EVALUATION OF THE INTRODUCTION OF ELECTRIC VEHICLES IN SEVERAL EUROPEAN CITIES

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Abstract :In the framework of the European Commission's JOULEII programme, a throrough study of the opportunities for electric and hybrid vehicle introduction in a number of European cities has been performed. In urban traffic, due to their beneficial effect on environment, electric vehicles are an important factor for the improvement of traffic an more particularly for a healthier living environment.
The cities and towns involved have been chosen through a three-stage selection process, taking into account the commitment of each city on one hand and the choice of a "palette" of cities with different characteristics on the other hand.

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Objectives

The objectives of this common VUB-CITELEC-AVERE study, performed in the framework of the Commission's JOULE II programme (DG XII) were twofold: firstly, collect experience from a large number of cities with a view to bringing related know-how to urban authorities and inviting them to take similar initiatives; secondly, the preparation of a large-scale demonstration project.
Cost and barriers of the implementation of new public and private transport systems being high, the proposed action has developed the methodology to evaluate and then to assess a whole range of new electric technologies and related developments in connection with their implementation in different types of cities.

The study has also dealt with the principal measures taken in the screened cities aimed at reducing in the short or medium term the volume of conventional car traffic and at introducing non-polluting vehicles such as electric cars. Measures to be evaluated were notably parking policy, slowing down traffic, limitation of access to city centres, ad technical and economical incentives for the introduction of clean vehicles (both on individual and fleet levels).

The reduction of traffic demand and attenuation of mobility by means of urban planning has also been considered in the light of the new technology. In the same light it has been studied whether it is possible, to reduce, to a certain limit, the number and distance of trips and the choice of transport means by zoning, locating activities and other measures related to urban planning practice. The feasibility of providing zones reserved to clean vehicles was part of the topics analysed.
Belonged also to the scope of this study the description of which kind of solutions have been, are or will be developed to better one of the primary missions of a city: to keep itself "liveable" for its inhabitants and its visitors, preserving its environment and its heritage.

The study is to be considered as an attempt to describe one of the elements of an up-to-date management of historical cities. The cities are however quite different among eachother and show different characteristics: we can for example distinguish small, self-contained towns and big metropolis, old mediaeval centres and modern conurbations, seaside harbour cities and mountain resorts.
It is a necessity to consider the mobility problems in each particular city as a whole in which electric and hybrid vehicles have a part to play; the study was looking for actions aiming to determine the conditions for the introduction of electric vehicles in city centres, including the impact on the city's infrastructures: charging stations, parking lots, electricity distribution. Special attention has been paid to the determination of the obstacles the introduction of electric and hybrid vehicles is facing: population, acceptance, rules, organisation of city transportation...

The more detailed objectives of this project were:

- to describe different measures, which can reduce the consumption of possible energy for transport, especially through utilisation of new electric technology;
- to describe different measures, which can reduce the overall energy consumption from the transport systems, by using more rational technology - by physical transport planning measures - and by this contribute to the improvement of the environmental situation in town;
- to describe comprehensive transport models for the selected town based on a co-ordination between the different types of transport systems that can be considered for each of these towns;
- to prepare the implementation of the result from the planning studies, e.g. by preparation of demonstration projects;
- to disseminate the results frm this project through the reports from the project by the attached group of towns following the project.

Summarising, the objective of this project was to contribute to more knowledge about the interaction mobility-energy-environment by description of different measures and mainly of the contribution of electric vehicles, specially for towns by describing two levels of models, a general one for a big number of cities and a more detailed one for a smaller sample, with the final scope to prepare large scale demonstration programmes.

In view of the importance of this project for the definition of a European EV strategy and for the identification of RTD topics in the field of the urban electric vehicle, in particular in relation to fleets and infrastructure, the management of the project has been guided by a steering committee consisting of the project partners and of Commission represenatatives.

Project phasing

It was proposed to develop the study in three steps. First a preparatory phase should bring an extended information on the full group of cities involved concerning the needs and the interests identifying efforts already undertaken and short, medium and long term planning.
The second phase was the selection of the cities to be visited in order to report on their mobility planning activities and the role of electric vehicles in it.
The third phase consisted in a selection of cities out of the second phase group giving them some financial support to write a report on their view about the introduction of electric and hybrid vehicles.

First phase

The first phase of the project aimed to draw the characteristics of a number of European cities and to "portrait" these cities concerning their activities in the field of mobility, environment and present or future electric vehicle programmes.

The choice of the cities depended on the following criteria:

- at least all cities with more than 100000 inhabitants were included
- some smaller cities with known electric vehicle activities were added
- a balanced share between EU countries was sought
- the initial group was extended to the new member countries (Austria, Finland, Sweden) and also Norway and Switzerland.

Table I shows an overview of the number of cities in each country and the number of cities which actually answered the questionnaire.

Country	**# Cities**	**# Answers**
Austria	5	3
Belgium	27	10
Denmark	4	3
Finland	6	1
France	54	24
Germany	84	50
Greece	16	5
Ireland	5	1
Italy	49	14
Luxemburg	1	1
Norway	4	1
Portugal	4	1
Spain	55	8
Sweden	5	2
Switzerland	5	4
The Netherlands	22	12
United Kingdom	88	16
Total	434	156

Table I: “First phase”

Second phase

Based on the results of the first phase inquiry, a number of cities have been chosen for which the description, to be considered as an extended illustration of the questions put in the questionnaire, has been performed. To this effect, a CITELEC expert has visited these cities, in order to discuss the follwing topics:

- organisation of transport and traffic in the city;
- organisation of the distribution of electrical energy and opportunities for electric vehicle charging infrastructure;
- environmental problems;
- parking policy;
- description of the general characteristics of the city and its area.

The list of cities selected for the second phase is given in Table II.

Graz	AT	Kallithea	GR
Linz	AT	Larissa	GR
Wien	AT	Thessaloniki	GR
Brugge	BE	Volos	GR
Brussels Capital Region	BE	Cork	IR
Namur	BE	Alessandria	IT
Lausanne	CH	Brescia	IT
Mendrisio	CH	Forli'	IT
Zürich	CH	Livorno	IT
Berlin	DE	Milano	IT
Bottrop	DE	Modena	IT
Dortmund	DE	Padova	IT
Düsseldorf	DE	Torino	IT
Erlangen	DE	Trento	IT
Essen	DE	Luxembourg	LU
Hamburg	DE	Amsterdam	NL
Hannover	DE	Delft	NL
München	DE	Groningen	NL
Regensburg	DE	Maastricht	NL
Saarbrücken	DE	Rotterdam	NL
Aalborg	DK	Utrecht	NL
Kobenhavn	DK	Stavanger	NO
Granada	ES	Funchal	PT
Sabadell	ES	Göteborg	SE
Vitoria-Gasteiz	ES	Stockholm	SE
Dijon	FR	Bradford	UK
Grenoble	FR	Bristol	UK
La Rochelle	FR	Cardiff	UK
Lyon	FR	Croydon	UK
Nantes	FR	Glasgow	UK
Paris	FR	Ipswich	UK
Strasbourg	FR	Leicester	UK
Tours	FR	Peterborough	UK
Athens	GR	Westminster	UK

Table II: “Second phase cities”

Third phase

The reports written during the second phase have led to the establishment of a comparative table which has helped the steering committee to perform the choice of a final group of cities to which a grant has been proposed in order to write a report on the city traffic planning activities including the introduction of electric and hybrid vehicles.
The choice has been based on the following criteria:

- commitment of the local authority towards electric vehicles and towards environmental affairs
- current or planned electric vehicle projects for municipal vehicles
- current or planned electric vehicle projects for public transport
- current or planned electric vehicle projects for goods transport
- balanced spread over the different countries of the European Union

Out of these reports, it is now possible to present a first overview of existing or projected activities in this last group of cities. This is presented in Table III.

City	Municipal vehicle	Private cars	Rent-a-car	Buses	Special vehicles	Goods distribution	Two-wheelers
AALBORG	•			•		•	
AMSTERDAM			•		•	•	
ATHENE				•			
BRUGGE	•					•	
BRUSSELS C.R.	•		•	•		•	
ERLANGEN	•				•	•	
ESSEN	•	•					
GLASGOW	•			•			
GOTEBORG	•	•				•	
GRANADA				•			
GRAZ	•					•	
GRENOBLE	•	•	•				
HELSINKI	•	•					
IPSWICH	•			•	•		
LA ROCHELLE	•	•	•	•	•	•	•
LEICESTER				•		•	•
LYON	•						
MENDRISIO	•	•					
MILANO	•					•	
ROTTERDAM	•			•		•	
STAVANGER	•			•		•	
STOCKHOLM	•			•		•	
STRASBOURG	•		•				
TORINO	•		•	•		•	•
TRENTO				•			

Table III: “Phase III cities”

Conclusion

The JOULE II study presented in this paper allows the Commission to have a broad view on the way the cities are organising their future mobility and on the impact of electric and hybrid vehicles on it.
It also gives a clear view on how big the necessity is to undertake intensive information campaigns in a big number of cities, as well as demonstrations, in view to create the awareness of the usefulness of electric and hybrid vehicles in helping to solve mobility problems.
Furthermore, the cities have an important role to play in the definition of the contents of the ACTION PLAN of the TASK FORCE “CAR FOR TOMORROW”. The JOULE II study can be considered one of the infomation sources here too.