition (ANPR) Systems "within the scope" of the analysis. These systems have been considered, according to customer's typology which they address and according to their function (to tackle the congestion in urban areas) as elements that are out of the scope of the project. The ANPR systems have been considered only as options/elements, out of the boundaries of industry, able to influence stakeholder investment choices, draining resources from the interoperability theme on the motorway network, at least in the short term period.

In defining the market boundaries of Electronic Tolling Collection systems the analysis focused on "satellite based" and "DSRC" technologies, that currently are the most deployed technologies in European countries, whereas other technologies such as those based on "contact-less" cards, locally adopted in some European countries, were not considered.

1.2.4 ETS current scenario: the PEST analysis

The Political, Economic, Social and Technological (PEST) analysis is the framework tool used to assess the Electronic Toll Collection industry in Europe. This industry is currently characterised by two major themes:

- Ø the appeal of the "ETC theme" that is determining ahead and at the same time is influenced by the flamboyant market growth, due to the combined effect of the following factors:
  - o market opportunities created by the implementation of the 2004/52/CE Directive;
  - o the positive experience of Germany in implementing and operating a "free flow ETC" system for heavy goods vehicles, exploiting a satellite based technology;
  - o the policy trend of many countries, especially in eastern Europe, to implement brand new charging systems aimed at financing the building and maintenance of new road infrastructures,
  - o the positive experience of local governments (e.g. the London case) in implementing the tackling of congestion systems based on technologies (APNR) complementary to those exploited for the ETC systems.
- Ø the implementation of the 2004/52/CE Directive on ETS interoperability, with issues related to management interoperability on all levels as is the case with:

- the technological standpoint,
- the legal and administrative standpoint,
- the contractual standpoint.

The combination of the aforementioned trends is determining the current status of the European ETS industry. In the following paragraphs the current status in Europe for each area included in the PEST analysis is shown.

The political factors

As far as the political factors affecting the Electronic Tolling Collection industry are concerned it is important to stress that the analysis will consider stakeholders operating in the European Union framework. This assumption does not take into consideration the items already addressed by EC regulations aimed at homogenising approaches in fields such as: the environment, international trade, competition, road safety or items related to political stability and government organisation. In a different situation the aforementioned elements would dramatically contribute in defining the "political scenario" for an industry.

By contrast much attention was focused on funding policies and on all other relevant elements in connection with the policies chosen to finance road infrastructure building and maintenance activities. The significance of the financial theme to develop and maintain the road network is also remarked in the 2010 White Paper *"…the Commission will propose a directive on the harmonisation concerning means of payment for certain infrastructure, particularly for motorway tolls"*.

Of the approaches chosen by Member states to finance road development, we can identify two main paths featuring national policies:

- **toll charging**: in this policy approach the toll is the payment collected by a company, usually according to a concession, for the use of road infrastructure. The toll is the payback set for a fixed period in the concession act to reimburse the company for building costs and to operate and improve road infrastructure. The countries that have chosen to adopt this policy are southern European ones such as France, Italy, Spain and Norway. Later on Greece, Slovenia, Hungary and Austria started to become familiar with the toll policies. Germany has had a completely different experience, based on toll collection. In that particular case the government decided to assign the electronic toll collection activity to a company, using the money collected from heavy goods vehicles to build, improve and maintain national road networks;
- **shadow tolling**: in this policy approach the government pays private operators who build and manage road infrastructure for network usage. Usually the criteria used to define "shadow tolls" are based on the number of vehicles on the road. In accordance with this policy approach, the government directly pays the toll chargers from taxation proceeds. This means that the "user/payer" principle cannot be applied. Shadow tolling has been adopted as a main policy system in northern and continental European countries, but it is also possible to find examples of shadow tolls in some Latin countries such as Portugal and Italy.

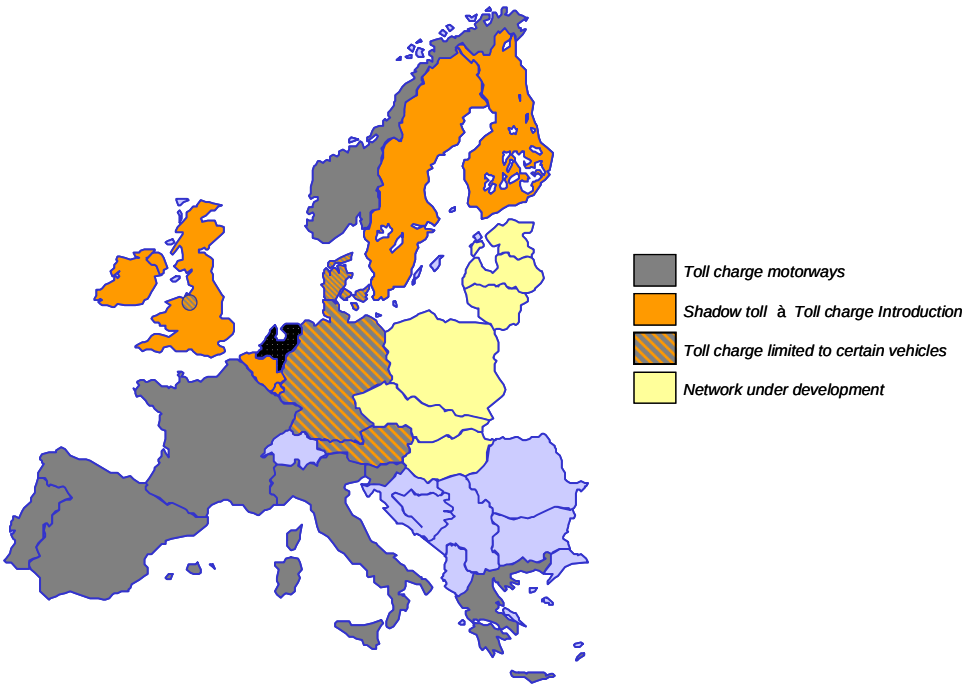
Within the two identified categories, each member state has applied:

- specific policies on taxation/tariff calculations (based on criteria such as: distance, vehicle features, number of axles, number of paired wheels etc.)
- specific institutional and organisational management models.

In some cases the Member States have adopted both policies simultaneously, discriminating their application based on a vehicle class basis (e.g. in Austria we can see the coexistence of the vignette for light vehicles and the ETC for the heavy goods vehicles).

A summary of the current situation of motorway financing policies is depicted in the following map:

Figure 1: EU Toll charging adoption map



Source: Ernst & Young elaboration.

The total EU motorway network is about **55,000 kilometres long** (33,000 km are subject to toll policies[*]). The new member states of the European Union identified in the map, with their 3,000 kilometre long network (800 km are under toll charging), has been classified as "*network under development*" and they will not be considered in the present study.

A detailed national description on the tolling regulation and tariff calculation is provided in the Annex 1 (Tolling Regulation by countries) to the present document.

Another important feature to consider - if the toll charging framework policy is implemented - is represented by the system chosen to manage toll collection. In fact, it is possible to implement a "closed system" or a "free flow system". These systems have one main difference: the presence or the absence of physical barriers, to collect the toll via collectors or through electronic systems.

The presence of physical barriers, over an obvious impact on the traffic flows management, enables a dramatic increase in the headcount of the toll chargers. Actually, the need to ensure a collection service available 24/7 in order to avoid creating conditions for a traffic flow

[*] (**source: Energy & Transport figures 2005, Directorate-General for Energy and Transport, ASECAP 2006**)

disruption, due to congestion or accidents, has obliged motorway operators to deploy a huge number of lanes in each toll station aimed at minimising the waiting time for road users. This approach has generated a large demand of human resources (collectors) that currently represent a share of motorway headcount ranging from 35% to 45% of the motorway workforce (the percentage has been estimated as an average of declared personnel, considering only motorways that have deployed tolling systems).

A further relevant effect connected to the implementation of the physical barriers refers to the enforcement theme. In reality, the barriers allow to effectively manage the enforcement theme, solving also the issue represented by foreigner travellers, even in the case of different enforcement regulations to be applied. A completely different situation will happen without physical barriers. In this case, the toll road service provider could be not allowed to prosecute the road user, e.g. it couldn't be allowed to take down the driver's licence plate number to send the driver a fine.

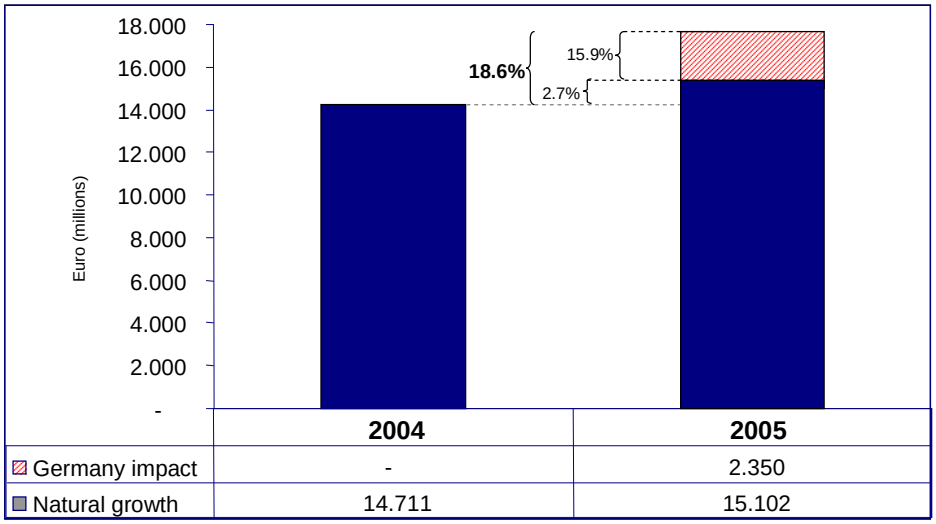
Last but not least, another highly significant factor featuring the political environment of the ETS industry is represented by the different European indirect taxes regime and levels (particularly VAT). These differences, especially in the VAT rate, lead to some difficulties in managing international reimbursement for professional users (namely logistic companies). In the Annex 2 a table summarises the different approaches on VAT rates and other fiscal tools.

The economic factors

Among the economic factors to be considered as elements able to determine ETS industry situation, it is mandatory to concentrate on revenues generated by toll charging. Considering European countries that are implementing the tolling schema, it is possible to note that in 2005 the total revenues generated at European level by toll collection almost amount to 17.45 billion Euros, compared to 14.71 billion Euros generated in the previous year. As shown in Figure 2, the explanation for the "*great leap*" made in the year 2005 (+18.6%) depends on two main reasons:

- "natural" growth (+2.7%) of the revenues volume due to the :
  - increase in traffic volume in road mode;
  - increase in the number of transactions managed through ETS;
- the starting of toll collection in Germany, for heavy goods vehicles with 12 or more tons in weigh (+15.9% impact of revenues growth).

Figure 2: Total ETS revenue, the German impact



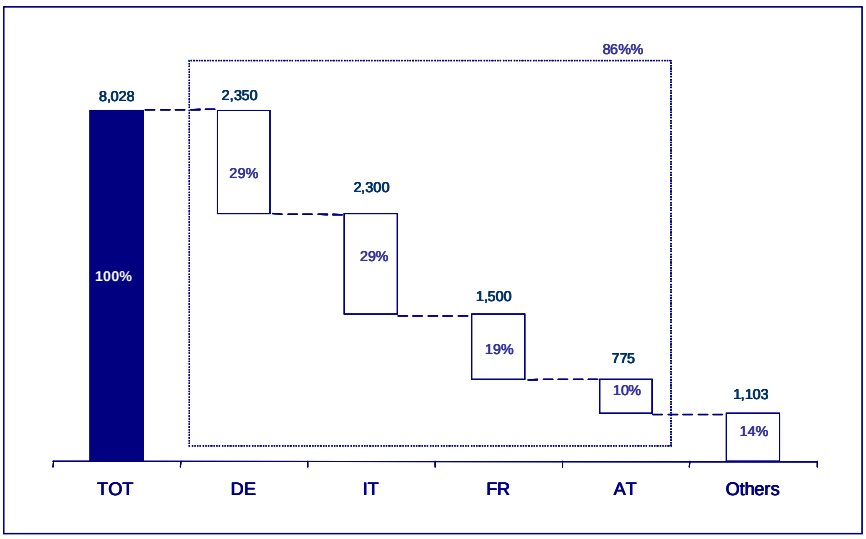
	2004	2005
Germany impact	-	2.350
Natural growth	14.711	15.102

Source: ASECAP 2005, direct interviews.

By focusing on the ETS market, we can note that the 2005 revenues, totalling almost 8 billion Euros, came from countries such as Italy, France, Germany, Spain Greece, Austria, Portugal, Norway and Slovenia, which have a high level of ETS system deployment.

Germany, Italy, France and Austria contributed to 86% of the total ETS revenues, as shown in Figure 3 (data in millions of Euro):

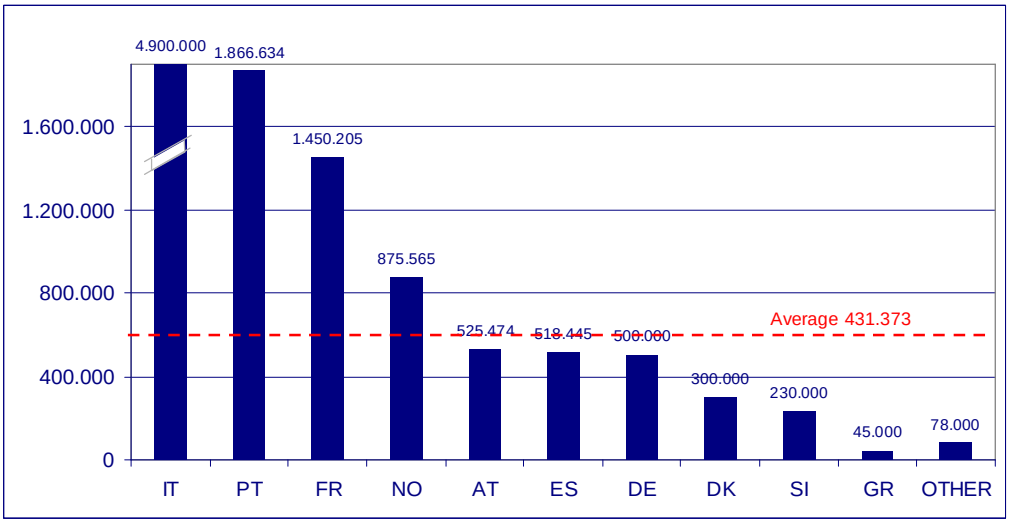
Figure 3: ETS revenue segmentation by country



Source: Ernst & Young estimates on direct interviews, 2005.

By going through the economic analysis, it is possible to determine the ETS market size in terms of subscribers. When analysing updated statistics regarding ETS subscribers, the first two countries (Italy and Portugal) in terms of absolute ETS subscribers account for 60% of the total market considered, while the first four countries represent 80% of the current ETS market.

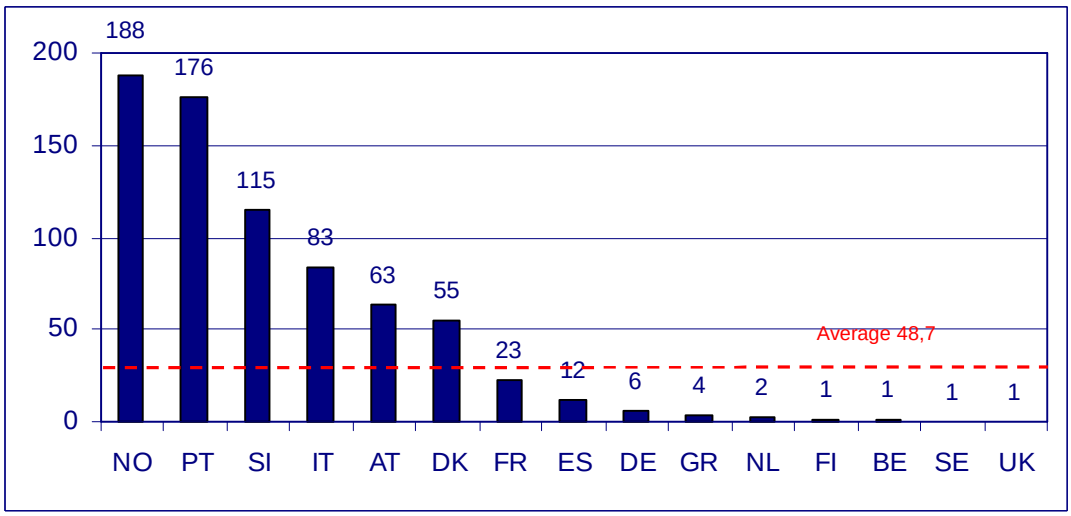
Figure 4: ETS Subscribers by country



Source: ASECAP statistics, 2005.

To understand the relevance of ETS phenomenon, trying to take into account the "size" of each country, it is useful to normalise the number of ETS subscriber figures through the population parameter by creating an index aimed at measuring the "*ETS diffusion*", this index will provide the amount of ETS subscribers for each 1000 inhabitants of a country. In Figure 5, there are the data related to the aforementioned index. The figures shows that six countries (Norway, Portugal, Slovenia, Italy, Austria and Denmark) have the highest values of the ETS diffusion, through an high rate of ETS diffusion, in relation to their respective population.

Figure 5: ETS subscribers per 1000 persons

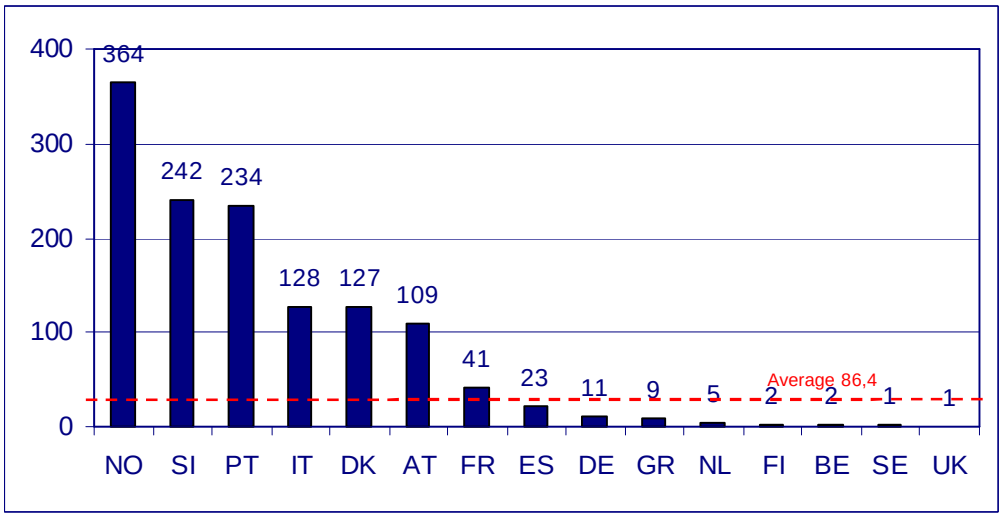


Source: ASECAP statistics, 2005.

Another way of evaluating the acceptance for ETS could be represented by the relation between the number of ETS subscribers and the stock of vehicles registered in every country. The national stock of vehicles include all the potential vehicles subject to toll charging in the motorway network (cars, lorries, buses and coaches), with the exception of two wheel units (motorcycles). The chart, showing the number of ETS subscribers for each 1000 vehicles in

the national stock (as defined previously), confirms the concept formerly described, pushing out higher levels of ETC diffusion for the same 6 countries.

Figure 6: ETS subscribers per 1000 vehicles



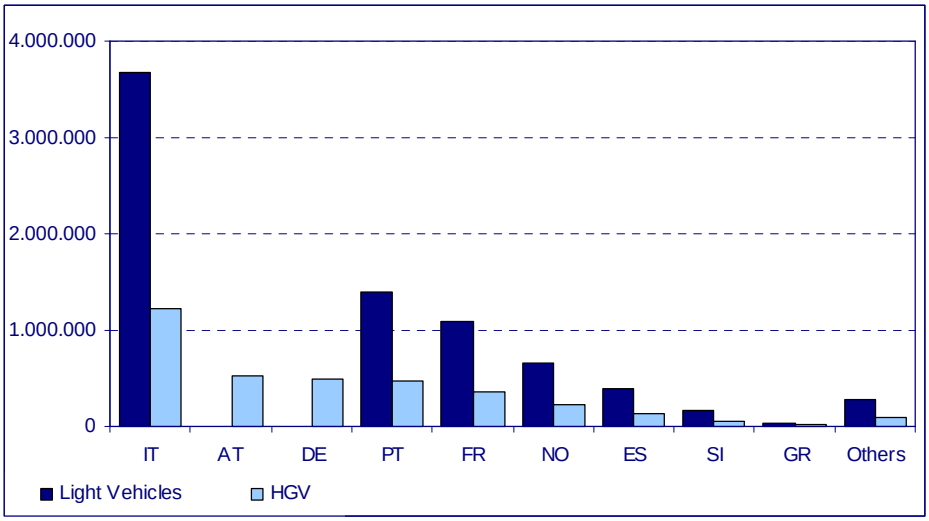
Source: ASECAP statistics, 2005.

Interviewing the ETS stakeholder it emerged that the authentic beneficiaries of the interoperability of the ETS at European level will be professional operators of the transport sector, either passengers or cargo, in particular Heavy Goods Vehicles, Buses and Coaches (for more than 9 passengers). These operators have to focus on many non interoperable ETS that force them to deal with a number of ETS providers (contract issuers), different invoicing systems and On Board Units.

There are no data available for all of the countries analysed as regards to the composition of the ETS subscriber customer base between Light Vehicles and Heavy Goods Vehicles. Nevertheless, the information gathered during the survey activities in the study, allows a rough estimate on the subscribers composition between LVs and HGVs being 75% and 25% respectively. Moreover we must add that in some Member States, such as Austria and Germany, the ETS system is only reserved to HGVs.

Figure 7 below shows the ETS subscription market size for member states analysed in the study:

Figure 7: Composition of ETS subscriber customer base by country (year 2005)



Sources: Ernst & Young estimates on Energy & Transport figures 2005, Directorate-General for Energy and Transport.

Table 1: Composition of ETS subscriber customer base by country

Country	LV	HGV
IT	3.675.000	1.225.000
AT	0	525.474
DE	0	500.000
PT	1.399.976	466.659
FR	1.087.654	362.551
NO	656.674	218.891
ES	388.834	129.611
SI	172.500	57.500
GR	33.750	11.250
Others	285.959	95.320

Sources: Ernst & Young estimates on Energy & Transport figures 2005, Directorate-General for Energy and Transport.

Italy, which is one of the first countries where ETS was introduced, has the highest number of ETS subscribers (4.9 millions, the portion of LV subscribers is far from being insignificant. This is because of a "light vehicles oriented" commercial policy, deployed through dedicated schema defined by the Italian Electronic Tolling Service Provider, aimed at increasing ETS usage among drivers. The results of this policy are represented by the composition of the ETS customer base, in which private users currently account for a share equal to 58%. This percentage could even increase after the deployment of a prepaid schema and new schema for light vehicles, that bundles to ETS ancillary services for drivers.

Nevertheless, there are many reasons to consider HGVs as high potential subscribers, especially if we consider HGVs as subject operating ad European level:

a. the need to optimise scheduled fleet movements by reducing queues at toll lanes;
b. long distance covered, often transiting through different motorway trunks, also at international level, with high frequency.

To deepen the analysis on the relevance of HGV's into the ETS industry it's useful to develop a measurement for the level of HGVs travelling across the most important borders

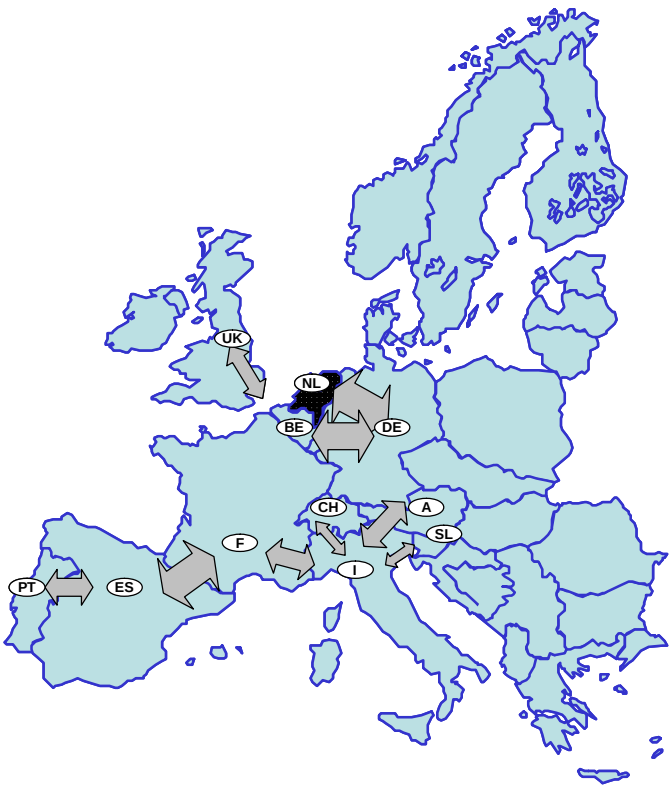
within the EU Member States. The lack of a structured and reliable analysis at European level aimed at understanding this phenomenon, suggest limiting the observations on a short but representative number of borders, in order to have an estimate of the traffic size to be used as proxy of the entire traffic. HGV annual transit data are shown in Table 2 and Figure 8 below:

Table 2: Number of transits across some relevant European borders

Borders	Annual number of HGV
Italy - France	2.781.000
Italy - Switzerland	1.425.000
Italy - Austria	2.993.000
Italy - Slovenia	892.000
Spain - Portugal	2.960.515
Spain - France	6.716.000
UK inflow/outflow	1.500.000
Netherlands - Germany	10.943.430
Netherlands - Belgium	13.111.530
Tot	***30.210.945***

Source: Ernst & Young estimates based on reports of different toad toll service providers, 2003 (Spain-France year 2000).

Figure 8: Map of targeted European Borders



Source: Ernst & Young elaboration.

More than 30 millions HGVs transit through nine European borders. This shows the significance of this market segment and stresses the need for an interoperable ETS at European level aimed at increasing the efficiency in the traffic management activities.

The Social factors

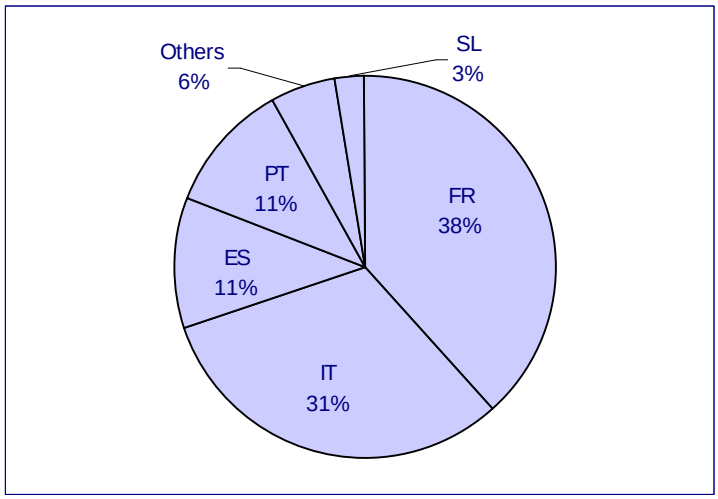
The implementation of the Directive brings out relevant impacts on the social environment. For this reason, it is useful to estimate the social impacts considering three main aspects:

- effects on employment, especially on TSP collectors;
- impacts on environmental issues;
- improvement in service quality level for users and in effective traffic management for the toll chargers.

A starting point in order to develop an analysis of the effects of ETS interoperability at European level on employment is the understanding of the total number of European collectors at toll stations. The observation is restricted to countries that have already adopted a tolling policy within the past few years. In detail, with reference to the map previously shown, the analysis is focused on: Italy, Slovenia, Portugal, Norway, France, Spain, Greece and Austria.

When taking into account the data gathered from the stakeholders interviewed and the desk analysis carried out, it is possible to estimate the total number of manual collectors, in the aforementioned countries, in a range between 20,000 and 23,000. In the following chart, is represented the breakdown of collectors workforce by country.

Figure 9: Number of manual collectors for those countries adopting a tolling policy



Country	Manual Toll Lanes
Italy	1.792
France	1.752
Spain	806
Portugal	690
Greece	163
Norway	155
Slovenia	144
Austria	35
Total	***5.537***

Source: ASECAP statistics 2006, direct interviews, company data.

Italy and France, through their large toll network size, account for the 70% of the total number of the "European headcount" of manual collectors.

By linking the total number of manual collectors to the number of manual toll lanes for each country, it is possible to calculate the average number of collectors needed to assure the full availability of a single manual toll lane. At national level this number changes between countries, ranging from 3.5 to 4. The range varies according to national labour policies (e.g. number of weekly hours) and management operational strategies. Furthermore, it is important to highlight that a manual collector's job is characterized by:

- high turnover rates of jobs offered by the toll chargers;
- low technical skills required;

- mandatory presence of at least a manual toll lane, in a toll station.

The **environmental impact** is the second element which has highly influenced the introduction of the ETS systems. The ETS deployment will reduce elements such as the time spent in a queue at the toll lane for thousands of vehicles each day, the emission of carbon dioxide and other pollutants at the toll plaza or near the motorway barriers, where generally traffic flow decelerates. In addition, the presence of special lanes dedicated to ETS subscribers, facilitates their transit and decreases the number of vehicles on the road surface next to the toll plazas.

The third issue that causes a social impact concerns the i**ncrease** in the TSP **quality service level** due to the establishment or improvement of an ETS. In that case the impact is positive, for end users and subscribers as well as for toll chargers.

The effects on such subscribers can easily be understood: the more ETS lanes are added, the more the service can help in avoiding queues, and facilitate the collection process. In addition, "residual users" (those using cash as means of payment) can take advantage from of increased ETS gates, which significantly lower the number of vehicles on manual toll lanes.

Other effects on concessionaries are related to the possibility of building and keeping detailed data on clients: vehicles, paths, revenues, etc. These data enable the concessionaries to:

- forecast traffic flows;
- undertake Customer Satisfaction's initiatives;
- constantly monitor and supervise the amount of revenue gathered each day.

The Technological Factors

Article 2 of the Directive, on technological solutions, identifies three kinds of technologies to carry out electronic toll transactions:

- satellite positioning;
- mobile communications using the GSM-GPRS standard;
- 5.8 GHz microwave technology (DSRC)

As shown in the following table, most of the ETS technologies currently used by Member States are usually based on Dedicated Short Range Communication (DSCR) technology, with the exception of Germany. Moreover, almost all the ETS systems comply with a standard defined by a Standards Development Organisation.

Table 3: ETS technologies used by Member States

Country	ETS Technology	Standard
DK	DSRC 5.8 GHz	CEN
DE	DSRC 5.8 GHz GPS and GSM	CEN for DSRC None for the GPS and GSM
GR	DSRC 5.8 GHz	CEN
ES	DSRC 5.8 GHz	CEN
FR	DSRC 5.8 GHz	CEN
IT	DSRC 5.8 GHz	UNI (national standard)
AT	DSRC 5.8 GHz	CEN
PT	DSRC 5.8 GHz	CEN
SI	DSRC 2.45 GHz	None
NO	DSRC 5.8 GHz	CEN

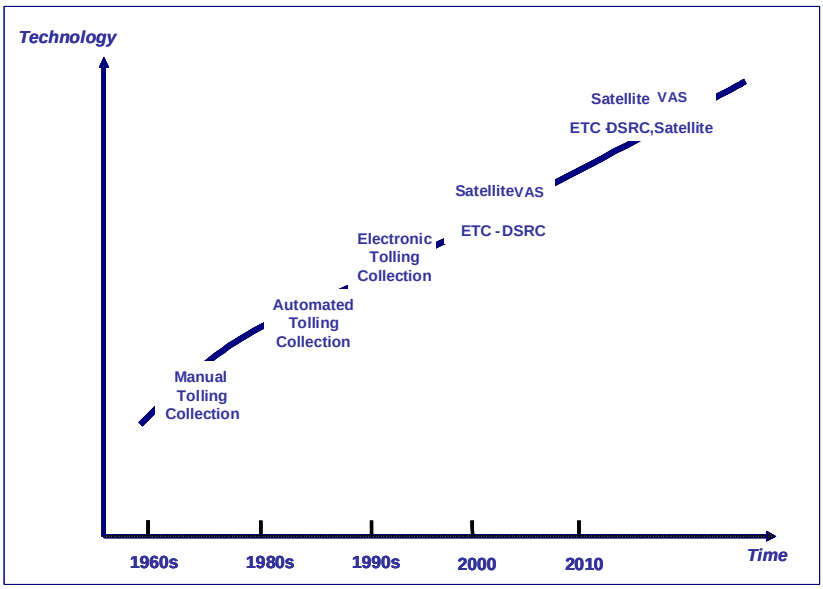
Source: direct interviews, company data.

The White Paper has already pointed out this concept underlining that *"…International standards are being adopted on short-range communication automatic toll systems and work is under way to establish the contractual and legal aspects of network interoperability"*. Since the expert groups established by DG TREN intend to analyse the technical features related to ETS systems and the pilot projects (such as Media, Pista, Norits, Via Iberica, RCI and CESARE), promoted and implemented at European level, the conditions for technical interoperability are considered achievable and thus do not represent a great challenge.

These technologies can be considered as the stages of a "technological path" of the collection process, ranging from manual collection to value added services bundled to satellite based collection systems.

Figure 10 illustrates such a technological path over a timeframe representing the period in which the technology has been introduced and deployed.

Figure 10: The ETS technological path



This path could even be used to work out some considerations on the distribution of payment means. Currently all payment means, ranging from cash to card (debiting and credit cards, petrol cards or payment cards issued by transport service providers), to ETC are exploited by road users. It is important to note that, according to the data gathered and the interviews made with toll chargers and Administrations, the ETC systems, as means of payment, are becoming even more relevant.

The underlying cause of this boom is the increased acceptance of ETC tools in every country as well as the preference given by some road user categories (namely heavy goods vehicles) due to the post payment features.

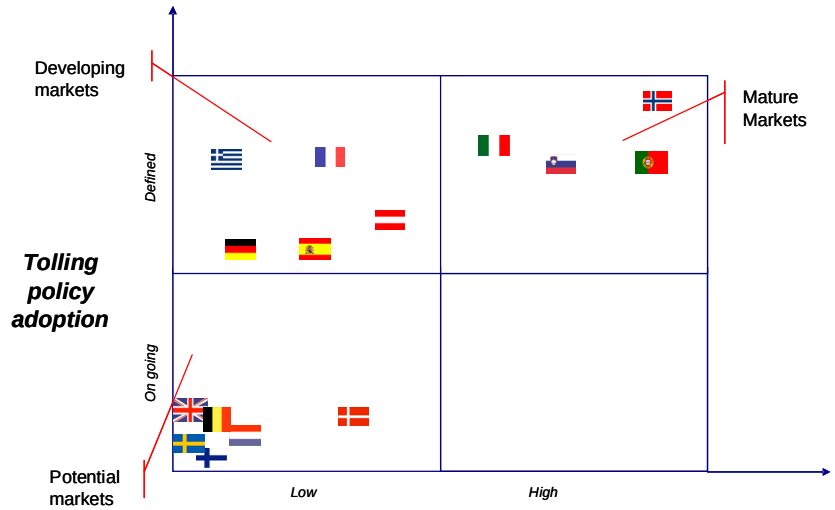
The wide acceptance of ETC as means of payment is becoming ever more important in countries in which ETC is not only for heavy goods vehicles, but for light vehicles as well (e.g. private cars and motorcycles). In these countries the ETC systems are also able to provide road users with other road- related telematic services (e.g. payment of parking lots, fuel payments, accession to downtown area, etc..

The PEST synthesis

To sum up the results of the PEST analysis conducted, a matrix is illustrated in Figure 11. The two axes of the matrix represent:

- **ETC penetration** (x-axis) which considers the ETS diffusion in the country. This quantitative variable includes the indexes mentioned in the analysis of the social trend related to the link between ETS subscribers and country population and the stock of vehicles and the revenues from ETS systems;
- **tolling policy adoption** (y-axis) which represents the policy schema chosen by the Member States to finance motorway networks. This variable stems from a mix of quantitative data and qualitative information by taking into account the percentage of motorway network subject to tolling on the total network and the diverse vehicle classes identified by different governments for toll charging.

Figure 11: ETC penetration



Within the matrix, it is possible to identify three main "areas" in which countries may be "classified". The areas are defined according to the main stages of lifecycle of a product.

- **Mature markets**: this block includes the most developed ETS markets represented by countries such as Norway, Portugal, Italy and Slovenia. These countries have reached a wide diffusion of ETC systems among motorway users and have deployed the ETS from the early stage, with the exception of Slovenia (the only Member State considered in this study out of the ten new member states), this is mainly due to geographical and commercial reasons, namely the relationship with Austria and Italy.
- **Developing markets:** this area of the matrix includes those countries that have already defined the toll charging policy, but those policies cover:
  - only part of the motorway network, which still shows high enlargement network margins that could be covered by tolls;
  - only special vehicle classes, according to the international and ASECAP classification, are under (distance or time based) toll payment or they can use the ETS as means of payment.

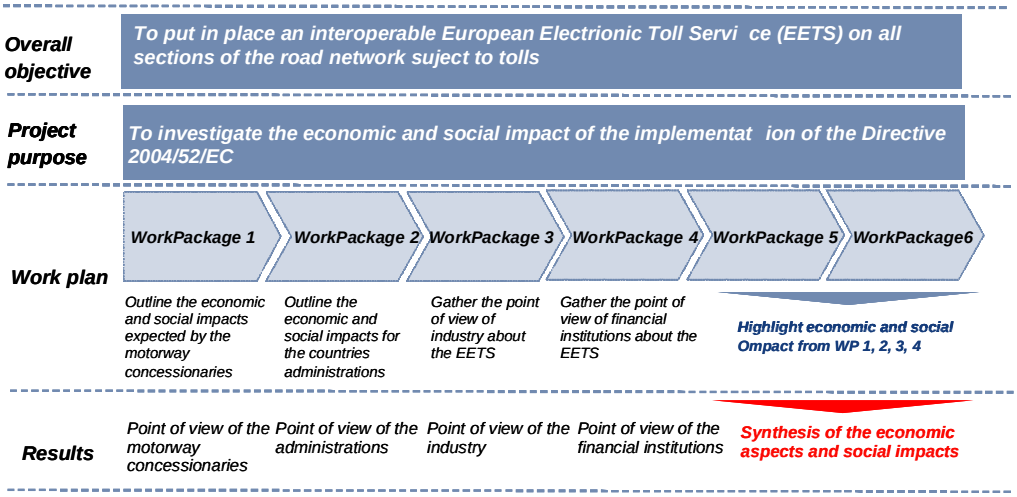
  Due to this partial coverage of the tolling field, those countries have experienced a lower ETS technology penetration but, potentially, they represent the future development of the market.
- **Potential markets:** Countries in this section still have not clearly defined an approach regarding the toll charging policy. In many cases, they are experiencing ETS systems on small stretches of the motorway network. It is important to highlight the case of Denmark which has only 36 kilometres of tolling network but nevertheless has already obtained 300,000 ETS subscriptions, showing a high ETC system penetration rate.

The PEST analysis showed the heterogeneity concerning the deployment of ETS systems in the countries analysed. This fragmentation is due to the fact that each country is experiencing its own ETS deployment process through the adoption of an organisational model tailored on national characteristics and to the role assigned to the toll, even considering it as a tax. A logical consequence of this proliferation of ETS models is the creation of several profiles and roles involved in the ETS organisational structure. Consequently, the social impacts related to the implementation of the Directive will vary in the Member States.

2 The methodological approach used

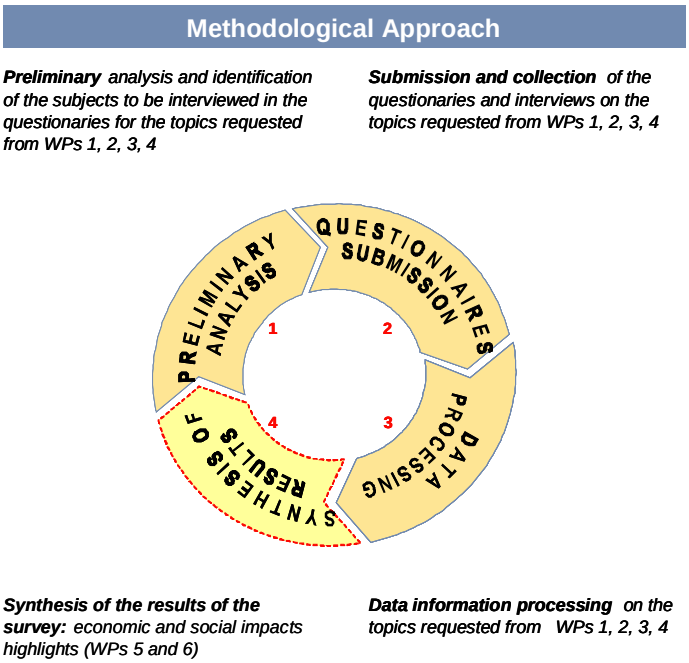
To carry out an analysis on economic and social impact of the implementation of Directive 2004/52/CE, a structured methodological approach has been used. At the beginning of the engagement, a *logframe approach* was carried out by tuning a firm's methodology on the ETS field. Below is a framework of the methodology aimed at showing links and relationships between objectives, tasks/activities, work-plans, preconditions and assumptions.

Figure 12: Overview on methodology



To achieve the goal *of the project*, it was necessary to conduct a study combining the "desk activities" with a "field analysis" to gather the opinions and standpoints – via questionnaires and interviews - of major stakeholders of the Electronic Fee Collection industry. Figure 13 detailed below highlights the methodological approach adopted to carry out the study.

Figure 13: Methodological approach



The path chosen to gather the **stakeholders' vision on the business perspective on the Single European Electronic Tolling Service** is described in detail in the following steps:

1. preliminary analysis and identification of the subjects to be involved in the study to draw up a "stakeholder list" in accordance with the European Commission, followed by the drawing up of the questionnaires to be submitted to the stakeholders;
2. submission and collection of the questionnaires and the stakeholders' interviews;
3. data and information processing;
4. upshots of the economic aspects and social impacts through gathering and processing, followed by the drawing up of a final report.

2.1 Preliminary analysis of the environment and identification of the subjects to be involved in the questionnaires

The aim of this stage was to come up with a clear vision of the current framework of the electronic toll collection system in Europe. This step mainly consisted in analysing the features of the current ETC systems, identifying the main subjects involved in Directive 2004/52/CE implementation and assessing the initiatives promoted/supported by the EC in the ETS field in Europe. In this regard it was important to identify the subjects involved, by acquiring in advance knowledge about their attitude on Directive 2004/52/CE. For this reason, the main activities carried out were:

- analysis of the features of the current electronic systems of fee collection;
- identification of the main subjects to be involved in Directive 2004/52/CE;

- preliminary discussion with the main subjects and the stakeholders about their views on the possible impacts of the implementation of the "Single European Tolling Service".

In this framework, the last step was critical to tailor the questionnaires and interviews in accordance with the specific features, needs and expectations of the subjects involved.

After these activities were completed a list of "potential" stakeholders was drawn up. This list enabled us to highlight and summarise the requirements and valuable standpoints of all the categories involved in the electronic fee collection field. The list was submitted to the EC in order to be validated before gathering the stakeholders' opinions. In the table below you will find the stakeholders involved.

Table 4: Stakeholders involved

Motorway companies	Administrations of target countries	Target Industries	Financial Institutions
Abertis (ES)	*Toll Collect (DE)*	*Thales (FR)*	*Norwich Union (UK)*
Autostrade per l'Italia (I)	*Rijkswaterstaat (NL)*	*Siemens (DE)*	*Unicredit Banca (I)*
Attikes Diadromes (GR)	*EZV/ARE (CH)*	*QFree (NO)*	*TVM (NL)*
Brisa (PT)	*Ministry of Trasportation (SI)*	*Octotelematics (I)*	*Ages (DE)*
Autostradas do Atlantico (PT)	*Department for Transport (UK)*	*Kapsch TrafficCom (AT)*	*Via Verde (P)*
Norvegfinans (NR)	*BMVIT and ASFINAG (AT)*	*TeleAtlas (BE)*	*Axxes (FR)*
ASFA (FR)		*PTV (DE)*	
ASETA (ES)		*ARS Traffic (NL)*	
AISCAT (I)		*VOS Logistics (NL)*	
		DAF(NL)	
		Daimler Chrysler (DE)	
		Eurolines (NL)	
		ARS-ALT MANN (DE)	
Countries represented			
France, Italy, Spain, UK, Portugal, Greece and Norway	*Germany, Austria, Switzerland, UK, The Netherlands, Slovenia*	*Germany, France, Italy, Belgium, The Netherlands, Austria, Norway.*	*Germany, Portugal, UK, The Netherlands, France, Italy*

Four types of interview panels were respectively carried out for:

- *Panel 1*: to obtain the viewpoint of the toll chargers (motorway concessionaries);
- *Panel 2*: to obtain the viewpoint of the administrations of the countries where charges are levied (and of the acting operators in those countries);
- *Panel 3*: to obtain the viewpoint of the industry representative;
- *Panel 4*: to obtain the viewpoint of the financial institutions;

Regarding Work-package 3, four categories of industry stakeholders were defined and analysed:

ü companies providing onboard units for Electronic Tolling Service;

ü companies providing onboard equipment for various duties and software integrators;

ü lorry manufacturers;

- transport companies- hauliers, both for people and goods.

Regarding the *Panel* 4, two categories of the financial institutions playing in the ETS industry were analysed:

- banks and insurance companies;
- electronic tolling service providers (contract issuers).

Given this framework, it is clear that the identification of the "*as is situation*", in accordance with the stakeholders' vision of the industry was the necessary preliminary step to foresee the possible economic and social impacts of the implementation of Directive 2004/52/CE in Europe.

2.2 The submission and data gathering of questionnaires

Preparing the interview and drafting the target structured questionnaires were the final and critical steps of the previous stage and the necessary input to embark upon the current phase. The aim of this stage was to gather specific information in a structured form in order to understand the outlooks and opinions of the stakeholders involved.

At the beginning of this step it was decided that more than four questionnaires were necessary to comply with the four stakeholder categories identified (Toll chargers, Administrations, Industry and Financial Institutions) to encompass the variety of subjects making up the "industry" category and the "financial institutions" category (e.g. bank representatives , insurance companies and "electronic tolling service providers"). In reference to this, the following questionnaire typology was worked out:

- toll chargers questionnaire;
- administration questionnaire;
- truck manufacturer questionnaire;
- OBU manufacturer and software integrators questionnaire;
- people and goods transportation questionnaire;
- financial institution questionnaire (addressed to banks and insurance companies)
- electronic tolling service providers (contract issuers) questionnaire.

The questionnaire template was mainly made up of four blocks of analysis, with a different emphasis on each block depending on the type of stakeholder involved:

- pricing policy (e.g. information on road pricing scheme, factors influencing toll, ETS value chain, etc.);
- business, economic and financial issues (e.g. size of the current and future ETS market, cost for local systems compared to ETS, impact of the Directive on traffic network, etc.);
- business and operation management (e.g. management and operational costs, OBU cost, annual service fee for each OBU, etc.);
- technology (e.g. technology adopted, impact of the Directive on technology choice, possible offering of future applications/services in addition to toll collection, etc.);
- general issues about the Directive (e.g. positive/negative impacts of the Directive on industry/organisation, opportunities and impacts brought about by the Directive, etc.).

To sum up, this phase focused on the collection of relevant data for the survey by submitting questionnaires to the stakeholders and conducting interviews with them to

discuss their responses. The questionnaires were provided to the selected subjects in advance to review the main topics and later, these same subjects were interviewed.

2.3 Data and information processing

This phase was oriented to create a synthesis report to show the opinions on the implementation of the "*Single European Fee Collection Service*" of all the categories of the stakeholders involved, through an analysis of the information gathered. In detail, for each stakeholder the following topics were discussed:

- toll chargers:
  - ü ETS market features (number of subscribers, revenues generated, etc.),
  - ü Electronic Toll Collection costs (investment and operational costs), especially in order to implement and deploy the service at European level,
  - ü the fraud /enforcement issue,
  - ü Business perspective related to the implementation of the EC Directive,
  - ü expected impact on toll plaza employment or in the central departments of the company,
  - ü business perspectives: export of knowledge in other countries, provision of turn key systems,
  - ü business perspectives on the introduction of ITS services on road network, aiming at improving the quality of traffic management, road safety and traveller information;
- administration of the countries where charges are levied:
  - ü current number of subscribers to the service already operating at national or local level, or expected market size,
  - ü expected costs of the European ETS (e.g. delivery and maintenance, invoicing and clearing system, financial security measures, safety/security measures on toll plazas, etc.),
  - ü expected costs for ETS at national level if existing,
  - ü expected revenue loss due to potential frauds,
  - ü expected impact on toll plaza employment or in central departments,
  - ü business perspectives on export of knowledge in other countries,
  - ü business perspectives on the introduction of ITS services on road network, aiming at improving the quality of traffic management, road safety and traveller information;
- industry:
  - ü business aspects related to the production and market for every onboard unit, in Europe and on the worldwide market,
  - ü the EC Directive and the impact on OBU design and production,
  - ü the technology issue: the platform's interoperability,
  - ü perspectives for market growth through the production of different ranges of interoperable equipment,
  - ü the role of the industry in the definition of new charging schemes in Europe,

- ü the EC Directive impact on the "professional" road user (goods and people transportation companies) daily business,
- ü the EC Directive impact in the industry in terms of social factors (e.g. unemployment effects);

- financial institutions:
  - ü the onboard units delivery issue,
  - ü issue of payment means associated with service,
  - ü the clearing activities between operators,
  - ü liability of operators between themselves and possibilities of insurance for this liability,
  - ü the electronic tolling service provider role in the ETS value chain,
  - ü the EC directive impact on the industry in terms of social factors (e.g. unemployment effects, employment changes).

Furthermore, the information gathered through the field analysis has made it possible to depict a complete framework of the economic and social impacts of the implementation of Directive 2004/52/CE for the Electronic Tolling Services stakeholders.

3 Stakeholder Viewpoint

The approach chosen to gather the viewpoint of ETS stakeholders is described as follows:

- preliminary analysis and identification of the subjects to be involved in the study in order to draw up a "list of stakeholders" that is to be submitted and validated by the European Commission;
- formulation of questionnaires to be submitted to stakeholders and their validation by the European Commission;
- submission and collection of questionnaires and the execution of the stakeholders' interviews;
- data and information processing.

In detail, the first step is aimed at obtaining a clear vision of the current framework of the electronic toll payment systems and to depict the "*current*" situation. It is a critical preliminary step in predicting the potential economic and social impacts of the implementation of the Directive 2004/52/CE in Europe. Basically this step consisted in analysing the features of the current electronic tolling systems; in identifying the main subjects involved in the Directive 2004/52/CE and in assessing the initiatives promoted by the EC in the ETS field in Europe. In this regard it was important to identify the subjects involved and to acquire knowledge concerning their attitude in advance. Once the abovementioned activities were completed a list of stakeholders was drawn up. This list made it possible to highlight and summarise the requirements and valuable viewpoints of all the categories involved in the electronic fee collection field. This list has been submitted to the EC in order to be validated before beginning the process of gathering the opinions of the stakeholders.

The second step which was carried out, after having received the validation of the list of the stakeholders submitted by the EC, was the design and implementation of the questionnaires to be submitted to the stakeholders. During this step we decided that more than four questionnaires were necessary in order to comply with the four categories of the stakeholders identified: Toll chargers, Administrations, Industry and Financial Institutions. In fact, it was clear that in order to encompass the numerous subjects involved in the categories of "industry" and "financial institutions" (e.g. representatives of banks, insurance companies and "contract issuers") it was necessary to work out the following questionnaire typology:

- toll chargers questionnaire;
- administration questionnaire;
- lorry manufacturer questionnaire;
- OBU manufacturer and software integrators questionnaire;
- people and goods transportation questionnaire;
- financial institution questionnaire (addressed to banks and insurance companies)
- electronic tolling service providers questionnaire.

The third step consisted in analysing the detailed information gathered on how the stakeholders manage their involvement in the ETS field and in understanding their different points of view. This stage focused on the collection of the relevant data of the survey through the submission of questionnaires to the stakeholders as well as how the interviews were carried out. The questionnaires were provided to the selected subjects in advance, so that they could immediately review the main topics and, afterwards interview these subjects directly.

The last step focused on the analysis of the information gathered via interviews and questionnaires in order to determine some preliminary considerations on the economic and social impact of the implementation of the Directive 2004/52/CE.

3.1 Viewpoint of toll chargers (motorway concessionaries)

Objectives

Activities included in that stage are aimed at outlining the social and economic impacts expected by the toll chargers (in the following pages these are equivalent to road and motorway concessionaries) which result from the implementation of the European Electronic Fee Collection Service.

The description of activities

During this stage of the study the activities performed were mainly aimed at identifying the subject to be involved in the study according to the following criteria: the principles stated in the 2004/52/CE Directive; the representativity of the road concessionaire network trunk; the representativity of the experiences which occurred in the last twenty years in Europe in the electronic tolling field to compare opinions from and on different experiences and the business models implemented. The carrying out of the activities according to the above-mentioned principle, together with the gathering and the assessment of the material in the ETS field from "official sources" (e.g. DG TREN or initiatives related to DG TREN) allowed us to draft a list of concessionaires that has been submitted and validated by DG TREN. Below is the aforementioned list

Table 5: How the work was organised and the stakeholders involved

Organisation	Person interviewed	Interviewer	Date
Abertis (ES)	Mr. Serra and Mr. Marti	J.M. Gautier	27/07/06
Autostrade per l'Italia (I)	Mr. Galletta, Mr. Battiboia and Mr. Del Pizzo	G. Luccitti	19/06/06
Attikes Diadromes (GR)	Mr. Halkias and Mr. Harito	G. Luccitti	14/06/06
Brisa (PT)	Mr. Braga	G. Luccitti	28/06/06
Autostradas do Atlantico (PT)	Mr. Ceja	G. Luccitti	28/06/06
Norvegfinans	Mr. Trondsen	G. Zomer	12/07/06
ASFA (FR)	Mr. Mesqui	J.M. Gautier and G. Luccitti	28/09/06
ASETA (ES)	Mr. Diez de Rivera	G. Luccitti	11/09/06
AISCAT (I)	Mr. Rotondo	G. Luccitti	04/10/06

In order to interview these stakeholders to compare the results gathered on the same basis we decided to draw up a questionnaire on the following items:

- services subscribers
- Electronic Toll Collection costs (investment costs and operational costs) to develop and deploy a service available at European level
- the fraud issue
- relationship between EETC and the employment issue
- business perspective related to the implementation of the EC Directive.

In order to develop the aforementioned issues, a template of the questionnaire to be submitted to road concessionaires has been produced. Questionnaires have been arranged by grouping questions into the following categories: economic & financial, business management, technology and general issues. In the annex 3 to the present document is reported a table providing an overview of the ETS "current "situation in France, Italy, Spain, Portugal, Greece and Norway. A brief report on the information gathered during the interviews which highlights the similarities and differences concerning the opinions of the interviewed stakeholders is stated below.

Economic and Financial items

The stakeholders interviewed provided a vision of the ETS market that is strictly related to the history of the concessionaires, regarding their geographical location and the traffic typology affecting their network. In fact, traffic within the network managed by the stakeholders interviewed is mainly represented by light vehicles, instead of heavy goods vehicles. The above mentioned traffic composition is confirmed by ASECAP statistics concerning average daily traffic (number of vehicles) in the associated countries.

Table 6: Traffic (average daily) – data as for 01/01/2006

Country	Light vehicles	Heavy loads	Total
Austria	39.747	5.265	45.012
Belgium	12.738	7.024	19.762
Denmark*	34.720	4.315	39.035
Spain	20.167	3.365	23.532
France	22.421	4.280	26.701
Greece	7.439,45	1.006,83	8.446,28
Italy	30.371	9.675	40.046
Norway**	455.613	41.843	497.456
Portugal	20.517	1.293	21.810
The Netherlands	11.840	1.841	13.681
United-Kingdom	-	-	44.669
Slovenia	19.805	4.365	24.170
Tot	***675.378***	***84.273***	***804.320***

* Total number of vehicles passing the two bridges per day

** For Norvegfinans the figures given represent the number of vehicles in a year, divided by 365 (days)

Source: ASECAP, 2006

Table 7: Payment means - data as for 01/01/2006

Country	Toll stations	Toll lanes	EFC lanes	EFC users
Austria	14	107	72	525474
Belgium	1	18	10	9278
Denmark	2	44	12	300000
Spain	206,00	2.032,00	1.226,00	518445
France	533	4.345	2.593	1450000
Greece	17	175	12	45000
Italy	464	3.765	1.987	4900000
Norway	89	284	129	875565
Portugal	127	1021	331	1866634
The Netherlands	1	6	14	38000
United-Kingdom	6	45	40	24000
Slovenia	26	179	107*	230000
Tot	***1.486***	***12.021***	***6.426***	***10.782.396***

* 35 automatic + 72 combined (combined = manual "classic" Toll and electronic Toll lane)

** 22.200 Smart Card subscribers

Source: ASECAP, 2006

The traffic composition previously reported, together with the deployment of electronic payment means, the location of the network - closer to urban areas or part of the Trans European Network - the geographic location of the concessionaires – at the heart of Europe or in peripheral areas – and the stage of the ETS life cycle, also determine the ETS market composition (between light vehicle and heavy vehicle) and their forecasted trends. In fact, ETS services are known to be massively deployed in the light vehicle category (in terms of subscriber numbers) and this “market composition” is emphasised in the “peripheral” countries where it is even possible to observe the seasonal fluctuations of subscriptions for light vehicles.

The stakeholders interviewed also emphasised that the current ETS market composition will be modified, in the short to medium term, by concessionaires that are experiencing the early stage of the ETS system lifecycle and that have decided to focus their attention on “professional” road users. On the contrary some concessionaires that have already reached the “maturity stage” of the ETS lifecycle by saturating their markets, believe that the ETC user number of “light vehicles” will increase as a result of the efforts made to enlarge the customer base by acquiring those customers that are not frequent motorway users. The above mentioned OBU market composition is also pushing to put forward other considerations about market size for a “comprehensive OBU” aimed at replacing the OBU currently deployed. This “market” has to be considered as a niche of the European ETS OBU market. A niche comprised of long distance travellers (usually heavy goods vehicles as well as coaches for international travellers on a regular basis) that could replace their multiple contracts/OBU with one single comprehensive OBU managed through a single contract. The real market size of such a market is not very easy to estimate due to insufficient reliable data on the long distance traveller HGV. Some motorways operators have worked out estimation on OBU market size for a country like Germany, in which the international haulage is a relevant phenomenon. According to these forecasts the German market for HGV weighting more than 12 tonnes could be roughly equal to 1,2 million vehicles.

Business management items

According to the opinions collected, the Directive 2004/52 will accelerate the adoption process of Electronic Fee Collection deployment among road concessionaires. This will bring about long term two effects:

- an increase in the percentage of ETS transactions on the total number of transactions made, due to the expansion of the subscriber base related to the change of user behaviour;
- a decrease in the percentage of workers in charge of manual collection.

These two effects will have a higher impact on those countries with lower ETS service market penetration than the other markets because those countries that immediately adopt the ETS system have gradually to come up against the consequences of those effects.

Business model

Concessionaires point out that the set up and deployment of an interoperable European ETS system requires detailed specification of the roles played by each key participant involved in the system. When identifying ongoing architecture models, it is possible to pinpoint two models representing two completely opposite "ways of thinking in business" that are able to encompass any other business model defined, simply by varying the values of some parameters:

- **the polarized model**: all the roles of the ETS value chain are played by a subject acting as an ETS Operator, ETS Provider, Payment Service Provider and even a Toll Road Service Provider;
- **the distributed model**: all the roles of the ETS value chain are played by different subjects, operating in the market arena.

The aforementioned models encompass all possible approaches that might occur in the European scenario. In fact, according to the importance given to the different role it is possible to obtain a variety of business models. In detail, the stakeholders interviewed have drawn attention to the roles played by the EETS provider, Payment Service Providers and the players responsible for the clearing transaction process, especially those regarding issues related to fiscal themes (e.g. VAT application and recovery: most concessionaires charge the total Fee value for transport service inclusive of VAT).

Social Impact

When considering the impacts related to employment, all those interviewed agree that the number of total employees will either be steady or gradually decline over the decades. Therefore the reduction of employees assigned to manual collection activities will not dramatically affect in one single period the employment rate of the concessionaries because:

- right from the very beginning, this kind of job has shown the highest turnover rate among those jobs offered by the motorway concessionaries;
- if we consider the few technical skills required, collectors can be re-trained in order to acquire new skills oriented towards other kinds of services which are created such as

call centres, customer centres and fraud control. In this way concessionaires will replace their collectors without hiring additional personnel and consequently saving on costs while avoiding those issues related to staff redundancy;
- some special lanes for manual collection will be retained, due to technical, management and contractual reasons.

A detailed analysis of the impact of the EC Directive on the employment of concessionaires would be possible if we had access to the internal data of firms. In fact, a simple assessment of the balance sheet data – due to the inclusion of non-motorway related subsidiaries and the differences in the ETC system lifecycle - does not enable us to make a comparison between the performance of operators. In addition, the stakeholders interviewed were quite reluctant to provide figures related to wages and salaries due to the strategic relevance of the data.

Technology

Article 2 of the Directive imposes an obligation to all the stakeholders interviewed in compliance with the technology requirements identified by the legislation. The concessionaries analysed are currently using one of the following technologies: DSRC 5.8GHz microwave technology, compliant with CEN or UNI10607 standards.

The aforementioned technologies guarantee the almost complete interoperability at national level (Greece, with its three concessionaries and limited toll network, is an exception). When referring to cross-border interoperability, concessionaries have already shown the willingness to cooperate in order to solve technical issues through special initiatives (e.g. Media and ViaIberica projects). However, it is important to underline that the above-mentioned technologies are able to create data which can be processed to obtain information that can be used in two different areas:

- the management area, where data obtained through the aforementioned technologies could be used to produce statistics on traffic flows in order to support traffic management tools and policies,
- the operational area, where data obtained through the aforementioned technologies could be used to provide ITS services to road users (e.g. traveller information services, petrol refuelling, access control to urban and private areas etc.)

General issues

All the motorway concessionaires interviewed have paved the road to fully comply with the EC Directive requirements. Below is a summary of the individual opinions gathered regarding the impact of the directive at two different general levels: the impact on their companies and that on the industry.

Positive impact at company level

- Enhanced performance of toll stations due to reduced congestion attributed to an increased number of ETC lanes
- Simplification of the OBU procurement (price reduction due to economies of scale and comparability of performances)
- Enlargement of the ETC users customer base

- Upgrading services offered

Negative impact at company level

- Risk of revenue loss due to potential increase in fraud and risks
- In the short term, additional costs related to commercial activities
- In some cases, concessionaries are not the ETS provider (this could impact one of their "side business", giving this business/revenue source to another company)

Positive impact at industry level

- Development of a legal framework to successfully deploy enforcement for ETC
- Development of business opportunities for companies related to Galileo

Negative impact at industry level

- Reduction of the number of players in the industry
- Possible increase in price level (with a positive impact for OBU producers, but a negative impact on the industry), due to the reduction of competition.

In general term, toll chargers look at the Directive as an opportunity to improve their source of revenues through greater access to new ITS Services, thus improving the quality of the services offered.

3.2 Viewpoint of the administrations of the countries and that of their operators where charges are levied

Objectives

Activities included in that stage aim at outlining the expected economic, financial and social impacts of the implementation of the Directive for the Administrations and the operators levying the charges for them.

Activities

The following activities have been carried out:

1. Preliminary analysis and definition of questionnaires - This activity consisted in the identification and analysis of the features of the existing ETS systems and in the identification of the potential main subjects involved in the Directive. These subjects have been discussed with the main stakeholders and the results have been used to develop the questionnaire for this type of stakeholder that is, the administrations.

2. Stakeholder consultation - This activity was used to gather information about the different points of view of the stakeholders involved in work package 2. The following topics have been discussed with the stakeholders:

- current number of subscribers to the service already deployed at national or local level, or expected market size;
- expected costs of the European ETS (e.g. delivery and maintenance, invoicing and clearing system, financial security measures, safety measures on toll plazas, etc.);
- expected costs on national level, if existing;
- expected revenue loss due to several potential frauds;
- expected impact on the employment, distinguishing the impact on toll plazas and on the main departments of the company (furthermore an estimate of other employment opportunities/changes will be carried out);
- business perspectives: export knowledge in other countries, bids to other concessions of motorways;
- business perspectives concerning the facilitation of the introduction of ITS services on the road network by the Single European ETS, aiming to improve the quality of traffic management, road safety and traveller information.

3. Data processing and analysis

The information gathered in the previous activities has been analysed and an overview of the expected impacts has been made.

4. Reporting

The results of the analysis have been used to draw up a brief report.

The work Organisation and the stakeholders involved

The following table provides an overview of the interviews which were carried out during the stakeholder consultation.

Table 8: Overview of the interviews with stakeholders

Organisation	Person interviewed	Interviewer	Date
Toll Collect (DE)	Alain Estiot and Martin Rickmann	K. El-Araby	15/06/06
Rijkswaterstaat (NL)	Jan Willem Tierolf and Jan Vis	G. Zomer	16/06/06
EZV/ARE (CH)	Bruno Hofstetter (Fed. Administration of Finance - EZV) Ueli Balmer (Fed. Administration for Spatial Development - ARE)	G. Zomer	20/06/06
Ministry of Transport (SI)	Dean Herenda (Min. of Transportation)	G. Luccitti	20/06/06
Department for Transport (UK)	Neil Schofield and Duncan Matheson	G. Zomer	27/06/06
Ministry of Transport and ASFINAG (AT)	Anton Sieber, David Kollenhofer and Friedrich Schwarz Herda	G. Luccitti	12/07/06

Schemes in Germany, Austria, Switzerland, the UK, the Netherlands and Slovenia

The following table provides an overview of the situation in the six countries:

Table 9: Overview of the situation in the six countries

Countries	Characteristics
DE	• Road network: 644,500 km • A Toll system (called LKW-MAUT) was introduced in January 2005 for all lorries with a maximum weight of 12t and above on 12,000 km worth of motorways o The toll is based on the distance driven in kilometres, number of axles and the emission category of the lorry and the average price is € 0.12 per kilometre. o The tolls collected are used by the government for road improvements and new road construction. o It is the first time a GPS-based toll system has been used
AT	• Road network: 106,000 km • A time-dependent toll scheme for vehicles <3.5 tons is based on a vignette system, existing since 1997. In six special toll sections (Alps crossing tunnels and bridges like Brenner, Tauern, Phyrn, etc) a distance related toll is charged and the levying is handled by toll plazas. • Since January 2004 a multilane free flow tolling system (called GO-MAUT) for vehicles >3.5, tons for all motor- and expressways. o The ETS system is based upon 5.8 GHz CEN DSRC technology. o Total collection costs are about 7-8% of the revenues generated.

Countries	Characteristics
CH	• Road network: 71,186 km • A flat fee for HGV was introduced in 1985. Passengers must have a motorway permit, which costs € 25 per year. • Since the beginning of 2001 an ETS system for heavy vehicle charging has been operative. o A fee (called LSVA) is levied on vehicles >3.5t and it is proportional to the distance driven on all roads. o Total collection costs are about 5% of the revenues created.
UK	• Road network: 416,000 km • The UK has many toll bridges and tunnels. In addition it has one private toll motorway, the M6, which was opened in 2004 and it can opt for ETS. It has congestion charging schemes in London, and Durham. • A national distance based charging scheme for all vehicles is being considered, but its feasibility is still being reviewed and will not be implemented before 2015.
NL	• Road network: 126,000 km • The Netherlands currently has the Eurovignette for HGV and two toll sections: the Westerschelde Tunnel and the Kiltunnel. • Three possible future systems are under consideration: o In the short term (4-6 years): A toll system on 4 to 6 new roads (or improved existing roads), introducing the 'acceleration' price on these segments for all vehicles. o From 2012: A nation-wide (all road users on all roads) kilometre-based system is planned to replace the current vehicle-related taxes. o Possible regional congestion charge schemes: no concrete plans or timing yet.
SI	• Road network: 38,400 km • Car owners have to pay a yearly tax and tolls on the motorways. • Slovenia would like to introduce a nation-wide road user charging scheme according to the distance travelled by the end of 2008. o The basis will be a new free flow DSRC-based electronic tolling system for all vehicles. o In parallel, the option is to introduce a road user charge scheme on all state roads for commercial vehicles > 3.5t.

Economic and Financial items

This section provides an overview of the economic and financial impacts of the Directive. The following issues have been discussed in this section:

1. Size of the current and future ETS market
2. Different ETS schemes for customers based on their needs
3. Impacts on cross border traffic flows and impacts Directive on traffic on the network
4. Costs of ETS systems

1. Size of the current and future ETS market - The following table provides an overview of the information related to the size of the ETS market, which has been provided during the interviews by the stakeholders.

Table 10: Overview of the information related to the size of the ETS market

Countries	ETS market
DE	Current (2005) ETS market: • 1,500,000 commercial users, of which 500,000 had an OBU • Total estimated annual revenues: 2.8 billion Euros • No charging policy for private cars
AT	Current (2005) ETS market: • No ETS systems for private cars • 598,174 commercial users with vehicles > 3.5t • Estimated total revenues: 1.2 billion Euros Future (2007) ETS market: • 890.000 commercial users with vehicles > 3.5t
CH	Current (2005) ETS market: • Estimated total revenues: 800 million Euros
UK	Current (2005) ETS market: • Between 200,000 and 300,000 OBUs are used for local systems • National system foreseen for all categories of vehicles
NL	Current (2005) ETS market: • No market yet. Future (2012) ETS market: • 7 million private users and 200,000 commercial users (the ETS system is only for users from the Netherlands, not for foreigners) • Estimated total revenues: 5 Billion Euros
SI	Current (2005) ETS market: • 240,000 Private users (passenger cars) paying tolls to the motorway concessionaire DARS • Estimated total revenues: 208 million Euros Future (2009) ETS market: • 1,200,000 private users (passenger cars) • Estimated total revenues:334 million Euros

Figures show that the overall ETS market in these countries is expected to grow in the coming years. Unfortunately no concrete figures can be provided to substantiate this. This growth will be based both on existing and new schemes which are expected to be used in the near future.

An important indicator for the market size of the EOBU is the number of vehicles (both private and commercial) which are used for international travels within Europe. In this case the users would benefit from using one single OBU in different countries, instead of using a different OBU in each country. If the vehicle is only used in one specific country for national travels the user could also use the national OBU. More details related to cross-border travel are provided under item 3.

The figures related to toll revenues provided by the six countries indicate that the revenues related to ETS vary between 208 million Euros for Slovenia and 2,8 billion Euros for Germany in 2005. The differences between the revenues of the various countries can be explained by the differences in average fee per user and the number of

users per country (for example: 1.5 million users in Germany and 0,24 million users in Slovenia). During the interviews the stakeholders indicated that they expected an increase in their ETS revenues in the future.

2. Different ETS customer schemes (for current and future systems) based on their needs - The following table provides an overview of the different ETS schemes in the six countries:

Table 11: Overview of the different ETS schemes

Countries	ETS schemes
DE	Current system: One ETS system for all HGV users
AT	Current system: One ETS system for all HGV users
CH	Current system: HGV: lower rates (75%) for transport of animals, wood and milk, but this only applies to special vehicles used for this purpose only.
UK	• Current systems: for local toll schemes there are discounts for electronic users (if reflecting administration costs) as well as discounts for a book of tickets • Future system: only one system for the planned national scheme
NL	Future system: There are no concrete plans for exemptions or different rates for certain branches. There are plans for regional differences (the fee the Dutch driver has to pay could depend on the municipality the driver lives in)
SI	Current system: A (5-10%) discount is offered if a user puts a larger amount of credit on the tag

In most of the six countries the same scheme is used for all ETS users. Different ETS schemes are only used in a few cases.

3. Impacts on cross border traffic flows and impacts Directive on traffic on the network - The following table provides an overview of the cross border traffic flows and the expected impacts of the Directive on traffic flows in the six countries:

Table 12: Overview of the cross border traffic flows and the expected impacts of the Directive on traffic flows

Countries	Cross border traffic and impact Directive on traffic flows
DE	• About one third of the HGV traffic on German motorways is related to foreign lorries. • No direct impacts of the Directive on traffic are expected. Traffic impact of lorry flows in terms of volumes and needs is due to market and economic growth.
AT	• About 44% of the vehicles >3.5t using the Austrian motorways are foreigners. • For traffic on the network itself there should be no impact at all. Problems could occur if something with the OBU is not functioning properly or if the customer is blocked because there is an invalid payment means.
CH	• No figures provided related to cross border traffic flows • No impact at all. Perhaps in the future some time gains at border crossings are possible.

UK	• Overseas visits by car to the UK: 1.8 million • Overseas visits by lorry to the UK: 1.1 million • Overseas visits abroad by car by UK residents: 7.0 million • Overseas visits abroad by lorry by UK residents: 0.4 million • No impacts expected of the Directive on traffic in the UK.
NL	• From/to Germany: more than 100,000 vehicles per day cross the border (2002 estimates) • From/to Belgium: more than 100,000 vehicles per day cross the border (2002 estimates) • In general no impacts are expected of the Directive on traffic volumes.
SI	• Road network is affected by cross border traffic flows, but no actual data is available. • A positive impact of the Directive is expected, resulting in more fluent traffic and less congestion points on the network.

The table above indicates that the traffic flows in the different countries are affected by cross-border traffic, and in countries like Austria and Germany foreign users are a significant part (between 35% and 44%) of the users who have to pay a fee. It can also be concluded that in most of the six countries no impacts of the Directive on the traffic volumes are expected.

4. Costs of ETS systems - The following table provides an overview of the costs of the ETS systems in the six countries:

Table 13: Overview of the costs of the ETS systems

Countries	Costs of ETS systems[3]
DE	• Vehicle costs: estimated at 200 - 250 Euro per OBU
AT	• Vehicle costs: 30-50 Euros for OBUs • Initial system costs: not provided • Yearly system operating costs: 14-15% of the total revenue
CH	• Vehicle costs: 330 – 370 Euro per OBU
UK	• No figures provided
NL	• Initial systems costs future system estimated at between 2.1 and 3.8 Billion Euros.[4] • Yearly system operating costs estimated between 0.4 and 1.1 Billion Euros.
SI	• Vehicle costs: 25-30 Euros for OBUs • Initial system costs: 150 million Euros • Yearly system operating costs: 10-12% of the total revenue

[3] Vehicle costs for Germany and Switzerland are provided in: "HET KAN! Eindrapportage Techniek, Organisatie, Handhaving en Kosten van varianten van Anders Betalen voor Mobiliteit Hoofdrapport + Bijlagen ", 14 June 2005

[4] Although the future system is still being investigated and not yet decided, some estimates are already available, see "HET KAN! Eindrapportage Techniek, Organisatie, Handhaving en Kosten van varianten van Anders Betalen voor Mobiliteit Hoofdrapport + Bijlagen ", 14 June 2005

It was very difficult to collect information concerning ETS system costs because in most cases this information was considered confidential. Very limited information on costs is available, it can be seen that vehicle costs vary between 25 Euro and 370 Euro mainly depending on the type of OBU used. The provided information related to system costs is not sufficient to draw general conclusions related to ETS system costs.

Social items

The main social consequences stem from the transfer from manual fee collection to electronic fee collection. For countries (like the UK and the Netherlands) that still do not have nation-wide toll systems in place the social consequences are less relevant. Clearly implementing new nation-wide systems in The Netherlands or in the UK would have a positive social impact and would create new jobs. Although, in the Netherlands negative employment effects are also expected at the Tax Authority once the vehicle-related taxes are eliminated.

The manual collection situation in the different countries is the following:

- In Austria all transactions concerning the nationwide tolling system for vehicles > 3.5t is done electronically.
- In Germany about 83% of toll transactions is automatic. From 2009, this share is expected to increase over 90% and up to 95% in 2020.
- In Switzerland the percentage of manual transactions is in the range of 25%-40%.
- No figures are provided for Slovenia, but ETS is now a complement to manual tolling.

In these countries except Slovenia (which behaves now as an ASECAP country), the social consequence of the Directive will be very limited until new charging schemes for private cars are eventually decided and implemented. In such a case, a positive impact is expected in different kinds of jobs, from central billing offices to customer relations and interface, sales services, installation…

Another social impact might arise from the increased market for OBUs, software and system integration. All countries expect to benefit from exporting hardware, electronic fee collection solutions, knowledge or expertise. However, further Interoperability is expected to lead to more suppliers, whereas the market for local systems is more fragmented. Negative employment effects for Europe can also occur if some activities are outsourced to low salaries countries.

Business management items

Frauds and revenue loss

The following table provides an overview of the frauds and revenue loss in the six countries:

Table 14: Overview of the frauds and revenue loss

Countries	Frauds and revenue loss
DE	• The fraud rate is less than 2% of all vehicle volumes; no impacts of the Directive are expected on possible revenue loss .
AT	• The number of frauds of the national ETS system is about 1.35%; no impact of the Directive is expected provided that the national ETS and its enforcement are not changed.
CH	• No figures related to fraud rate are provided; no impacts of the Directive are expected on possible revenue loss
UK	• No definite figures related to fraud rate are available; it is likely that fraud levels will increase given the broader operational area for users to travel, a payment guarantee between the toll charger and the EETS provider might prevent an increase in revenue loss
NL	• Expected revenue loss related to fraud is about 2%; no impacts of the Directive are expected on possible revenue loss, the percentage strongly depends on the enforcement of penalties and on the chances of getting caught.
SI	• Confirmed revenue loss related to the fraud of the national ETS system of DARS is less than 0.2 %, while expected revenue loss due to fraud for the European ETS service is expected to be less than 1%; a positive impact of the Directive is expected.

Overall fraud and revenue loss are 2% or less, and in most cases no impact of the Directive on revenue loss is expected.

OBU production, procurement and distribution

The following table provides an overview of OBU production, procurement and distribution in the six countries:

Table 15: Overview of OBU production, procurement and distribution

Countries	OBU production, procurement and distribution
DE	Two suppliers are contracted for OBUs: Siemens VDO and Grundig Delphi; a service partner network in Europe with 1900 service partners is currently being used for the distribution of OBUs
AT	The OBUs are bought by the manufacturers. The owner of the OBU is ASFINAG MSG. Retail organisations, selected gas and petrol stations distribute the OBU.
CH	For the current system EZV defines the requirements, procures the OBU, issues it to the user, owns the OBU and maintains it; authorised garages and workshops distribute the OBU.
UK	The OBU production, procurement and distribution of the possible new ETS system are currently unknown.
NL	For the planned new ETS system the OBUs will be produced by the industry, RWS will not buy the OBUs nor distribute them.
SI	The Ministry of Transport does not produce nor buy the OBU. Kiosks and special points of sale distribute the OBUs for DARS. The future national charging scheme is under definition

As reported, in most countries the OBUs are produced by subcontractors. The procurement of the OBUs differs for each and every country. The network used to distribute the OBUs also differs for each country.

Costs of OBU (deposit, prepaid balance, transaction fee)

The following table provides an overview of OBU costs in the six countries:

Countries	Costs of OBU
DE	• The users only pay a maximum of 4 man-hours for the installation of the OBU; • Users are not required to make a deposit for the OBU; • Two types of subscribers are possible: post-payment through invoice, or pre-paid, requiring a positive balance; • no charges for each OBU transaction; • No annual service fee per OBU.
AT	• A handling fee of 5 Euros will be charged to the user; • The users are not required to make a deposit; • An initial prepaid balance of 50 Euros is required for the OBU; • There is no transaction charge; • There is no annual fee per OBU.
CH	• No OBU costs for the user; • Foreign users have to make a deposit of 1500 Swiss Francs (which amounts to about € 950) for the OBU, Swiss users are not required to make a deposit; • An initial prepaid balance is not required for the OBU; • The charges for each transaction via the OBU depend on the definition of transaction; • No annual service fee per OBU.
UK	• The OBU costs for the user (deposit, prepaid balance, transaction fee) are currently unknown.
NL	• There will probably be no OBU costs for the user; • The other OBU costs for the user (deposit, prepaid balance, transaction fee) for the planned new ETS system are currently unknown.
SI	• The OBUs cost 15 or 30 Euros; • The users are not required to make a deposit; • An initial prepaid balance of 5 Euros is required for the OBU; • There is no transaction charge; • There is no annual fee per OBU.

There are huge differences between the OBU costs in the different countries particularly concerning the cost of acquisition of the OBU for the user, the deposit and the initial prepaid balance. In most cases there are no transaction charges and there is no annual fee.

Technology

The technology aspects related to ETS differ in each of the countries. Therefore a table which gives an overview of relevant technology aspects related to ETS is provided for each of the interviewed administrations.

Table 16: Overview of relevant technology aspects related to ETS

Countries	Technology aspects
Germany	• ETS became operational in 1/1/2005 • ETS technologies used: 5.8 GHz DSCR, GPS, GSM and infra-red • The DSCR technology was made in compliance with the existing EC ETS Directive in 2002 • The technology requirements comply with the interoperability features requested by the Directive • ETS technology complies with CEN standard for DSRC transponder, the OBU is industry standard • For interoperability, open issues have to be solved on the technical, contractual and procedural levels. • The technology used provides possibilities to offer added applications, but no concrete plans exist. • The toll data may be processed and used solely for the purpose of the Toll Act. Data stored under the Toll Act may be used in an anonymised form for preparing business statistics.
Switzerland	• ETS started in January 2000s • ETS technology used: 5.8 GHz, GPS, interface with tachograph • No impact of Directive on technology choice. • The technology requirements comply with the interoperability features requested by the Directive • ETS technology complies with CEN and ISO standards • The Swiss OBU can also be used in Austria, but not the other way around • It is possible to provide other services, but the Swiss customs will never agree to this since they do not have a legal mandate. • Collected data is used to produce traffic statistics
Netherlands	• ETS will start in 2010 at the earliest with an acceleration price for 6 or 7 objects and at the earliest in 2012 with a national system • ETS technologies which will be used: RFID, 5.8 GHz DSRC, GPS, GSM, infra-red • Very little impact of the Directive on technology choice is expected, DSRC is pushed by the Directive for enforcement instead of infra-red. • The technology requirements still do not exist, but will comply with the interoperability features requested by the Directive • ETS technology will comply with the CEN, IEEE, ISO, ITU and ETSI standards • No difficulties foreseen in the interoperability of the ETS system with neighbouring countries • It is a political wish to provide additional services in the future • There are no plans for data processing

Countries	Technology aspects
United Kingdom	• A national time distance–based charging scheme will not be available within the upcoming 10 years • ETS technologies used: 5.8 GHz DSRC, GSM • GALILEO might be used for the future national ETS system • No impacts of the Directive on technology choice (two schemes are in the process of changing from 2.5 GHz to 5.8 GHz, but this was also pushed by the market) • ETS technology complies with CEN standards and internal DFT national specifications • No difficulties in interoperability with neighbouring countries • DFT is looking for service providers, which also facilitate charging with their device. • Data processing for traffic statistics and traffic management is planned, but privacy restrictions will be taken into consideration
Slovenia	• The actual ETS system started in 1995, and the new system will start in 2009 • ETS technology used: 2.45 GHz DSRC • The Directive will be taken into account for the new ETS system • The technology requirements comply with the interoperability features requested by the Directive • A study for interoperability in the Alpine region (MEDIA) has been finished. It indicates that interoperability with the existing ETS system and the neighbouring countries is technically impossible. • Its intention is to offer location based services, like info, parking info, e-call, etc. • No processing of subscribers data is carried out
Austria	• ETS started in 2004 • ETS technology used: 5.8 GHz • No impact of the Directive on technology choice. • The technology requirements comply with the interoperability features requested by the Directive. For the operation of the EETS some changes are needed. • ETS technology complies with CEN and ISO standards • An actor model for interoperability with neighbouring countries must be agreed upon. Upon that the EETS service could be implemented • There is no plan to provide additional services. • Anonymised data is used for traffic statistics and traffic management

The ETS technology of the existing systems in most countries is compliant with the Directive, and the ETS technology for new systems will be developed by taking the Directive into account. In some countries specific interfaces are needed (for example the infra-red interface in the existing German system, and the tachograph interface in the Swiss system), which are only needed in these countries. It needs to be investigated how these interfaces can be provided by the EOBU which will be developed in the coming years. In most cases the ETS technology used provides possibilities for additional services, but plans are being made to develop these services only in a few countries. If

data processing is carried out, then in most countries anonymised data is used for traffic statistics.

General issues

Main positive and negative aspects

The following table provides an overview of the positive aspects mentioned by the interviewed administrative stakeholders in the six countries:

Table 17: Overview of the positive aspects mentioned by the interviewed administrative stakeholders

Countries	Positive aspects
DE	• Support for satellite-based systems • Openness for other applications in the future • Attempt to strive for compatibility with GNSS/DSRC systems • This directive refers to technology like GALILEO, which will offer high quality precision information
AT	• Foster interoperability achievement • Openness for other applications in the future
CH	• Foster interoperability achievement • OBU might become cheaper due to mass scale production • Creating a common understanding
UK	• Potential benefits for users to travel with one OBU and one contract in Europe • Supports interoperability • It provides something concrete to focus on for the industry
NL	• Raises awareness • The Directive has a positive effect on transport companies: efficiency improvements • Foster standardisation, which will make implementation easier
SI	• Interoperability with other ETS systems in the EU • Boosted income • Traffic fluency optimised

Overall the positive aspects are *mainly* related to the benefits of the ETS users (both commercial and private), supporting interoperability between the different ETS systems in Europe, possible cost reductions for companies active in the ETS market and possibilities for new toll systems and additional applications in the future. The advantages for national administrations and their operators are mainly related to the availability of one common EOBU for the whole of Europe. No specific activities need to be undertaken anymore to provide foreign users with an OBU, because this can now be done in their own country; functionality which is not yet available in their own national system, but which is available in other countries can be used in the near future; etc. Another argument is related to ETS as a tool to support future pricing policies. The Netherlands for example

is studying the possibilities to introduce flexible road pricing, with separate rates per time of the day and location. ETS is seen as an efficient tool to support these policies. The interoperable EOBU supports these requirements.[5]

The following table provides an overview of the negative aspects mentioned by the interviewed administrative stakeholders in the six countries:

Table 18: Overview of the negative aspects mentioned by the interviewed administrative stakeholders

Countries	Negative aspects
DE	It will be difficult to reach compatibility between GNSS/DSRC systems
AT	Lack of a migration path Impact on existing systems, in term of costs
CH	The Directive provides mandatory requirements for a concept that includes commercial negotiations The market for international passenger vehicles is very small
UK	Huge cost impact on existing systems Potentially a small market of users Huge legal and international implications (e.g. cross border enforcement, tax systems and private charging systems working together) Unclear whether there is a market for users at this stage. Is there really a market where industry stakeholders can make money
NL	The Directive leads to more restrictions (e.g. technology) Cost effectiveness and coverage of additional costs
SI	Required capital investments It will be critical to stabilise the electronic system (signals from satellites, energy/telecommunication coverage, etc) Criticality on the prediction of eventual frauds

The negative aspects are mainly related to the expected increase in costs for existing national systems, the view that the market potential is still unclear, and the significant legal and international implications.

Opportunities

The following opportunities are considered feasible by the administrative stakeholders:

[5] See www.andersbetalenvoormobiliteit.nl

Table 19: Opportunities

Countries	Opportunities
DE	• In the short term, the Directive gives way to valuable brain-storming and brings people together to enhance interoperability and "free-flow" ETS systems as a vision for Europe particularly for lorries • The Directive drives the further development of technological tools for governments to improve trans-European traffic management • In the long term, the Directive would be useful to facilitate the transport of goods on the transport network through efficient charging systems at the technical, environmental and economic levels.
AT	• The Directive could drive the further development of technological tools for governments to improve trans-European traffic management • Relevance of the standardisation and interoperability
CH	• A policy opportunity to achieve standardisation and interoperability
UK	• In the short term there are no opportunities, but only difficulties to move forward with local scheme implementation (these initiatives have to take into account an unknown EETS functionality, performance requirements, cost impacts and uncertain market take-ups)
NL	• Travelling more easily throughout Europe • Creates a market for GALILEO • The Dutch implementation is more targeted through the Directive • Focus on standardisation and interoperability.
SI	• In the short term the users will deem the system as being friendlier (one bill per month, internet based services, etc) • In the long term – in the EU road network – it will be similar to roaming for cellular networks (one system). • We also expect new and highly skilled job opportunities and more income and a better demand management of traffic in the future.

The opportunities mentioned are obviously related to the positive aspects previously referred to. The opportunities are mainly related to user improvement, supporting satellite and mobile technology implementations, potential new services and applications, and focusing on standardisation and interoperability. In the long term, new job opportunities and transport network improvements will be possible.

ETS Directive and ITS deployment in vehicles

Most of the interviewed administrations either fully agree that the ETS Directive is a key element to foster deployment of ITS services and technologies in vehicles, or partially agree indicating that it is just a push factor.

Impacts of the Directive

The following impacts of the Directive are expected to take place by the interviewed administrations:

- Road safety: the expected impacts vary between none and high. Some administrations expect no impacts or only low impacts, while others expect high impacts.

- Quality of Service: most of the interviewed administrations expect moderate to (very) high impacts.
- Traffic information services: the expected impacts are quite diverse and vary between none and very high.
- Traffic congestion: the expected impacts vary between none and very high, although most administrations expect no impacts.
- Traffic management: the expected impacts vary between none and very high, although most administrations expect no impacts.

Overall low impacts are expected of the Directive, with the exception of quality services, where moderate to (very) high impacts are expected.

Planning of the implementation process of the Directive by the administrations

Some administrations have already implemented the Directive into national law (Germany, Slovenia and The Netherlands), or expect to implement it this year (UK). Switzerland (which is not an EU Member State) has no plans yet to implement the Directive into national law and Austria did not provide a response.

Advantage from export knowledge to other countries

The administrations in countries where the satellite-based national ETS is operational (like Germany or the Netherlands where it is planning on being operational in 2012) expect to be able to export their knowledge to other countries. Some other administrations see possibilities to export knowledge to neighbouring countries.

3.3 Viewpoint of the industry

Objectives

Activities included in that stage are aimed at outlining the impacts, especially the social and economic ones, expected by the industry players due to the implementation of the Directive 2004/52/CE. In detail, the aim of the survey was to highlight the vision of four different industry categories:

- companies providing onboard units for Electronic Tolling Service;
- companies providing onboard equipment for various duties and software integrators;
- lorry manufacturers;
- transport companies both for people and goods

Activities description

During this stage of the project the activities carried out were first and foremost aimed at identifying the subjects to be involved in the study in order to encompass the opinions of the typology of all stakeholders playing in the ETS field. The criteria adopted to select the subjects to be interviewed can be summed as follows: industry coverage (the subjects involved have to be considered elements or valuable proxies of the ETS value chain), technological variety, geographical coverage, principles stated in the 2004/52/CE Directive, the representativity of the opinions from the different experiences and business models implemented. The carrying out of these activities according to the aforementioned principles, together with the gathering and assessment of material on the ETS field from "official sources", (e.g. DG TREN) has enabled us to draw up a list in which the subjects involved have been grouped into three categories: manufacturers of OBUs and system integrators, transport companies (both for people and goods) and lorry manufacturers. The recommended list was submitted to and validated by DG TREN.

Table 20: Work organisation and the stakeholders involved

Organisation	Person interviewed	Interviewer	Date
Thales (FR)	Mr. Bernard Lamy	G. Luccitti	23/06/06
Siemens (DE)	Mr. Ralf Bosch, Mr. Michael Muller, Mr. Harry Krickl	K. El-Araby	03/07/06
QFree (NO)	Mr. Oddvar Solemsli	G. Zomer	19/07/06
Octotelematics (I)	Mr. Fabio Sbianchi	G. Luccitti	10/07/06
Kapsch TrafficCom (AT)	Mr. Josef Czako	K. El-Araby	29/06/06
TeleAtlas (BE)	Mr. Rob van Essen	G. Zomer	24/07/06
PTV (DE)	Dr. Ing. Dieter Wild	K. El-Araby	06/06/06
ARS Traffic (NL)	Mr. Jan Linssen	G. Zomer	23/06/06
VOS Logistics (NL)	Mr. Erik Janssen Steenberg	G. Zomer	13/07/06
ARS-ALTMANN (DE)	Mr. Marcus Hoops	K. El-Araby	19/09/06
Eurolines	Mr. Wyns	G. Zomer	03/08/06
Daimler Chrysler (DE)	Mr. Wolfgang Beier	K. El-Araby	14/06/06
DAF Trucks (NL)	Mr. Peter Kramer Mr. Peter de Wit	G. Zomer	19/09/06

In order to interview these stakeholders and to compare the information gathered on the same basis, we decided to develop a questionnaire on the following issues:

- business aspects linked to the production of onboard units, in Europe and on the worldwide market;
- the EC Directive and the impact on OBU design and production;
- the technology issue: the platform's interoperability;
- perspectives for market growth through the production of different ranges of interoperable equipment;
- the role of the industry in the definition of new charging schemes in Europe;
- the EC Directive impact on the "professional" road user (goods and people transportation companies) daily business;
- the EC Directive impact in the industry in terms of social factors (e.g. unemployment effects).

Below you will find a short report on the information gathered during the interviews which highlights the similarities and differences in the opinions of the interviewed stakeholders.

3.3.1 OBU producers and system integrators

Economic and Financial items

The stakeholders interviewed described their vision of the ETS market to the interviewers. In particular they described in a detailed manner the expected trends and their points of view on the impact of EC directive on OBU design and production.

The interviewed participants also indicated that they are currently experiencing some difficulties in depicting a clear vision about future trends. In fact, they have declared that they are currently not able to make a forecast if a "*comprehensive OBU*" (an OBU enabling the interoperability among all technologies forecasted in the EC Directive) will be deployed or, if a solution based on OBU allows interoperability between couple technology (e.g. CEN DSRC and satellite based technology) will be the preferred one. The uncertainty about the most beneficial solution to be adopted is mainly related to market size for a "*comprehensive OBU*". OBU producers think that market opportunities should be carefully assessed via a "business case" aimed at evaluating the economic and financial viability for a "comprehensive OBU" to be deployed at European level. This analysis should carefully take into consideration issues related to a "vicious cycle": the OBU cost depend on the number of the OBU that can be sold, but this figure is determined by the OBU cost. Moreover the previously mentioned "vicious cycle" is also influenced by the issue of the current OBUs customer base. In fact an OBU change over have to be convenient, also for road user currently exploiting ETS systems "only" into country's boundaries or for commuting purposes. Given these premises the "only" road user category that could be "seriously" interested in a "comprehensive *OBU*", at least in a early stage, is the "professional user" category. This category - focused on road haulage - could exploit the chance to reduce ETS service costs, including administrative ones, provided that mortgage of investment carried out to buy old OBUs or even to set up firms in foreign countries (to take advantage of legislative benefits) has been already covered.

A possible line of action for the full deployment of a "*comprehensive OBU"* may be a "two step approach". In the short to medium term the success of OBU based upon a combination of two technologies may be possible (thanks to a deployment probably linked with the geographic contiguity of the technology currently adopted), by exploiting the current customer base of DSRC technologies. Alternatively, in the long term (over 10 years) satellite technology, together with the deployment of Galileo services, may effectively represent the standard.

It is important to note - as highlighted by some of those interviewed - that a major issue for the complete deployment of a "*comprehensive OBU*" is represented by the cost of telematic services provided through Galileo.

Another important issue related to the impact of the EC Directive on OBU design refers to "architectural choice". In fact, a dramatically relevant factor for the OBU success in a market is represented by the OBU cost that is directly linked to "intelligence" located within the OBU. The more centralised the computing features are, the less intelligent OBUs are required to be and, therefore they are less expensive: it is a matter of technological architecture, even when adopting the same technology.

An additional factor to be considered in assessing the impact of the EC directive on the market size is related to the conduct of the niche players that would prefer to concentrate their efforts and skills on the "congestion theme", rather than on continental interoperability. In fact some operators interviewed considered the market to be more promising under policy decisions taken up by big cities or metropolitan areas to launch and deploy measures aimed at tackling traffic congestion and pollution via telematic solutions (see the London case), instead of being an advantage attributed to ETS service interoperability, especially because, according to current experience in markets outside Europe – e.g. the USA and Canada – European interoperability is seen "only" as an excellent test to try-out system reliability in selling "turn key" systems. Some OBU producers in fact, would prefer the development and deployment of ETC systems, specifically designed according to the requirements given by the cities in order to bind them for the entire life cycle of the system under a monopolistic approach. This approach could lead to higher R&D and marketing costs, but it will create protected niches for the OBU producers.

In order to conclude the analysis of the responses provided on the OBU market and the impact of the directive on the OBU design and production it is important to highlight that the firms which focused on OBU production and software integrators, acknowledge that their focus is not only on technological issues (issues considered solvable, even though it's necessary to estimate the investment needed), but in particular on contractual matters. In fact, an accurate estimate of the market could be made only if all OBU requirements concerning interoperability could be clearly defined as regards those particularly related to the management of the following issues:

- enforcement/fraud,
- fine collection,
- taxation (especially Value Added Tax recovery).

Business management items

The stakeholders interviewed provided details of their viewpoints about the EC Directive impact on their employment level as well as on their production/distribution model.

The OBU producers and software integrators did not predict any massive impacts concerning the implementation of the EC Directive on their current employment level, particularly in the short to medium term. In fact, in the short to medium term they see the decisions of local policy makers (for the implementation of telematic systems aimed at tackling downtown city congestion) as the cause which can influence employment levels, instead of the EC directive implementation.

The EC Directive implementation may affect their employment level (as well as workforce composition) only in the long term period, through the OBU standardisation process. If this does occur, the firms involved in the business forecast an increase in their employment level, mainly in engineering, sales and after sales and even in the installation function (provided that the function is internal), but not in the manufacturing function. In fact, the standardisation could favour the outsourcing/delocalization of OBU production processes (increasing trends have been currently experienced in the outsourcing/delocalization of OBU and software production). On the other hand a lack of standardisation could make the industry firms feel the need to keep an organisational structure which is able to proactively meet any requirements emerging from different OBU platform/technology thus increasing the workforce dimension.

There may be some completely new opportunities, to increase the employment of OBU producers and system integrator firms, and to refer to new businesses that could arise from the definition and deployment of a "comprehensive OBU" technologically standardised at European Level: the need to implement new functions in manufacturing firms aimed at monitoring OBU compliance with the quality and certification standard that will be implemented to guarantee OBU interoperability between countries and technologies.

Another business that could arise as a "side effect" of the "comprehensive OBU" deployment is represented by the need to technologically assist the "clearing house" aimed at regulating and ensuring all transactions taking place between electronic tolling service operators, toll chargers, payment service providers, financial institutions and clearly road users having their home base in different European countries. This activity would represent a valuable business opportunity for OBU producers and software integrators, who are able to provide turn key solutions to their customers.

The interviewed subjects did not see any particular impact of the EC Directive on their distribution model, primarily because their typical buyers are represented by road concessionaires and they usually act after a public tendering procedure. However would there be changes in the distribution process with the full deployment of the standardised "*comprehensive OBU*", so that then the distribution channel represented by lorry manufacturers could become more important. Furthermore, the birth of the so-called EETS providers, service operators interfacing between Road operators and final clients,

will modify the distribution model in the sense that these EETS providers will become the clients of the EETS electronic industry.

A final issue, which is strictly related to the distribution model currently adopted, was highlighted by some operators referring to the lack of an after sales market: the OBU producers don't have any direct contact (or exclusively loose contact) with the final customer.

Technology items

The stakeholders interviewed provided the interviewer with their viewpoints about the EC Directive impact on the technology they have developed. All firms interviewed have declared their compliance with a technology standard (usually they are compliant to CEN standard) and their capability to redesign and produce OBUs in order to allow technology interoperability and full compliance with EC Directive requirements. In order to complete this process, which is already underway, they are awaiting the stabilisation of the requirements of technical issues (such as technology and certification issues) established by the EC Directive implementation.

OBU producers and software integrators have also declared that their platforms are able to bundle ETS services together with other ITS services that can be provided directly by the already produced OBU (e.g. fuel payment service or street parking payment, freight and fleet management; emergency calls etc.) or integrate OBUs currently produced with other devices such as smart cards. Nevertheless it is necessary to point out that the provision of other ITS services, exploiting the EETS service platform, should take the "security issue" into account, especially for services bundling together with the ETS OBU features of an "electronic wallet". It is important to note that these issues could take place only in the case of the implementation of a "comprehensive OBU".

General issues

All OBU producers interviewed shared a common vision regarding the impact of the EC Directive on their company and on the industry.

The implementation of the Directive is an extraordinary chance to promote the simplification and integration of OBUs within vehicles. At the same time it favours the reduction of variances in the OBUs, reduction of research and development costs and an increase in user friendliness. The directive will define the conditions to establish a European based market for ETS by also allowing the introduction of a complex ETS schema which is able to address enforcement and fine collection issues as well. The definition of such a huge and unique market, lacking protected niches, will also increase the "competition level", with the final result being a simplification of the market and a reduction of the number of providers in the market. This situation, on the road user's part, could be summarised by the OBU price level, initially expected to be on the rise – due to the embedding of different technologies in a single OBU and later expected to decrease during the battle to acquire the market also exploiting scale economies, and then to rise again following the consolidation of ETS system players. The envisaged standardisation could favour software integrators, in particular large ones, which could easily address

resources in a promising industry featured by niche players, leveraging scale and scope economies coming from the integration of ETS systems with legacy systems deployed in toll chargers.

OBU producers also made a common remark about the EC Directive: the directive itself is not complete. The Directive did not focus on including some technical/operational features: it failed in including a "migration plan" aimed at addressing its successful implementation. Moreover, it did not focus on including some technical annexes on technical requirements, privacy, security levels, data protection and interfaces that could support and steer industry players towards deploying the Directive.

An OBU producer has explicitly requested the presence of a European body in charge of checking and validating the security level of OBUs for cross border implementation.

Another OBU producer has developed an idea on the role of Galileo in the ETS service by putting forward the hypothesis that the Galileo service should be free of charge for ETS services. Moreover, it has been emphasised that the EC incentives are perhaps the best solution to support and promote the migration of systems currently operate. The need for incentives to develop the "universal OBU" due to a limited number of customers interested in it has also been highlighted.

Another general issue unanimously addressed by OBU producers and software integrators refers to separating ETS OBU from the OBU dedicated to other ITS applications: everyone agreed that technically this is not the best solution, but it is the cheaper way to preserve data integrity and to promote the reduction of security costs. In fact this approach will avoid any R&D cost related to the design, implementation and deployment of an OBU including all applications and functionalities.

3.3.2 Truck manufacturers

Economic and Financial items

The stakeholders interviewed provided their viewpoints on the impact of the EC directive on the automotive platform and on their business model.

In detail, the lorry manufacturer interviewed expressed some criticism as to the approach envisaged by the EC regarding their readiness to install ETS OBU (especially the European one) as first equipment or in a retrofit of a vehicle, especially if the manufacturer acts as "pioneer" in the field of the ITS deployment. According to the opinion of one of the interviewed stakeholder the full deployment of ETS devices will follow a four step approach ranging from a level in which OBU are retrofit of the vehicle with power supply requirements to a level in which ETS OBUs are embedded in a multipurpose secure-sensitive computing platform. Currently the industry is positioned at the second level of the scale, the level in which OBU cables and antennas are installed by lorry manufacturers. It is important to note the current lack of a standard for lorry manufacturers. This lack could cause problems in designing and implementing the cockpit allowing interoperability between the ETS and the automotive platform.

The manufacturer agreed on the possibility of adding new features to the ETS platform, nevertheless they emphasised that the inclusions of new features could be performed only after addressing security issues to protect user privacy data .

The manufacturers highlighted that only a large scale production could bring prices down even though it is important to stress that it is currently referring to HGV vehicles. Furthermore it is imperative to stress the concept of the "price threshold": maybe the idea to have on OBU available for less than one hundred Euro is not realistic, especially if the OBU is featured by a display and a Human Machine Interface. Perhaps different technological standards could arise in different regions, in relation to light vehicles and passenger vehicles; this will determine price differences between car and lorry OBUs.

Another important element which will determine the price of OBUs is represented by architectural choice: the more the "intelligence side" is concentrated on the OBU the less the OBU prices will decrease. However, this should cause a decrease in back office costs (to be sustained by the subject in charge of the ETS system management) as well as in communication costs (these considerations refer to a "free flow ETS system" in which it is necessary to communicate between vehicles and the computing centre, via a mobile communication network).

The last thought in relation to future trends refers to the cockpit configuration. The manufacturers think that the more the ETS OBU goes through the previously mentioned approach the less is the need felt to add new elements in the cockpit, thus having the chance to add new features in the same console, eventually via "pop up" applications.

Business management items

One of the interviewed stakeholders assembles his own OBU: it buys the components produced by the manufacturers according to detailed specifications defined in accordance with the requirements issued by the lorry manufacturer and the standardisation institutes. The manufacturer is able to provide and currently provides ITS services to its customers: these services cannot be bundled into the ETS OBU (due to legal constraints). The interviewed subject believes that "one single contract for all ITS services" is not the solution for the business, especially if ITS services are provided by different players acting on the same OBU. This could cause many conflicts. Another manufacturer simply buy and install "off the shelf" components and applications (e.g. the digital tachograph), if possible, or it relies on qualified supplier. Currently this manufacturer provides value added services based on business requirements of the customers (e.g. anti theft systems or alarms).

Technology items

About the technology it's important to mention the different attitude of interviewed stakeholders on the theme, according to the strategic path they have chosen to implement, even if either the "pioneer" or the "follower" envisage, as soon as possible the deployment of a technological standard at European level. In detail the lorry manufacturer acting as pioneer is designing and implementing its cockpit to comply with international standards on ETS OBUs. It currently complies with GSM and GPS standards, but it has

planned to comply with the 5.8 GHz standard and with all other standards envisaged by the EC Directive.

Other OBUs currently designed, produced and installed in cockpits are addressed to the provision of other ITS services. These OBUs do not clash with automotive standards nor with OBUs dedicated to ETS. As soon as a European standard emerges and the market size is considered to be viable for a business case, the manufacturer will design, develop and deploy "comprehensive OBU". On the opposite the "follower" lorry manufacturer will adopt a "wait & see" strategy, facing any technological challenge as soon as the technological framework will be stabilised.

General issues

The opinion of the lorry manufacturers concerning the EC directive impact on its own business area was positive because it envisaged the advantages related to standardisation as is the case with, the opportunity to bundle "simple services" to its current OBU in the short term. In the long term the OBU insertion as first equipment in the lorry, instead of retrofit, could improve its business by adding new revenue sources. Nevertheless it has stressed two issues: the first refers to user privacy and security-sensitive data management; the second refers to the need to carefully manage the development of the Human Machine Interface of the comprehensive OBU, in order to avoid any deviation of driver attention from guidance.

One of the truck manufacturers has also defined a possible approach for the deployment of ETS services: the first step is to embed a single service (e.g. e-call, freight and fleet management, hazardous goods monitoring) and this can be readily implemented using the current platform, the second step (in the long term) is the standardisation of satellite services. The issues to be managed are telecommunications (especially for roaming) and back office costs.

Truck manufacturers didn't expect any dramatic impact on their business, the only forecasted impact refer to an increased burden for the design function – but only if they are involved in this activity - without any increase in employment. In fact, manufacturing is outsourced as the sales activities.

3.3.3 Transport companies for people and goods

Economic and Financial items

The stakeholders interviewed provided their viewpoint on the impact of the EC directive on the transportation of people and goods. The analysis of these opinions clearly highlighted the different impact of the Directive on the different stakeholder typology.

It has been noted that a bigger impact is expected on goods transportation, in which there are operating companies that have already implemented systems aimed at providing their fleet ITS services such as freight and fleet management, e-call and so forth over different OBUs for the differentiated ETS services currently operating in various countries. In that case, the implementation of the concept "one single OBU per one single contract" will be

absolutely welcomed, not because of the impact on the cockpit (reduction of outfit installed) or because of the impact on the security of cash managed by drivers, but because of the impact on operational costs, especially back office activities.

In fact, the presence of business relationships with many EETS providers (contract issuers) and payment service providers has a massive impact on back office activities of logistic companies to manage and clear any transactions made, as well as invoices and bank statements received from all service providers. The implementation of the Directive, and the implementation of the concept embedded in it "one single OBU per one single contract", will certainly improve the business operations of logistic firms, allowing them to even reduce labour force dedicated to back office activities (until a threshold of 50% of dedicated labour force). Logistic companies envisage that the Directive implementation will also make the usage of other ITS services (in term of cost saving) more efficient by exploiting the bundling of multiple services in a single OBU.

The previously mentioned benefits are necessary to completely replace all installed OBUs, this could be done in accordance with the lorry renewal plan (an interviewed company affirmed that the lorry lifecycle is about 3/3,5 years). It is important to note that, even after the complete renewal of their lorry fleet, logistic companies, for internal organisational reasons, expect to keep a small share of the company motorway fee to be paid in cash.

People transportation companies, unlike goods transportation companies, did not see EETS as such a critical success factor in their business, due to the legislative/fiscal treatment reserved for buses in many countries (e.g. in Germany they are free of MAUT) and to the circulation of cards as means of payment. Nevertheless, they recognize the importance of the ETS service as tools to reduce queues at toll stations (improving the reliability of their scheduling and therefore keep/defend the competitiveness of road transportation with railway transportation). Moreover the ITS services proposed for logistic companies are not considered as killer applications, with the exception of e-call services.

Business management items

The people interviewed clearly highlighted that the viewpoints belong to people and goods transportation businesses by stressing different critical success factors. In fact for the logistic companies the cost element is the critical success factor (as it includes in its consideration either OBU cost or "payment dates shift"). On the contrary for people transportation companies reliability is the key competitive driver. Therefore, the critical success factor is to have access to all tools that could improve it, including ETS OBU, even if an OBU discount is obviously welcomed. Other benefits shared and welcomed by both the firm typology are represented by increased efficiency related to transaction centralisation.

It is important to note that the welcomed transaction centralisation could minimise a threat: lack of possibility for logistic companies to "negotiate", via competitive bids, their route choice.

Technology items

With regard to the technology issue, the interviewed companies did not expect any significant impacts from the implementation of the Directive, especially in relation to the interferences or disturbances on the vehicles. However, they expect improvements from the installation of a comprehensive OBU - instead of a series of retrofit – and from the "stabilisation" of the "technological context".

General issues

Both logistic service providers and firms focused on people transportation to see the EC Directive implementation as a positive element for their business: it will allow a reduction of transactional and administrative costs, over savings related to the installation of only one OBU.

Moreover, logistic firms also see other benefits related to a possible integration of the digital tachograph and a quicker and easier crossing of Swiss borders. Their only concerns are in relation to: the timescale needed to effectively implement the system and some possible effects within the competitive arena in the long term (a reduced number of players will negatively influence ETS service price settlement mechanisms, especially at international level). On the other hand, firms focused on people transportation directed their attention to an element believed to be more relevant than the ETS service that is to say, the level of fiscal duty (e.g. the VAT increase which occurred in Germany going from 16% to 19%).

3.4 Viewpoint of financial institutions

Objectives

The work package is aimed at outlining impacts, especially the social and economic ones, expected by financial institutions from the implementation of the Single European Electronic Fee Collection Service. In detail the survey has the aim to highlight the vision of two different categories of financial institutions playing in the ETS industry:

- financial institutions (banks and insurance companies);
- financial players (electronic tolling service providers)

Activities

During this stage of the project the activities carried out primarily aimed at identifying the subjects to be involved in the study so as to encompass the opinions of all stakeholder typology acting as financial institutions in the ETS field. The criteria adopted to select the subjects to be interviewed can be summarized as follows: "industry coverage" (subjects involved have to be considered elements or valuable proxy of the ETS value chain player), geographical coverage and principles stated in the 2004/52/CE Directive.

The carrying out of these activities according to the previously mentioned principles, together with the gathering and the assessing of material on the ETS field from "official sources" (e.g. DG TREN) has enabled us to draft a list in which the subjects to be involved have been grouped into two categories: financial institutions and contract issuers and payment service providers. The list worked out has been submitted and validated by DG TREN. The mentioned list is as follows.

Table 21: The work organisation and the stakeholders involved

Organisation	Person interviewed	Interviewer	Date
Norwich Union (UK)	Ms. Liz Chettleburgh	G. Zomer	26/07/06
Unicredit Banca (I)	Mrs. Artioli	G. Luccitti	14/06/06
TVM (NL)	Mr. Erik Schiphorst Mr. Ulco Oskam	G. Zomer	18/07/06
Ages (DE)	Mr. Boehme	K. El Araby	18/07/06
Via Verde (P)	Mr. Pecegueiro	G. Luccitti	28/06/06
Axxes (FR)	Mr. Lassauce	J.M. Gautier	10/07/06

These stakeholders were interviewed on the basis of the assessments stemming from the same information gathered which therefore enabled us to work out a questionnaire on the following issues:

- issue of payment means associated with service;
- clearing between operators;
- liability of operators between themselves and possibilities of insurance for this liability;
- delivery of onboard units;
- the EC directive impact on the industry in terms of social factors (e.g. unemployment effects),

A short report on the information gathered during the interviews highlighting the similarities and differences in the opinions of the interviewed stakeholders follows.

3.4.1 Electronic tolling service providers and payment service providers

Economic and Financial items

The stakeholders interviewed provided their viewpoints concerning the impact of the EC directive on their business. The contract issuers interviewed see the EC Directive as a powerful tool able to enlarge their business either by increasing market size or by adding new services to be marketed in bundled packages, together with the already existing ones. Typical examples of services currently provided – over contract management are: petrol card management, parking lot management, transactions as well as clearance management, billing management, sales support for OBUs and support to access tolling. The aforementioned opportunities are considered to be even more relevant if the electronic tolling service provider also plays the role of payment service provider or if it is acting as a "clearing house".

The analysis of the data gathered via the interviews has highlighted that the business model chosen in the country to manage the ETS system influences the OBU distribution model: the contract issuers could be delegated to act as an OBU issuer or it could be in charge of the OBU distribution.

The analysis of the information provided during the interviews has stressed that the firms taken into consideration used to focus their business on "contract management", instead of on the OBUs. This stakeholder category usually does not concentrate its business on OBU distribution; on the contrary they focus on the provision of services aimed at strengthening contractual relationships. Their business mission could be summarised in the creation, enlargement and loyalty of a customer base, providing new services or adding new features to already existing ones. This approach has been carried out with remarkable results by contract issuers acting as payment service providers.

The subjects interviewed also have emphasised their role in guaranteeing transactions: usually the contract issuers have to financially guarantee services provided by the transport service provider by taking charge of the transaction risk. Due to the relevance of this issue, the interviewed contract issuers have highlighted the need to define and implement a transaction management model at European level, in order to clearly define their business boundaries and to manage the "international roaming theme", regardless of the home country of the electronic tolling service provider /road user.

Other important issues raised by those interviewed refer to theme pricing. The price (toll) for service transportation is out of the electronic tolling service provider' scope , provided that the toll road service provider and the electronic tolling service provider are different. In fact the toll is usually legally defined in the contract ruling the concession between governments and road concessionaires, therefore any discount policies on tolls are a business constraint and not a leverage for the electronic tolling service provider and could cause extra activities (especially in IT functions) to comply with the requests of toll road

service providers to charge road users according to extraordinary schema valid for a limited period of time or for a specific user's niche.

General issues

The interviewed electronic tolling service providers, especially those operating in the "developed" ETS market, perceived the EC Directive as a remarkable business opportunity to enlarge their market boundaries at international level, giving them the chance to access the new market as an "experienced newcomer" able to provide a complete list of services.

The electronic tolling service providers interviewed focused their attention on some issues that could hinder the successful implementation of a market featured by "contract interoperability", these issues refer to the enforcement and the fraud theme at cross border level.

Another theme emphasised by the stakeholders interviewed refers to the "interchange agreement" to be settled and managed between transport service providers and contract issuers, to encompass all "business conduct" affecting the domestic business of the contract issuers, particularly regarding the fee theme. The interchange agreement should be designed to solve any potential controversies emerging from the following matters:

- management of fiscal issues (especially VAT) at international level,
- the issuing of bills (many electronic tolling service providers currently have no rights to issue bills, they simply issue statements),
- the management of contractual relationships between private companies and public players,
- the need to create a new player in the ETS value chain, that is to say, the "interoperability manager".

3.4.2 Financial institutions

Economic and Financial items

The Stakeholders interviewed emphasised their viewpoint on the impact of the EC directive both on people and goods transportation.

Financial institutions, especially banks, see the EC Directive as a marketing tool aimed at allowing the provision of other services to bind customers to the usage of a bank account. In fact, often banks develop co-marketing initiatives with transport service providers of ETS operators to promote usage of their service from bank account subscribers. Nevertheless the ETS is not considered as a killer application from banks, they don't expect a big impact of this service on their balance sheet.

As far as customers are concerned it's important to note that greater benefits will be obtained by professional customers that could attain gains from the transaction management carried out by banks. Consumers, on the other hand, could mainly attain gains from the digitalisation of the service and not from payment delays or any other financial benefits. It's important to take into account that banks guarantee Electronic Tolling Service payment to transport service providers (particularly for transactions performed by customers identified as consumers, through the definition of "service consumption threshold" to rank customers in a group or in another).

Moreover the interviewed insurance company does not see the ETS as killer application for their business, because the service is not closely related to the provision of insurance service. The Electronic Tolling Service could impact insurance companies business only if it could positively influence the conduct of drivers (seen as the main cause of accidents) and increase transport safety as an act of support in tackling theft.

General issues

The interviewed stakeholders emphasised the capability of the EC Directive to enlarge their business either from the geographic or the market viewpoint through greater access to provided services. Moreover the EC Directive opens new perspectives for clearing services, especially for services aimed at solving issues arising from differences in the legislative and fiscal systems of European countries.

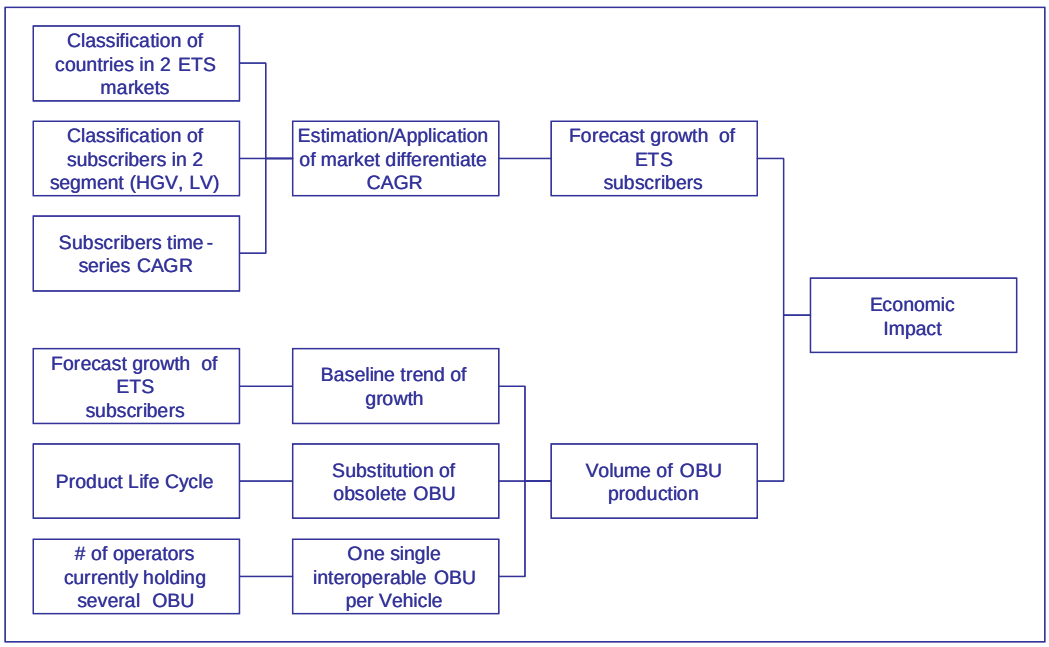
According to contract issuers the most important issue to be solved, in order to provide a viable and financially sound EETS service, is represented by the "contractual and financial roaming" theme. The solution of this issue, as well as promoting coordination between all international initiatives on ETS (e.g. Media etc.), will lay down the foundations to implement and deploy a functioning EETS system.

4 Forecast analysis

4.1 Economic forecast analysis

In order to assess the economic impact of the Directive on the environment it is essential to define the ETS subscriber trend and the volume of OBU produced, in accordance with the chart depicted below:

Figure 14: Economic forecast analysis chart



Forecast growth of ETS subscribers

With reference to the classification of the targeted countries, previously mentioned in the synthesis of the PEST Analysis (par. 1.2.4), it is possible to group countries into three market types:

- **Developing market**: France, Spain, Greece, Austria and Germany;
- **Mature market**: Italy, Slovenia, Portugal and Norway;
- **Potential market**: other countries (e.g. Belgium, UK, Sweden, The Netherlands, etc.) which do not have a relevant penetration of road tolling policies. For these countries it is not possible to assess the effects of the Directive in a reliable way, because their approach towards tolling policies could be either that of a massive adoption or a complete rejection.

The analysis is based on the following assumptions:

1. the analysis is "focused" on the current situation in each country, because any estimates based on speculations about future policies, aimed at increasing the ETS service penetration, are considered as "not credible";

2. data used about current ETS subscribers are those produced by ASECAP and do not include urban tolling systems (e.g. congestion traffic in London);
3. all countries grouped into the same market typology are supposed to behave in the same way: it is supposed that all countries are growing at a similar rate, so the growth rate applied to a market segment can be considered as a proxy of the growth rate experienced in each country;
4. markets now classified as "developing markets" will reach the "maturity stage" of the ETS lifecycle product in four years' time;
5. forecasts are worked out by adopting a four year interval step as a time reference (2006 - 2009, 2010 - 2013);
6. the targets of the analysis (in term of countries studied) are identified in Chapter 1;
7. to understand and estimate the impact of the EC Directive deployment the analysis has been split into two main trunks to isolate the impact on Light Vehicles from the impact on Heavy Goods Vehicles.

According to the aforementioned assumptions the process aimed at estimating the growth's trend of ETS subscribers it has been launched, as a first element to evaluate the economic impact of the Directive.
To work out the estimation on the ETS subscribers trend we start by considering that the first two assumptions indicate that there is a growth trend featuring each market segment identified in the PEST analysis, this trend is represented by the CAGR[6], chosen as proxy of the ETS subscribers evolution. In addition to that, the aforementioned growth trend changes according to each time interval, due to the assumption that the time interval represents time needed to pass from one stage to the other of the ETS lifecycle.
The determination of expected CAGR in the number of ETS subscribers is based on the following steps:

1. definition of an average CAGR for each of the two market types, using them as proxies of the growth rate of ETS subscribers. These average values are calculated on the historic CAGR experienced in the analysed markets in the period 2001-2005. For this purpose data on the significant countries of each market have been employed (see table in Annex 4);
2. definition of the relationship between the two CAGRs previously defined on the two market types (developing and mature markets), to measure how the growth rate decreases from the developing to the mature phase, considering that the time interval needed to pass from one stage to the other of the lifecycle is 4 years;
3. after having defined the proxies of the ETS subscribers growth rates (the two CAGRs calculated per each time interval) and the relation between the two CAGRs, these values are deployed to the CAGRs defined according to current behaviour of ETS subscribers in the market types in order to calculate the growth rate concerning all the considered time intervals.
4. having obtained the CAGRs path or better the proxy of ETS subscribers growth rates, through the analysis of the situation currently observed in Europe, it is possible to

[6] Compound Annual Growth Rate calculated as follows: [(Final Value/Initial Value) ^{n}] – 1, over a n years period.

differentiate between the CAGRs related to Light Vehicles and those related to Heavy Goods Vehicles segments.

This last step of the process will be achieved by defining the different growth rate of the two different kinds of vehicles. The issue to perform this calculation is represented by the lack of data concerning the ETS subscribers, split between the two market segments (LV and HGV).

To face this issue, considering that the light vehicles are more numerous than the heavy goods (something like 75% compared to 25%) and that they are featured by a different growth rate that should be reflected in the ETS subscribers growth rate, it has been decided to use a proxy to estimate the two "paths of growth". The proxy chosen is represented by the stock of vehicles, either the stock of Light Vehicles or the stock of Heavy Goods Vehicles. To assess the changes in the aforementioned stocks the time series of that data it has been analysed, considering a period of ten years, from 1995 to 2005. Data from 1995 to 2005 about the stock of vehicles in the countries showed that HGV stock has grown more than LV stock. Once the proxy has been defined it is mandatory to define the differential growth rate featuring LV ETS subscribing rate from the HGV ETS subscribing rate. This differential is calculated according to the following steps:

- Ø definition of the spread between the CAGR of HGV ETS subscriptions and the CAGR of LV ETS subscriptions over the past 5 years, for each country, after having calculated the CAGRs for each market segment;
- Ø calculation of the average of the above calculated spreads, in order to obtain the average spread between the CAGR of HGV ETS subscriptions and the CAGR of LV ETS subscriptions;
- Ø deployment of the average differential previously defined to the CAGR path.

In this way, as for the first interval, the difference between the LV CAGR and the HGV CAGR is exactly the result achieved before in identifying the relation between CAGRs observed in the different stage of ETS lifecycle stage (1.4%).

The table reported below shows the results of this estimate:

Table 22: HGV expected CAGR in the targeted time intervals

Market	Current representative growth rate 2001-2005	Expected growth rate 2006- 2009	Expected growth rate 2010-2013
Mature	17.7%	6.9%	2.7%
Developing	45.7%	17.7%	6.9%

Source: Ernst & Young estimates.

Table 23: LV expected CAGR in the targeted time intervals

Market	Current representative growth rate 2001-2005	Expected growth rate 2006- 2009	Expected growth rate 2010-2013
Mature	16.3%	6.0%	2.2%
Developing	44.3%	16.3%	6.0%

Source: Ernst & Young estimates.

The baseline number of current ETS subscribers, on which the CAGR path must be applied, is different between the two segments. Referring to par. 1.2.4 the proportion

between Light Vehicles and Heavy Goods Vehicles ETS subscribers is equal to a ratio of three to one.
The tables shows that, in the first year, the difference between HGV growth rate and LV growth rate is equal to 1.4%.

The baseline volume of current ETS subscribers, both for LV and HGV, according to ASECAP data is[7]:

Table 24: LV expected CAGR in the targeted time intervals

Country	Tot Vehicles	HGV EFC Subscribers
Italy	4.900.000	1.225.000
Slovenia	230.000	57.500
Portugal	1.866.634	466.659
Norway	875.565	218.891
France	1.450.205	362.551
Spain	518.445	129.611
Greece	45.000	11.250
Austria	*525.474*	131.369
Germany	*500.000*	125.000
Others	*381.278*	95.320
Tot	***11.292.601***	***2.823.150***

Country	Tot Vehicles	LV EFC Subscribers
Italy	4.900.000	3.675.000
Slovenia	230.000	172.500
Portugal	1.866.634	1.399.976
Norway	875.565	656.674
France	1.450.205	1.087.654
Spain	518.445	388.834
Greece	45.000	33.750
Others	*285.959*	214.469
Tot	***10.171.808***	***7.628.856***

Source: Ernst & Young ASECAP statistics, 2005.

The next step is to forecast ETS penetration. This activity consists in deploying the above estimated rates on the current number of ETS subscribers. These rates are applied each year to the respective interval.
The estimate worked out, according to the model previously described, foresees a global increase in ETS subscribers from the current basis of 11 million up to 20 million ones the next 8 years. In detail, the total amount of ETS subscribers should be split between LV and HGV as follows: more than 6.5 million of LV and more than 2.6 millions HGV.
The main effect should occur in the Latin European Countries (namely Italy, Spain, Portugal), where an increase of 2.4 million of LV and 0.95 million of HGV is forecasted.
The simulation model adopted also foresee a remarkable increase of French ETS subscribers, generating figures equal to1.4 million of new ETS LV subscriptions and 0.5 million of new ETS HGV subscriptions.
It is important to note that estimates have been worked out according to a prudential approach and based on current market composition and trends. In fact, only the categories of vehicles currently using the ETS systems have been analysed, in the countries considered as in the scope of the study. Therefore data and forecasts concerning Austria, Germany, the Netherlands and Slovenia do not take into account future scenarios, in order

[7] "Others" include: Belgium, Denmark, The Netherlands, Finland, Sweden and UK. The UK data excludes the London urban ETS system.

to quantify the effects produced by any initiatives or new policies undertaken by countries to increase the ETS deployment.
To maintain fair estimates it was decided to avoid taking into account the ETS policy that will be adopted in The Netherlands and in Slovenia. In detail: the **Netherlands**, in the interviewing process, has foreseen a growth of the ETS market of up to 7 million ETS subscribers, as a consequence of the introduction of a National Road Authority. At this stage and in this document, this purpose is considered as a mere hypothesis and there are no credible variables to predict the effects of this decision. Nevertheless, the expected trend previously displayed lies within a prudential estimates. In **Slovenia** a growth of the national market up to 1.2 million ETS subscribers by 2009 has been forecasted, on the basis of a political decision that has not been taken into account in the present study. This has lead to a cautious rounding down of the Slovenian predictions.

Volume of OBU production
To forecast the OBU production, an analysis was developed in the following steps:

1. Calculation of the **baseline growth trend of OBU production**, linking the number of OBU produced to the number of ETS subscriptions and indirectly, to the stock of vehicles registered in a country (given the relation between the stock of vehicles registered in the country every year and the number of ETS subscribers). The estimation of the OBU production is based on the assumption "*one OBU-one subscriber*", meaning that any new subscriber will purchase a new OBU;
2. Evaluation of two effects that influence the OBU production estimation:
   - **positive impact**: substitution of OBU devices because of the product lifecycle ends (obsolete, renewal, etc.);
   - **negative impact**: with ETS interoperability all the users that currently have more than one OBU (and related subscription) for each of the countries crossed, will only have a single OBU and a single contract. This will affect the number of total OBUs in circulation.

The **baseline growth trend** data coincides with the ETS subscriptions registered each year, considering also the composition of the market between heavy goods vehicles and light vehicles in a country.
The effect on the **substitution of obsolete OBUs** is calculated according to the sum of new OBUs and substituted OBU, that could be activated in each year:

- new OBUs: these figures are equal to the number of new subscribers in the year X, calculated as **Subscribers year X - Subscribers year X $_{-1}$**;
- OBU substitutions: this figure equals the new OBU delivered at the beginning of the Product Life Cycle period.

To develop the analysis more fully the combined effect generated by the substitution of OBU shall now be considered and, on the other hand, the choice of one single OBU.
Based on the information gathered during the interview process, it is possible to set the **OBU Product Life Cycle** as lasting three years, both for HGV and for LV devices.
Having **one single interoperable OBU per vehicle,** would certainly reduce the number of OBUs installed because many operators will opt for one single OBU, instead of more than one device as now is the case when travelling into many countries. Nevertheless, this effect will not dramatically impact the OBU production, because it only concerns the

HGVs operating abroad. To estimate the amount of HGV operating abroad, cross-checked data on cross-border transits between the main European borders on the one hand and, on the other hand information gathered during the interviewing process have been considered. Both the analyses data lead to the conclusion that no more than a quarter of HVG operates abroad. From this percentage one should extract all HGV that operate abroad but do not have the necessity to hold more than one OBU. Thus suggesting that less than 5% of total vehicles may be affected by the OBU substitution issue, remembering that only a quarter of total HGV use to travel abroad and that the HGV account for 25% of the ETS total subscription.
Given the aforementioned information (namely the number of ETS subscribers, the stock of vehicles, the Product Life Cycle and the estimate made to define the number of HGV holding more than one OBU) it is possible to estimate the **volume of OBU produced** in the upcoming years. Figures obtained are displayed in the following table.

Table 25: Expected volume of OBU production (data in millions)

	2006-2009		2010-2013	
	HGV	LV	HGV	LV
OBU Production	2.2	5.9	2.5	6.4

Source: Ernst & Young elaboration.

These data incorporate the substitution effect of technologies currently deployed, with the new one that will be set, once the European ETS (EETS) will be entirely operational. It has been assumed that the EETS would be operational at the earliest in 2010, so the estimation across the period 2006 – 2009 refers to the production of OBUs currently operating on national and local schemes, while the estimations across the period 2010 – 2013 may be interpreted as the production of OBUs compliant with the EETS chosen technology.

The aforementioned figures are the outcome of a fair estimation process; data displayed in the previous table are rounded down. In fact, they come from the analysis of the countries studied, not considering the potential increase in the OBU production coming from the spreading of the ETS system to other vehicle classes in Austria and Germany, or the implementation of ETS system in the Netherlands.
Furthermore the baseline data on which OBU production growth is estimated is indirectly based on the growth path of the vehicle stock, considering either the growth path of light vehicles or the growth path of the heavy goods ones.
Assuming that, it is not possible to foresee which would be the strategic approach of manufacturers toward this increase of OBU demand. They could delocalise production toward countries featured by lower job costs, in order to improve their efficiency. This would certainly affect the ETS industry either on the economic or on the social point of view (paragraph 4.2).

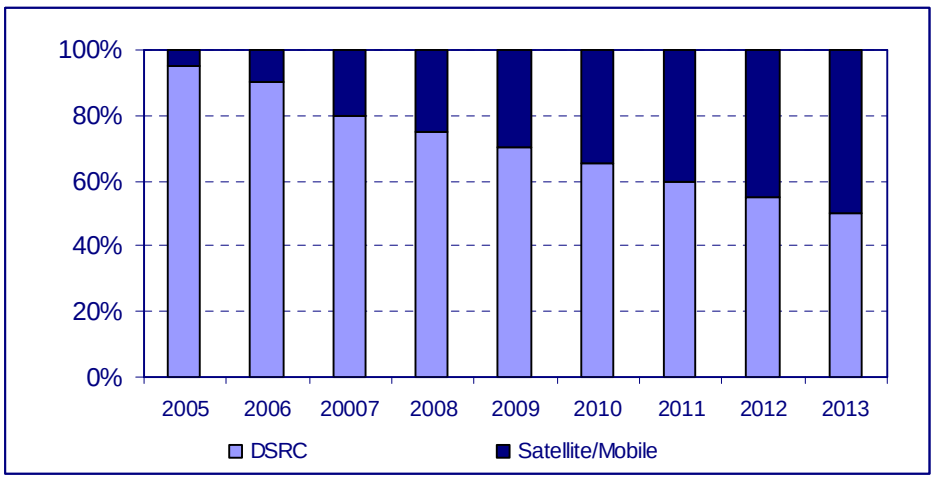
Once the number of OBUs has been estimated, it is mandatory to take into account, a last factor that would affect the OBU production market: the technology used. Currently there

is no real dominating technology or standard in the European framework. The Directive foresees that all toll systems must adopt one of the following technologies:

a) satellite positioning;
b) mobile communications using the GSM-GPS standard (reference GSM TS 03.60/23.00);
c) 5.8 GHz microwave technology.

Nevertheless, the European Commission Directive openly recommends the adoption of the first two alternatives, which allow the exploitation of the European Galileo system features. A credible hypothesis of the penetration path of the satellite based technology in the upcoming years has been put forward, on the basis of the currently adopted technologies in the countries examined in the study and the estimates of the time needed to perform the changeover to a new standard. The path can be represented with the following chart:

Figure 15: Hypothesis of the path of Satellite/Mobile technology penetration



Source: Ernst & Young elaboration.

The technological shift, foreseen for the upcoming years, will basically have two impacts on the OBU market:

- a **positive impact** represented by an increase in OBU substitutions and production, due to customer requests attracted by the new technological standard;
- a **negative impact** concerning the industry-related DSRC, which would be gradually threatened by the affirming Satellite/Mobile standards.

To summarise the effect of the Directive implementation on the OBU market a growth over the upcoming time interval made of eight years is globally foreseen. Furthermore, figures on OBU production would certainly increase, considering the likely increase in the ETS subscribers in Austria and Germany.

It is even important to notice that, the **growth path of OBU market** is sustained by **a limited Product Life Cycle** (the OBU lifecycle is estimated in three years), that assures a continuous production to substitute obsolete devices, **and the foreseen growth of ETS subscribers and in the stock of HGV**.

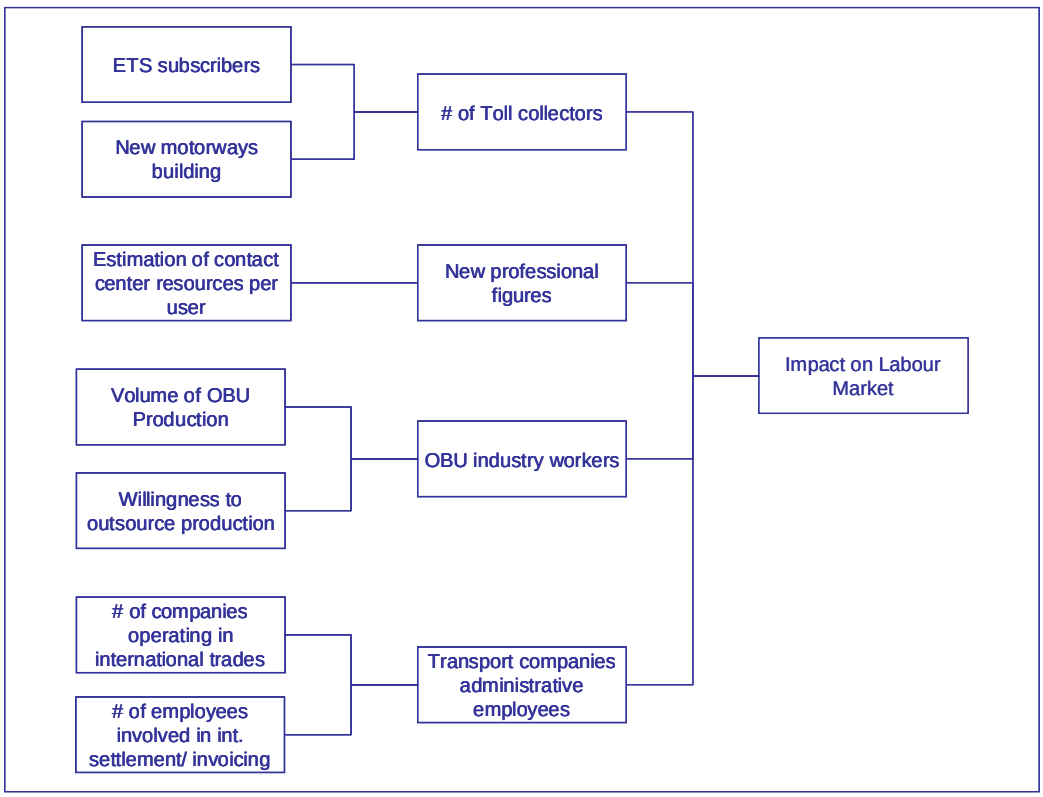
On the other hand, the deployment of interoperability will reduce the number of OBUs held by users to just one device, especially in the segment of the professional users category represented by lorries used to travel abroad in Europe. The “negative effect”

could be amplified for those OBU producers focused on ETS devices exploiting the ETS standard technology (namely the DSRC one) that are expected to decrease in the upcoming years, compared to satellite based technology.
Nevertheless, considering that 75% of total vehicles circulating in the European area are light vehicles - usually circulating into the country borders - and that only 25% of heavy goods vehicles may be interested in the opportunity to concentrate all ETS services currently exploited in one single OBU, the conservative growth path foreseen in the OBU production, can be considered as realistic.

4.2 Impact on labour market

The purpose of this section is to evaluate the social impact generated by the implementation of the EC Directive 2004/52/CE. To assess the aforementioned impacts an approach allowing isolation of the effects produced by any single element through a "tree model" has been adopted showing relationships between cause and effect. Below is a table aimed at displaying the evaluating approach adopted.

Figure 16: Impact on labour market chart



Impact on toll collectors

A remarkable social impact generated by EC Directive deployment is represented by the effect on **collectors,** due to a gradual substitution of manual toll lanes with ETS lanes.

In order to estimate the magnitude of this impact, it is essential to design and implement a forecasting model that estimates the future number of manual toll lanes and consequently, the number of toll collectors interested in the impact of the Directive.

The outcome of the model will be cross checked with a second analysis, aimed at assessing the relationship between the number of ETS subscribers - and indirectly the number of ETS lanes and manual lanes - to traffic flow, considering it as the variable able to influence the outcome of the analysis.

The model should take into account two variables:

1. **ETS penetration** – this variable allowing one to approximate the number of new ETS lanes, in substitution of manual toll lanes;

2. **New motorways infrastructures** – this variable represents a baseline to determine the likely number of manual toll lanes that would be installed at new toll plazas, built either as an element of the new trunk of motorways, or as an instrument adopted to manage increased traffic flows affecting the same motorways.

The two aforementioned variables influence the number of manual toll lanes differently. Unfortunately the data available about the type of vehicle circulating on the motorways (light vehicles or heavy goods ones) and especially the difficulties/issues in registering the cross borders transit of vehicles (especially the HGV ones) do not allow us to accurately estimate the social impact of the implementation of EC Directive on the toll collectors, isolating this effect from those related to the implementation of ETS at national level. In fact, due the lack of reliable data about cross border traffic, any estimate on toll collectors about the effect of ETS penetration will be inevitably distorted by the following elements: the simultaneous usage of toll stations by light vehicles and heavy good ones, the weight of the light vehicles compared to the heavy good ones, the basically "national dimension" of traffic flows.

Given these facts, considering that the EC Directive is mainly targeted on HGV, one could certainly affirm that the *EC Directive direct impact on collectors will be negligible*, because the growth trend of ETS usage is basically boosted by light vehicles, vehicles that are neither directly and remarkably involved in the cross border traffic, nor are highly concerned by the interoperability issue of the ETS System across Europe.

This last evidence is confirmed adopting another analysis approach, based on data about the **traffic flow of vehicles on the motorways**.

This analysis approach starts from the analysis of the **average distance travelled by HGV**. Analyzing data concerning the freight transport distances in Europe[8], it emerged that 85% of the total tonnage transported travels within a distance of 150 Km. The "short distance" travelled demonstrates that most traffic flow has a domestic origin and destination. This phenomenon is even more relevant for light vehicles. According to the interviews performed and to data of the sector assessed, it has been possible to estimate an average distance of 70 Km travelled by light vehicles.

All these considerations suggest that the European road traffic is mainly composed of light vehicles, mostly concentrated on short distances. This reduces the direct impact of the Directive 2004/52/CE on the toll road service provider employment. In fact, considering that light vehicles roughly account for 75% of the total ETS users, their growth would put pressure on the installation of new ETS lanes, independent of heavy goods vehicles usage.

This shows that the **introduction of ETS lanes instead of manual lanes**, has to be **mainly considered** as **a local phenomenon**, pushed by domestic trends and by stakeholders not directly concerned by the Directive.

[8] Source: International Roads Transport Union (IRU) elaborations on NEA and Eurostat data, 2004.

Therefore the Directive can **spread its effects to those operators that would largely benefits from its introduction**, **namely HGV operating abroad**, without significantly jeopardizing the market equilibrium.

The second part of this approach analyses the **relationship between road freight traffic and ETS usage.**

The main purpose is to demonstrate that the increase in traffic flow on motorways and the number of the ETS subscribers (as for HGV) move toward the same direction. The match between the two variables is made for those countries formerly used as proxy to determine the growth rate of ETS usage: Italy and Portugal, identified as "mature markets", France and Spain, defined as "developing markets".

The Eurostat data on the national annual road transport, expressed in millions of tons-km, show an increase of the road transport in all countries: the average CAGR over the past 4 years for all the considered countries is 3%, with a peak in Spain of 10%.

The ASECAP data over the same period concerning the HGV ETS subscriptions, by contrast shows an average CAGR of 28%.

The match between the two time series is made by calculating the **ratio** between **the national annual road transport** and **HGV ETS subscriptions**. Over the considered period, the ratios calculated prove the following:

1. there is coherence between the increase of traffic and the increase of HGV ETS subscriptions;
2. HGV ETS subscriptions grow more than the traffic;
3. the growth rate of the ratio is higher in the developing market (35% on average), than in the mature markets (13% on average).

The first evidence strengthens the results of the analysis conducted until now. In fact, it is realistic to think that the traffic increase influences road users (especially professional users) decision to subscribe to an ETS contract, as well as pushing the motorway companies to install more ETS lanes in order to improve the management of traffic flow. This is even more suitable for light vehicles, due to the higher number of vehicles involved.

The second and the third evidences show that the leading variable is ETS usage. In fact, on one hand ETS usage grows more than the traffic and, on the other hand, the growing path of the ratio is similar to the ETS usage, growing more in the developing markets, than in the mature ones.

Analyses performed support the expectations of an increase of ETS lanes in the next eight years, caused either by an increase of the ETS subscriptions or by increased traffic volume. Thus resulting in a substitution of manual lanes, with the new ETS lanes. The subsequent "redundancy" of toll collectors is certainly the most visible and immediate effect, but it is not directly linked to the Directive implementation, as before showed. By contrast the EC Directive could be responsible for having missed the creation of new jobs (in the collector job profile) due to the substitution impact generated by the deployment of ETS lanes.

Considerations

The social assessment shall indeed include all impacts of the Directive, whose effects positively affect the social framework, even if it is difficult to estimate the magnitude of their impact. Some elements should be taken into account:

1. The first consideration is that the decreasing trend of motorway building mainly concerns EU Western Countries, with the exception of Spain, which is experiencing a high building activity. In fact **Central and Eastern Europe countries** are experiencing a **high infrastructure construction rate**, also facilitated/promoted by the economic support of European institutions. The quantitative analysis does not take into account Central and Eastern Europe countries, with the exception of Slovenia. Therefore, considering the whole group of 27 countries, currently composing the EU, the Eastern countries positively impacts the number of new manual lanes implemented, and more in the coming years.

   The massive road building activity and the forthcoming introduction of ETS systems in the Cech Republic, in Slovakia and Hungary will positively affect the number of workers employed to operate and manage the electronic toll collection. Nevertheless it must be added that this effect is mainly due to the implementation and deployment of ETS at national level, rather than to the introduction of the Directive.

2. The second consideration is that a relevant share of collectors is hired according to a fixed and **temporary term contract,** or as **part time** workers; so toll chargers could undertake a gradual exit plan for these employees, not losing jobs, but avoiding creating new ones to mitigate any substitution effect linked to ETS implementation.
3. The third consideration concerns the share of **collectors** that are **close to retirement** age limit. The toll chargers could optimize their retirement plan, eventually anticipating the period, adequately appealing to incentives to workers. However it is not possible to estimate the fixed-term contracts, on the one hand and the workers close to retirement on the other hand, because of the lack of data and information on toll chargers workforce composition.

Assuming the most efficient usage of the aforementioned tools, to minimise any effects on the collectors employment, the number of collectors impacted by the Directive can be considered negligible. Moreover collectors could be re-qualified by toll road service provider, exploiting also technical skills owned by collectors.

4. It is important to notice that there is a number of **job positions**, in the toll road service provider organizational structure, to be exploited **to relocate collectors**, as for example the road maintenance, and all related duties. Moreover, it must be said that even the ETS lanes would need a human presidium, able to provide prompt assistance or the maintenance/recovery of ETS equipment.
5. The last consideration is that glancing through the previous considerations the number of collectors impacted by the Directive would tend to zero, and the social impact of the Directive mainly concerns the future framework of the manual collection job. It is reasonable to assess that after a relocation of possible redundant manual collectors, the toll chargers will not hire new collectors.

For all these reasons it is not deemed reasonable to consider the redundancy of toll collectors as “lost jobs”, but maybe only as a lost chance to increase its total number. However it is mandatory to stress again that the effects on the collectors are not related to

the implementation of the Directive 2004/52/CE, but mainly to phenomenon generated to country trends.

New professional figures for toll chargers

The Directive would completely change the operational framework of toll collection, calling for new job profiles (featured by higher skills compared to those currently owned by collectors) that could be matched by redundant toll collectors, once that they have been re-qualified trough specific training activities.

The first job profile that will become needing is the **data manager**. The amount of information that the ETS system could manage is enormous. As for today, more than eight millions road users continuously passes through ETS lanes, generating each time dozens of data about fee payment, location, vehicle characteristics, etc. All this data must be gathered and conveniently warehoused, in order to be managed for business and administrative reasons.

The toll road service provider and the ETS providers would in fact benefit from data elaboration concerning all their users/customers movement. Monitoring the vehicles movement offers a great tool to foresee traffic volume, to detect any sort of problem on the network, such as insufficient number of lanes on a particular toll plaza, etc. In this way the toll road service provider may improve the service quality level, but also use this data to optimize traffic flow. For example they may offer to users saving opportunities, promoting the usage of certain routes in certain periods of the day to improve the network throughput, reducing congestion and avoiding traffic disruptions.

By contrast, the ETS providers could use the aforementioned data to accurately profile customers and market them a bundle of services that will be selected according to their behaviour. Given that, each company may rapidly train the collectors to work on a PC, in order to elaborate data, that would be analysed by technical personnel.

The second job profile that could arise in the future is the **contact centre operator,** as consequence of the growing demand of users/customers assistance. The experience of ETS systems in mature markets, showed that users need a reference contact centre in order to be assisted in the main phases of ETS usage:

- information about the product/service prior to subscription;
- opportunity to directly subscribe to the contract, through a contact centre;
- solving of technical problems related to the OBU device.

Based on the experience gained in the CRM market service, it is possible to estimate the average number of contact centre operators per user. For this purpose, contact centre case studies of companies with a large number of users have been analysed (e.g. companies belonging to industry such as insurance, banking, postal services, etc.). It emerged that there would be needed, as a rough average, one operator employed for each 3,000 users/customers. This assessment considers on one side that the number of calls made by ETS customers should be lower than the number of calls made by financial services customers, and on the other hand that the system must be operative on a 24/7 basis. In addition, to that there would not be a unique call centre, but at least one for each country, or one call centre per each concessionaire or group of them, where a minimum presidium should be assured. This feature will even “reduce” the scale economy effect related to the dimension of the call centre, contributing to a generation of new jobs as contact centre job profile.

The figures and the experiences occurred in other industry demonstrate the relevance of the contact centre job profile for toll road service provider, even if the provision of an estimate about the number of new jobs that could be created at European scale currently seems not prudent.

Nevertheless, it is important to note that the considerations previously stated are strengthened considering that the number of needed contact centre operators could increase, bearing in mind that:

- the analysis is limited only to future new ETS subscribers, but it is necessary to consider that, in some "developing markets", the current assistance service must be improved;
- the calculation is made only considering "inbound calls", but the contact centre may implement also marketing and promotional activities (outbound campaign), that could generate the need of further operators;
- even if the service must be continuously provided, it is reasonable to think that there would be a major need of contact centre operators during traffic peak periods that are limited and foreseeable in the time.

Another significant job profile needed by toll road service provider is the **R&D job position**. In fact, any toll road service provider would need a relevant number of IT experts in order to:

- improve the existing IT systems;
- analyse and solve problems, related to IT;
- optimize the ETS technical management;

All the previous considerations allow one to think that not only the social impact on toll collectors could be absorbed, but even that under certain conditions and provided that toll chargers will engage themselves on these issue, the social framework of the ETS industry could benefit from the Directive implementation.

Impact on OBU producers

The second group of stakeholders that would be affected by the Directive implementation is represented by the OBU producers. The OBU production will change in accordance with the recommendations included in the Directive. In fact, the production scale increase could encourage producers to outsource OBU production, or some not critical activities of the production process. The interviews with OBU producers showed that production is suitable to be turned into outsourcing and it can even be internationally delocalised, to exploit the reduced cost of overseas countries. This could certainly negatively affect the labour market in this segment of the ETS industry.

Other effects on employment in the OBU producers market segment refer to a possible increase in the number of people dedicated to R&D and marketing and sales functions, in order to improve OBU functions and performance and especially their success on the market.

In both cases it is not possible to provide an accurate estimation of the magnitude of the outsourcing in OBU production as well as the volume of needed R&D and marketing and sales employees.

Impact on Transportation Companies

Another stakeholder group directly affected by the Directive is represented by transportation companies. This stakeholder group could benefit from the side impact generated by the Directive's implementation reducing staff dedicated to the administrative and accounting activity aimed at settling reports, invoices and statements issued by ETS providers. In fact, having the chance to receive complete reports and statements from an European ETS provider the transportation companies (basically the logistic ones) could reduce personnel dedicated to the management of contracts, invoices and statements issued by regional ETS provider. During the interviews, it emerged that each transport company has at least one employee full time dedicated to this activity, with peaks of 4/5 people. Available data about the number of transportation companies in the EU countries (the 25 Members States, not including Greece and Poland)[9]shows that there are 436,000 firms operating in the road freight transport and 230,000 in the road passenger transport. To estimate the potential magnitude of the phenomenon previously described on the employment of transportation companies it would be necessary to combine data about the number of transportation companies active in Europe with the estimations made about the number of vehicles involved in cross border transportation, vehicles estimated in about 900.000 units. Considering an average of one employee for each company or consortium dedicated to the management of administrative issues (reporting, bank settlements and invoicing management) related to transport execution it will be easy to have an idea of the potential impact of the Directive on that specific job profile, even if due to the chance to relocate personnel in another organizational position, especially in marketing and sales functions, through specific training, is difficult to precisely estimate.

[9] Source: Eurostat, 2003.

5 Conclusions

The implementation of the Directive 2004/52/CE will generate economic and social impacts on every stakeholder group of the ETS industry. In order to estimate these impacts an analysis process arranged on three main axes has been undertaken:

a) interviews with the ETS stakeholders, in order to gather their perceptions and opinions on the effects that would arise from the Directive's implementation;

b) forecast analysis on the main economic variables influenced by the Directive's implementation;

c) social and economic impact assessment;

The information gathered during the interviewing process and the estimates made allowed to depict a clear picture of the economic and social framework that would result after the Directive's implementation. All the stakeholders of the ETS industry will be affected, in different ways, by the interoperability of ETS system:

- toll chargers (including in that group either motorway concessionaires, or the electronic fee collection operators)
- ETS provider (stakeholder groups representing all firms playing the contract issuer role);
- OBU producers;
- lorry manufacturers;
- transportation companies;
- financial institutions.

Combining the three analysis axes we have identified and assessed the economic and social impact expected by the implementation of the Directive 2004/52/CE, highlighting changes expected in the current industry framework, emphasizing different impacts - in terms of opportunities/treaties for any stakeholder groups – and trying also to depict possible strategic paths for each stakeholder group in order to maximise expected benefits. A summary of the expected effects on any stakeholder category follows.

Toll road service provider

The forecast analyses on ETS usage envisages an increase of ETS subscribers over the next eight years, for both light vehicles and heavy goods. This growth is expected to be higher in those countries where ETS usage has not currently reached yet a "mature" stage, as for example in France and Spain. It is important to emphasize that the expected increase in ETS usage is only partially due to the EC Directive implementation; by contrast it is basically fed by a consolidated trend generated at national level. According to the interviews with toll chargers, the increase in the ETS usage would produce both positive and negative effects on their business. The positive expected effects mainly consist of: the enhancement of the toll stations' performance, the simplification of the OBU procurement (due to the reduced variety of available devices), the expected OBU price fall related to the opportunity to take advantage from the economies of scale of

OBU producers, the enlargement of the ETS users customer base and the upgrading of the offered services.

The negative expected impacts mainly consist of the risk of loss of revenue, due to a potential increase in fraud and risks related to the need of management of cross border transactions, especially in the case of "free flow systems" and in the increase of costs related to commercial activities and to the need to give a fee to ETS providers for their services.

In order to stress the positive impacts and manage difficulties/issues coming from the implementation of the EC Directive, it seems opportune to envisage some possible strategic paths.

Some strategic actions could be undertaken by ASECAP, as representative of the toll chargers, which could coordinate all the affiliated toll chargers to define a common commercial strategy, both in the pricing policy and the user segmentation. This policy shouldn't be intended to homogenise tolls and tariffs across the countries, but could facilitate the adoption of common (or similar) commercial policy concerning the targeted customer base and its segmentation. This could dramatically cut the "commercial cost" spent to design and implement winning commercial strategies, due to the economies of scale that may be exploited. In addition to that, bearing in mind that toll chargers do not normally compete among themselves (they operate as natural monopoly regime in the respective countries), the adoption of this policy will enhance the effectiveness of their marketing and sales functions, giving them also the chance to use the spared resources to improve service quality.

Also the European Commission is assuming some strategic actions aimed at increasing benefits for the entire ETS industry, through specific intervention aimed at supporting the toll chargers. These actions are basically addressed in two ways: the first intervention promotes the definition of a common framework at European level about regulation on fraud issue (especially in the case of a free flow system). This intervention will clarify the regulatory framework in which toll chargers and ETS provider will operate, favouring the set up of new firms, especially ETS providers, to manage the ETS business and indirectly promoting the increase of the level of service provided through competition among the ETS providers.

The second strategic intervention that could be implemented by the European Commission is merely communicative and concerns the raise of the awareness of motorway users in using ETS systems instead of cash, using its institutional role and its access to media.

The deployment of the aforementioned actions could bring the European Commission a side-effect that could be even more important than the effects related to the implementation of the EC Directive 52/2004. This side effect is the exploitation of Electronic Tolling Services as drivers for the deployment of ITS application, especially those based on a satellite technology (namely those based on the future GALILEO platform), that could take advantage of a customer base already experienced in using services and products based on satellite technology.

A major impact coming from the implementation of the EC Directive refers to toll collectors. The forecast analysis showed that the growth of ETS users over the next eight years will reduce the percentage of workers in charge of manual collection, due to the gradual substitution of manual toll lanes with ETS lanes. In the previous chapter many

instruments to face with the potential redundancy (both "real" or "figurative" ones) of toll collectors have been envisaged:

- management of the status of collectors close to the retirement age limit;
- management of the status of collectors hired under a fixed and temporary term contract or as part time workers;
- workers' turn over management;
- relocation of collectors in other job positions;

In addition to these tools, there are different job profiles that would arise form the implementation of the EC Directive and the related upgrade of the ETS systems:

- data managers;
- contact centre operators;
- R&D employees.

Some of these job profiles could be covered by collectors conveniently trained. These actions, suitably supported by the ASECAP, combined with the previously mentioned tools could avoid any issue about employment in the toll road service provider. Even if it is mandatory to state again that the mere implementation of the Directive 2004/52/CE will cause only insignificant effects regarding collectors' employment.

ETS service providers

The implementation of the Directive will positively impact this stakeholder category. First of all because the Directive will create the condition for the affirmation of this firm's typology defining the conditions for the implementation of a cross border service. The success of ETS services will enable ETS providers to explore the chance to provide to road user ancillary services to the ETS one. Some examples of ancillary services bundled to the ETS contract (the list is merely exemplificative and not exhaustive) are: fuel payment service or street parking payment, freight and fleet management; emergency calls, VAT reimbursement management….

To exploit the aforementioned business opportunities the ETS providers should develop a strategy aimed at understanding business requirements of stakeholder of ETS provision chain, concentrating their efforts on the "after sales service" function to develop a competitive advantage based on the capability to differentiate their services.

The awareness of customer needs should allow ETS providers to develop strategic partnerships with toll chargers and financial institutions in order to design new services tailored to the behaviour of road users, exploiting data and knowledge acquired via ETS transactions occurred. For example, an analysis of travel behaviour of a road user could allow either the provision to the toll road service provider of data and info that could be exploited for traffic management purposes (e.g. to forecast travel time, traffic flow trend or to increase road safety providing the right information at the right place at the right moment to prevent or manage any traffic disruption of the motorway network) but also to provide road users traveller information services (ranging from tailored traffic info to emergency call) or other ancillary services to improve their travel.

The implementation of this strategic intent should involve also OBU producers and ITS service providers in order to funnel all travel related service into one single platform if not into one single contract. Pursuing this strategy ETS providers should also improve

their workforce, either in the quantitative point of view, but especially in the qualitative one, because they will need skilled job profiles to manage and analyse data produced (mainly job profile experts in data warehousing and data mining), but also marketing and sales job profiles, to design, promote and market new services; legal expert to manage all items related to the privacy of data gathered and commercially exploited.

OBU producers

The implementation of the EC Directive will impact the OBU industry according to two main leverages: the forecasted increase of the ETS users, the technology shift.

The first element will positively impact the OBU producers industry segment. In fact, if more users need an OBU device, there would be an increase in the revenues of this industry segment. By contrast, the second element will have a positive impact on the market segment, but could have a different impact on operators, stressing the competitive pressure on those producers currently not well positioned on the market to exploit changes promoted by the Directive. In fact, the Directive strictly recommends as technology to be used for the interoperable ETS system one of the following: satellite positioning, mobile communications using the GSM-GPRS standard, 5.8 GHz microwave technology (DSRC).

Each operator has adopted/developed over the years a different technology, as clear from the table in the annex 3. It has been foreseen that in the next years, the DSRC technology will be gradually replaced by the combination mobile/satellite based technology, thus advantaging such manufacturers that have already focused their efforts on that technology.

So the expected scenario for the OBU producers market segment is an increase of the market, but only a few competitors will take advantage of that, this will lead to a concentration process (featured either by merger and acquisition operations or by the failure of some market players). The expected concentration phenomenon, together with outsourcing/offshoring production trends could impact negatively employment in the OBU production industry segment. The framework changes promoted by the implementation of the EC Directive would also cause the need for the OBU producers to hire new job profiles, either in the R&D area or the marketing and sales area, to support the growth and repositioning process of the firms.

The outcome of the previously briefly described process cannot be well forecasted, either in the magnitude or the direction, due to some lack currently affecting the OBU production scenario about the standard to be adopted in producing the new interoperable OBUs. To face this issue, that is paralysing the OBU producers and also the lorry manufacturers that account for a big share in the market through the first equipment segment, it is possible to envisage two different intervention's, that could even be coordinated.

On one side it is possible to foresee an action of the European Commission to set up and rule an Agency aimed at ruling the validation process of the interoperability features of the produced OBU. The implementation of such an Agency could also allow the EC to pursue the side of Galileo success, through the definition of technical requirements able to promote fair competition in the OBU producer industry segment (avoid any direct interference with firm decision about plants localisation), taking also into accounts the

needs of urban areas - that could use OBUs as a tool of the congestion management strategy.

On the other hand the OBU manufacturers may join in setting up a unique European Association aimed at coordinating their activity. A similar solution has been experienced in the car industry (with ACEA) and in the hauliers industry (with the IRU). Moreover, such association, in coordination with the European Commission, may speed up the process of setting up technical standards, avoiding preference to only a small group of producers, that first moved toward the adoption of the imposing technology. Another advantage linked to the set up of industry association refer to the chance to improve the management of the relationship with the lorry producers, developing win-win strategy in the design and deployment of new OBUs, eventually embedded in the cockpit, both lorry producers and OBU producers .

Lorry manufacturers

An interoperable ETS system, which allows the transport companies to have one single OBU (and one single contract) for each vehicle, will certainly positively affect lorry manufacturers, that could simplify the design and the implementation of new cockpits.

Obviously the Directive will not impact the revenues of the lorry producers, even if it could produce some issues in the design and production step. In fact, it is mandatory to remark that only a tight strategic cooperation between lorry manufactures and OBUs producers – eventually supported by an EU agency operating on ETS - could avoid any conflict between the ETS platform and the automotive one, meeting all requirements needed to allow the efficiency of ETS application increasing/promoting at the same time the road safety (on the vehicle side) via a effective support to the driver.

Transport companies

The implementation of the Directive will certainly positively impact transportation companies (either those focused on people transportation, or those focused on freight), due to the impact on the cost side of the firm. In effect, the implementation of the Directive is particularly welcomed by freight transportation companies that, over the more evident savings relate to the installation of one OBU managed through a single contract, instead of more OBU managed through multiple contracts, foreseeing a saving for personnel costs engaged in the administrative and operational activities aimed at managing invoices, statements and any other documents issued by ETS provider. In fact, the chance to receive complete invoices and statements where all needed business and administrative information are arranged will enable the transportation companies to eventually relocate human resources to more value added activities (e.g. commercial ones). It is even relevant to note that some freight companies perceive the implementation of the Directive as a sort of “threat” to their business, because it could limit their chance to choose a route taking advantage of a spread among different toll tariffs for different motorway trunks.

An interviewed freight company has stressed that currently, combining the the time needed to move freight with different tolling level currently deployed in the European countries, is able to gain an extra profit exploiting the different road tariffs used in the European countries.

For that specific segment of the ETS industry it could result extremely important to launch some intervention from the European Commission side, to support training activities and the re-qualification of transportation companies personnel currently focused on administrative activities

Financial Institutions

The financial institutions, intended as the banking sector in an extended point of view, will certainly take advantage of Directive implementation. In fact the increase of ETS users customer base will generate more business for them, due to the need to manage electronic transactions. This "extra" business will not generate any extra requirements of new personnel in the bank industry, even if banks will be directly involved in the distribution of the OBUs to road users.

An area in which the financial institutions could generate some issues to be managed at cross border level is represented by the management of fees for financial services provided. In that case, especially if financial institutions are also playing the ETS provider role an intervention of the European Commission is more than welcomed to avoid any potential distortion of fair competition among regional markets in which a financial institutions play either its typical role or the ETS provider one.

6 Annexes

Annex 1: Tariffs description

Country	Tariffs regulation	Tariffs calculation
DK	The calculation of toll tariffs is determined by the Ministry of Transport and Energy after having consulted the concessionaires. The concessionaire company is not allowed to apply variable pricing schemes, but it is allowed to set up subscription schema for commuters.	Toll tariffs are determined in accordance with this principle: the construction costs should be repaid within a time frame of 25-35 years.
DE	The Motorway Toll Act authorises the German government to set the amount of the toll by regulation.	The road toll is calculated based on the toll route travelled and the number of axles on the vehicle, as well as on the pollution class of the vehicle or vehicle combination.
GR	Drivers pay the toll fare at the entrance of the motorway. The toll is defined by the Government through the concession act. Concessionaires are allowed to apply variable schema, keeping to the limits set by the Government.	Flat fee calculated on the basis of 4 vehicle classes (motorbikes, cars, small medium HGV (≤ 3 axels), large HGV (≥ 4 axels).
ES	The calculation of toll tariffs is fixed in the concession act. Concessionaire companies are allowed to apply variable pricing schemes depending on the time of day and on the means of payment (for example, discounts for those using ETC).	There is no specific calculation formula. The criteria used for the calculation of toll tariffs are financial cost, amount of investments, operating costs, duration of the concession, environmental costs and return on investments.
FR	The kilometre rate takes into account the amount of investments, the depreciations, the structure of the motorway, the traffic volume forecast, the operating and financial costs. To determine the initial toll rate, calculations are done in order to recover complete costs, to balance the whole concession, insuring the complete or partial covering of the expenses sustained to build, develop and maintain the motorway network. This purpose is served by applying class coefficients that produce a Km rate for each vehicle class. The class coefficient, specific for each concessionary company, is fixed in the concession contract of each company.	These criteria are employed to define the class of a vehicle: 1. the overall height of the vehicle; 2. the total gross weight permitted; 3. the number of vehicle axles . These criteria highlight 5 classes of vehicles. To set the initial tariff the network is divided into sections. On each section an average Km rate is applied for the 1st class vehicles (height ≤ 2 met.). This tariff changes according to the different vehicle classes, the statistical evolution of the general level of prices (without tobacco). It is also possible to apply a special increase in case of high construction and operative expenses.
IT	The concession contract, which rules and disciplines the concession, establishes an average toll tariff for each motorway stretch, which varies according to vehicle type, and is applied per kilometre travelled. Tariff changes are regulated by the national road agency and the government together with the state through the application of the so-called price cap formula.	The price cap formula is the calculation toll formula. The formula is: • T • • p - X + • * • q where: • • T represents the tariff variation considered; • • p represents the planned rate of inflation; • X represents the expected rate of productivity to be specifically established for each company, bearing in mind the assessments concerning the following aspects: - suitable remuneration of capital invested;

		- future investment products; - expected changes in productivity; - expected variations in demand and therefore development of the competitive conditions in markets in which the company operates; • • q represents the percentage variation of a complex indicator of the quality of the service; • • is a positive coefficient.
AT	The Federal Ministry of Transport is in charge of setting tariffs. ASFINAG is not allowed to apply variable pricing schemes or to set up subscription schema.	The criteria taken into account for the calculation of toll tariffs are financial costs, investment costs, operating costs and environmental costs.
PT	The determination of toll tariffs in the Portuguese concessions is fixed by the decree-law and tolls are calculated according to a specific formula. The concession company is allowed to apply variable pricing schemes depending on the time scale and it is allowed to set up HGV subscription formula.	The toll for a specific section is obtained by multiplying the tariff by the length.
SI	The calculation of toll tariffs is fixed by "law on public roads and Decree on toll roads and tolls" for the use of toll roads. The concessionaire company is not allowed to apply variable pricing schemes and set up subscription formulas.	There is no specific formula used for the calculation of toll rates. The criteria taken into account are capital costs (calculated on the basis of internationally comparative interest rates like the rate of the capital invested in the toll road construction), average reconstruction costs, routine maintenance costs and toll road operations costs.
NO	Tolls are fixed and calculated by the Norwegian Public Roads Administration, after having received points of view from relevant local administrations. Concessionaire companies are allowed to imply variable pricing schemes depending on the time scale if they get the authorisation from the Norwegian Public Roads Administration.	There are no formulas/models for the basic calculation. Toll tariffs are fixed based on the amount needed to cover project costs, foreseen traffic, and fixed down payment period (usually 15 years).
BE	The concessionaire company is free to set provided tariffs, moreover it is allowed to apply variable pricing schemes.	The concessionaire company is free to set tariffs. Therefore, the only constraint on the tariff calculation is the price elasticity of traffic demand.
NL	The calculation of the toll tariffs is fixed by the concessionaires. The concessionaire is not allowed to apply variable pricing schemes or set up subscription formulas.	The criteria used for the calculation of the toll tariffs are traffic volume forecast and return on investments.
UK	Toll tariffs are determined by the concessionaire alone. The concessionaire is free to set tolls. The concessionaire is allowed to autonomously employ variable pricing schemes depending on the route chosen, on the time of day and on the type of vehicle.	The criteria used for the calculation of the toll are based on extensive market research and customer feedback.

Source: Toll Tariff Calculation among ASECAP members, ASECAP 2006.

Annex 2: VAT Rates and Fiscal tool by country

Country	TAX regulation	VAT reclaimable by transport passenger companies
DK	21% of VAT is included in toll rates. The other fiscal and fiscal related burdens deal with the accounts of private companies (taxes).	Yes
DE	The toll is subject to VAT, the rate is 19%	No
GR	18% of VAT is applied on toll rates	No
ES	16% of VAT is applied on toll rates. There are no other fiscal related burdens.	No
FR	The toll is subject to VAT, the rate is 19.6%. There are no other fiscal or fiscal related burdens applied.	Yes
IT	The toll includes charges due to contributions to the Central Guarantee Fund and VAT (20%).	Yes
AT	The toll is subject to VAT, the rate is 20%. There are no other fiscal or fiscal related burdens applied.	No
PT	The toll is subject to VAT, at the rate of 21%.	Yes
SI	20% of VAT is applied on toll rates. There are no other fiscal related burdens.	No
NO	Tolls are not subject to VAT. There are no other fiscal related burdens.	No
BE	21% of VAT is included in the toll rates and the toll may increase (manual toll). The other fiscal/para fiscal burdens deal with the accounts of private companies (taxes).	No
NL	19% of VAT is applied on the toll rate. There are no other fiscal or fiscal related burdens.	No
UK	VAT is applied and included in toll tariffs at 17.5%. There are no other fiscal related burdens.	Yes

Source: Toll Tariff Calculation among ASECAP members, ASECAP 2006 ; direct interviews

Annex 3: Overview of the ETS "current" situation

Country	Motorways Network	ETS system features
FR	8.295 km	The ETS system for light vehicles and motorcycle (class 1, 2 and 5) has been operational since 2000 at all tolling stations and is based on the DSRC compliant to CEN standards (5.8 GHz). The tolling stations are equipped with a mixed system consisting of: Manual lanes, Self-service lanes (cards only or cards+ cash), Class 4 lanes - for very heavy vehicles only (cards), Electronic lanes (Liber T) and mixed lanes (LiberT + manual). The lane is able to automatically define or measure the vehicle class (according to the number of axles and the total height). The ETS system will be extended to all vehicles in 2006. Accepted payment means for fees are Cash, the main Credit and Petrol Cards, the Caplis card (Company card with discount), Subscriptions and the LiberT OBU (Post-paid OBU linked to subscriptions).
ES	2.842 km	Since 2004, the Spanish interoperable ETS system involves some different types of organisations in the EC business activities. The tariffs vary according to vehicle classifications. There are three classes: light vehicles, HGV I, HGV II. The classification parameters are the number of axles and dual tires. • Light Vehicles: Motorcycles (with or without sidecar), passenger cars, vans with two single-wheel axles, minibuses with two single-wheel axles, passenger cars, vans and minibuses with trailer of single-wheel axle. • HGV I: Vans of two dual tired axles, double and triple axle trucks and coaches, double-axle trucks and coaches with single axle trailer, triple-axle trucks and coaches, passenger cars, vans, trucks and minibuses (double-axle and four wheels) with trailer of a single axle with dual tires. • HGV II: Trucks and coaches of four or more axles (with or without trailer), passenger cars, vans, trucks and minibuses (double axle and four wheels) with trailer of two or more axles and at least one with dual tires. Tariffs are defined and applied independently on the different vehicle classes with a ratio from 4 to 5 between light vehicles and HGV. Concessionaire companies are allowed to apply variable pricing schemes depending on the time of day and on the means of payment (discount for ETS payment)
IT	5.637 km	In 1990, an electronic fee collection service was introduced by Autostrade for all categories of vehicles in addition to the manual system. The Telepass ETS system is compliant to the Italian DSRC standard UNI-10607.Today the toll stations can offer facilities for Manual lanes, Self-service "Blue" lanes (Automatic Cash Machine, VIACARD, FASTPAY, Credit cards, Debit cards), Electronic "Yellow" lanes (TELEPASS), mixed "Yellow + Blue" lanes "Bi-modal lanes" (TELEPASS + Self service). The tolling classification scheme is the same for each payment mode and the characteristics of the vehicles are measured with the same logic when the vehicle is in the lane. Therefore, each lane has the devices to classify vehicles according to the number of axles and height Accepted payment means for the ETS service are: Credit Card or Direct debit, with user's bank guarantee for TELEPASS Family; Credit Card or Direct debit, with user's bank guarantee or with a deposit given to Autostrade, for the VIACARDs. Telepass Business may be subsequently requested by the cardholders of VIACARDS.

Country	Motorways Network	ETS system features
PT	1.401 km	Since 1995, Portugal has developed a single ETS national system. The system is managed by one company, Via Verde, under a contract established with each of the concessionaires. Via Verde plays all the roles aimed at managing the ETS activities, with the exception of debiting and crediting accounts (managed by SIBS – Sociedade Interbancaria de Servicos). The tariffs vary accordingly to vehicle classifications. There are 4 different classes of vehicles depending on the height of the first axle and the total number of axles. The tariffs applied are obtained by multiplying fixed coefficients to the light vehicle tariff. The ratio from light vehicles to HGV ranges from 1 to 2.5: • Class 1: Motorcycles and vehicles measuring less than 1.1 metres (measured vertically from the first axle, with or without trailer); • Class 2: Vehicles with 2 axles measuring 1.1 metres or more (measured vertically from the first axle); • Class 3: Vehicles with 3 axles measuring 1.1 metres or more (measured vertically from the first axle); • Class 4: Vehicles with more than 3 axles measuring 1.1 metres or more(measured vertically from the first axle). Ecological classes do not exist. The concession company can apply variable pricing schemes depending on the time scale as well as set up HGV subscription formulas.
GR	916 km	Since 2002, ATTIKI ODOS motorways have experienced the ETS application named ePass. As far as Tollgate Charges are concerned, Toll fares depend on vehicle categories which are determined on the basis of the height of the vehicles and the number of axes. The tariffs vary according to the three main classes of vehicles: • Light vehicles (class 1) • Vehicles with 2 or 3 Axles • Heavy Vehicles with 4 or more axles The concessionaires can apply discounts based on the quantity (number of transits) but they have to comply with the concession rules stated by the government.
NO	787 km	Since 1999: Autopass national system represents a collection of local schemes: 24 companies (concessionaires) and about 8/9 ETS operators. Toll tariffs are the same for the entire conceded section. The tariffs vary according to the three classes of vehicles: • Light vehicle, up to 3.5 tons • Heavy vehicle, more than 3.5 tons • Some projects - ferry replacing projects have an additional category for heavy vehicles longer than 12.4 metres. There is usually a ratio from 1 to 2 between light vehicles and HGV. Concessionaires are allowed to imply variable pricing schemes depending on the time scale if they obtain the authorization of the Norwegian Public Roads Administration. Subscription formulas with discount are available at toll companies, for all types of vehicles. The discount given is fixed by the Norwegian Public Roads Administration for each toll company according to national rules. Electric cars, buses and vehicles used for working on the toll road are free of charge.

Annex 4: Number of ETS subscribers

Country	2001	2002	2003	2004	2005	CAGR 2001-2005
Italy	2.632.000	3.270.000	3.873.000	4.355.000	4.865.000	17%
Portugal	1.200.000	1.400.000	1.600.000	1.700.000	1.866.634	12%
France	331.500	651.400	935.000	1.156.143	1.450.205	45%
Spain*				320.000	518.445	62%

Source: Asecap statistics, 2001-2005.

*For Spain CAGR is calculated over the 2003-2005 period.

ANNEX 5 -

G~~LOSSARY~~lossary

Autonomous systems	Toll systems using on-board sensors to detect road toll usage
CN	Cellular network
Customer, client, Service user	Person or company who subscribes to a contract with the EETS provider to use the EETS service
Driver	Driver of the vehicle, not necessarily owner of the vehicle and client of the EETS service
DSRC systems	Toll systems using DSRC as main technology for toll road usage detection and communication
EETS	European Electronic Tolling Service; a service enabling users having only one contract and one set of OBE to use a vehicle in all toll domains under the operation of Directive 2004/52
EETS Provider	Company who is performing the EETS provision role (or function)
EETS Provision	EETS Provision means providing equipment (OBE), contracts and payment means to those who want to use the EETS. EETS Provision includes claiming money from users and guaranteed payment for genuine claims received from the Toll Charging Role.
EEETS Management Body	Defined by Article 3 and annex 2 of the present decision
EETS Member	Any organization, Toll Charger, EETS provider or Customer representative participating in the EETS operation
EFC	Electronic Fee Collection
EOBU	Onboard unit for the EETS
GNSS	Global Navigation Satellite System
HGV	Heavy Goods Vehicles
OBE	On-board equipment
OBU	On-board unit
Service Usage	Service Usage means taking advantage of the EETS for payment of tolls in the toll domains of the Toll Charging

	Role.
Toll	A charge, a tax, or a duty in connection with using a vehicle within a toll domain
Toll Charger	Administration or company performing the Toll Charging role (or function)
Toll Charging	Toll Charging means providing a transport service (often road usage) to a Service User and charge the latter a fee for this (the "toll"). The responsibility for levying toll in a toll domain is part of the Role and results in claiming payment from a third party within the EETS Provision Role.
Toll domain	An area or part of a road network where a toll regime is applied
Toll regime	The set of rules, including enforcement rules, governing the collection of toll in a toll domain
Toll scheme	Generic term used for toll regime and/or toll domain and/or toll system
Toll system	The off board equipment and possible other provisions used by a Toll Charger for the collection of toll for vehicles
Tolling application	An application functionally defined by the autonomous Toll Chargers to get the needed data from the EETS Provider in order to claim the toll due.