

Action Plan for promoting electromobility in Region of Attica

Foteini Orfanou¹, Panagiotis Papantoniou¹, Eleni Vlahogianni¹, George Yannis¹

¹ National Technical University of Athens, School of Civil Engineering, 15773, Athens, GR
forfanou;ppapant;elenivl;geyannis@central.ntua.gr

Abstract

Electromobility is a very promising sustainable technology for reducing emissions and energy consumption in the transportation sector. During the last year, electric vehicles are gaining increased attention in Greece and various incentives and actions favor their use and purchase. The aim of this work is to present a complete Action Plan developed for the Region of Attica, the largest region in Greece, for promoting electromobility through the implementation of concrete and targeted actions, based on the results of the region's current situation analysis. The actions classified in three primary axes, infrastructure, equipment and promotion, include campaigns organization, installation of charging infrastructure in strategic locations and substitution of part of the regional vehicle fleet with electric ones. The Action plan presented in this work gives a complete framework of the steps that should be followed from the analysis of the current situation to the formulation and implementation of the actions and can be used as in inspiration and a guide for other regions interested in electromobility field.

Keywords: *electromobility, gap analysis, swot analysis, action plan, Attica region.*

1. Introduction

The energy consumption and emissions production are exponentially increasing worldwide. Based on European Union (europa.eu) data, the transportation sector has the highest share in energy consumption (33,1% in 2016) and constitutes the second contributing factor in CO₂ emissions (28,5% in 2016). Specifically, the road transportation field is responsible for most CO₂ emissions (72,9% in 2016). In a national level, statistic data for Greece show the same trend as the share of the transportation sector in CO₂ emissions is 29,5% (the second highest after energy industries sector) and the road transportation contributes most to air pollution with a share of 57,3% (EU, Statistical pocketbook 2018). Concerning the Region of Attica, and more specifically the city of Athens, capital of the Region, the share of CO₂ emissions per sector is: 30,8% food, 29,1% transport, 13,7% goods, 11,3% gross fixed capital formation, 7,1% housing, 4,6% government and 3,4% services (Baabou et al., 2017). The above presented high shares in European, national and regional level, reveal the need for the design and implementation of interventions and actions towards a more sustainable mobility. Within this framework, electromobility and alternative fuels are considered to be key - solutions towards a more environmentally friendly transportation system, having a direct effect on energy saving and emissions reduction.

The diffusion of electromobility and alternative fuels is the main goal of e-MOPOLI (Electro MOBility as driver to support POLicy Instruments for sustainable mobility) project, a European

research project financed by the European Regional Development Fund aiming at the implementation of innovative strategies for reducing the carbon footprint of economic activities in urban and extra-urban areas. A key output of e-MOPOLI project is the development of action plans which will contribute in promoting electromobility and alternative fuels in the region of each project partners. In order to achieve this output, nine regions from eight different European countries will exchange ideas, knowledge and policies already implemented that should be adopted, altered or avoided.

The aim of this work is to present a methodology towards the development of concrete and successful Action Plan as well as the structure for such a document. Additionally, the Action Plan for Region of Attica developed based on this methodology and within the framework of the eMOPOLI project will also be described. Based on the thorough analysis of the current situation in the region concerning electromobility, five actions are developed and included in the Action Plan classified in three primary axes: infrastructure, governance and promotion. The actions are described in terms of their scope, the background led to their formulation, the individual activities that should be carried out, the stakeholders involved, the timeframe, the cost and the funding sources, the economic, environmental, territorial and electromobility impact as well as the action transferability potential. The Action plan presented in this work gives a complete framework of the steps that should be followed from the analysis of the current situation to the formulation and implementation of the actions and can be used as an inspiration for other regions interested in electromobility field based on the high transferability potential of the proposed actions but also as a guide for the development of a concrete and efficient action plan.

2. Methodology

An Action Plan is a document providing detailed information on how lessons learnt and knowledge gained will be transformed into actions and how these actions will be implemented. In order to create a successful and effective Action Plan, significantly contributing to the improvement of the policy instrument addressed, a methodology has been developed and followed in order to formulate targeted and concrete actions based on the region needs and characteristics. The methodology consists of three steps (the fourth step is the implementation of the Action Plan) and is illustrated in Fig. 1.

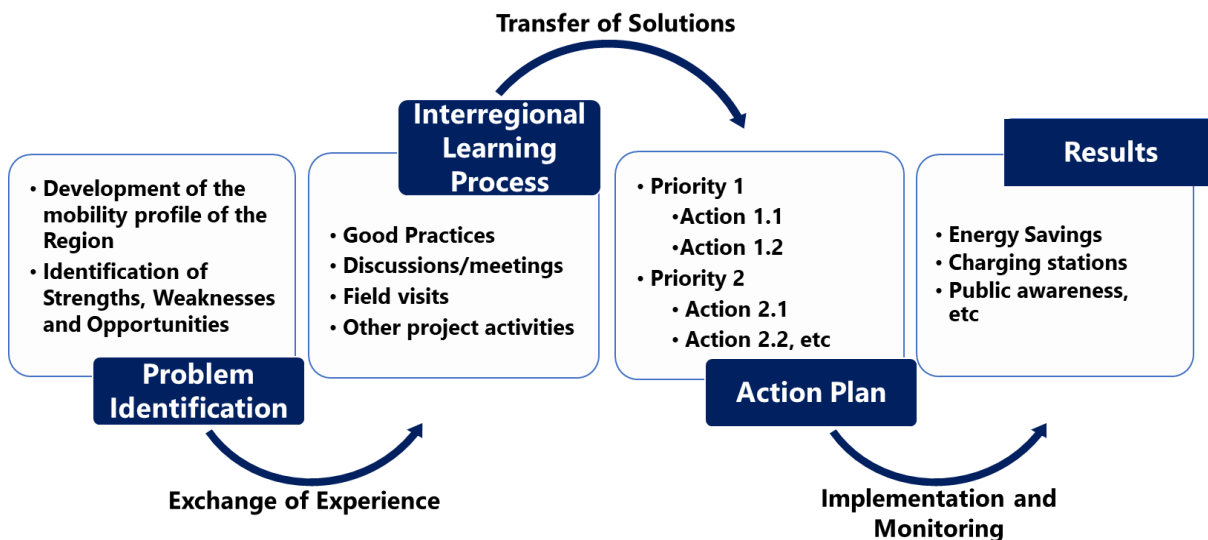


Figure 1: Methodology for the Action Plan formulation .

The first step towards the formulation of an appropriate Action Plan is identifying the problem, detecting the deficiencies, the aspects need to be further improved in order to encourage the diffusion of electric vehicles and aspects that sufficient progress has already been achieved. For this purpose the current situation has been thoroughly analyzed based on three thematic areas: business, governance and Research and Innovation Strategies for Smart Specialization (RIS3). The current situation is evaluated and the potential for further improvement is illustrated while the SWOT Analysis will contribute to defining the strengths and weaknesses of the region in the field of electromobility as well as the opportunities arisen from the promotion of these sustainable technologies and the threats that could hinder this promotion. All these activities will result in formulating a regional profile concerning the field of electromobility and alternative fuels.

The next step, the Interregional Learning Process, is a core factor for the formulation of the action plan. The exchange of good practices among the project partners, the stakeholders and institutions involved in this field, the discussions and meetings, the field visits and the various project activities are the components for the development of actions suitable and necessary for each region based on the current situation and according to its needs and visions. Inspiration from the learning process and not transfer of a good practice is the key-point for developing a successful action plan.

After the identification of good practices and experience sharing among the project partners as well as the consultation with the regional stakeholders' group, each region will formulate, in the third step, an action plan which will contain the necessary actions that should be implemented in order to promote electromobility and the use of alternative fuels. It should be mentioned that all actions should be categorized in respective priority axes. Finally, the fourth step refers to the implementation and monitoring (in phase 2 of the project) of the actions that are defined and included in the action plan.

3. The Action Plan structure

The Action Plan is a document describing the policy instrument addressed and includes concrete, targeted and reasonable actions for improving this policy. The actions are thoroughly presented in terms of their source of inspiration, the objective for their implementation, their impacts, the duration, the different stakeholders involved in the various stages for achieving their successful finalization as well as their costs and the funding sources. The monitoring process indicating the start and end date of each action and some indicative sub activities should also be part of the Action Plan. The structure of the Action Plan is illustrated in Fig. 2 and its individual parts are further described in the next paragraphs.

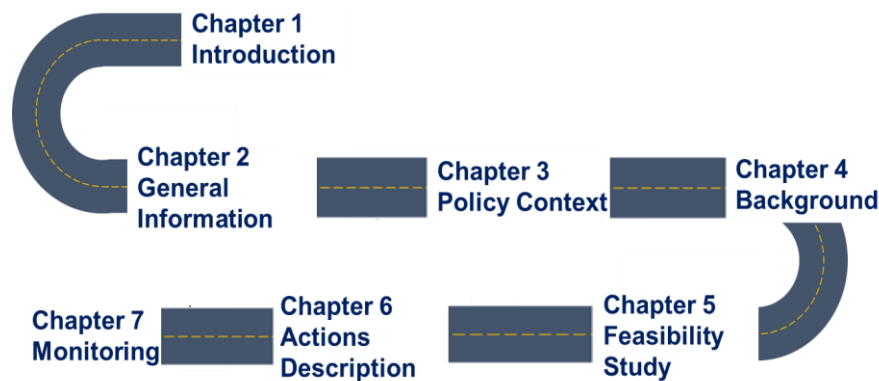


Figure 2: The proposed Action Plan structure

3.1 General Information

This part of the document contains information about the region the action plan refers to. Data concerning the administrative division, its size, the population, its participation in other European projects and other important information should be included here. Additionally, an important part of this section is related to the project parent information and it consists of the following individual points:

- Partner organization: the name of the project region (e.g. Region of Attica)
- Country: the country the region belongs to (e.g. Greece for Region of Attica)
- NUTS2 region: According to the definition of the European Union, “the current NUTS 2016 classification is valid from 1 January 2018 and lists 104 regions at NUTS 1, 281 regions at NUTS 2 and 1348 regions at NUTS 3 level. The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU. The socio-economic analyses of the regions is: NUTS 1: major socio-economic regions, NUTS 2: basic regions for the application of regional policies, NUTS 3: small regions for specific diagnoses” (<https://ec.europa.eu/eurostat/web/nuts/>).

3.2 Policy Context

In this section the policy addressed and should be further improved through the implementation of the defined action is described and the way the action plan will contribute towards this enhancement is presented. Additionally, it should be specified which of the following three aspects the action plan aims to influence: (1) Investment for Growth and Jobs program, (2) European Territorial Cooperation program European Territorial Cooperation program and (3) Other regional development policy instrument. Finally, the last part of this section is related to the self – defined performance indicators. For each policy instrument addressed by the project, at least one result indicator has to be defined to be used to monitor the performance of that instrument and therefore to assess, during phase 2, whether performance has been improved thanks to the interregional cooperation. Essentially, this indicator is specific to each policy instrument and it measures the percentage of beneficiaries that are better off thanks to this instrument. The indicator must be both meaningful and measurable.

3.3 Background

The next part of the Action Plan includes all the information consisting the basis for the formulation of the specific actions. The current status of the progress in the field of electromobility and alternative fuels as well as the issues hindering the promotion of these two technologies in the region are briefly presented. Followingly, the main and most important points revealed by the SWOT analysis are presented in order to identify the region's strengths that can be exploited, its weaknesses that should be managed, the opportunities occurred and the threats to be overcome when formulating and implementing the actions included in the action plan.

Basic information about the region and the electromobility indicators consist the third subsection while the last one illustrated the recommendations formulated in previous phase of the project. The recommendations part will be the connector between the current situation and the SWOT analysis and the final clarification of the actions to be implemented and monitored in the next phase.

3.4 Feasibility Study

The purpose of conducting a feasibility study is analysing all the relevant factors of the project aiming at investigating whether the project should be carried out. The factors are economic, technical and legal, while the timeplan and the corresponding activities are also taken into consideration. Project managers are using the feasibility studies in order to ensure the successful finalization of the project and the fact that it will not be harmful for the business/organization/industry, etc. This study protects the organization from worthlessly wasting resources, money and time.

3.5 Actions Description

The core part of the action plan is the description of the actions aiming at promoting and diffusing electromobility and alternative fuels in each region. These actions inspired by the interregional learning process during the first project phase, will be implemented and monitored

in the second phase. The actions will be categorized in priority axes (e.g. infrastructure, promotion, etc.) and described clearly and thoroughly covering the following categories:

1. Background: The lessons learnt from the project are described constituting the basis for the development of the Action Plan. Additionally, it is explained how each action is linked to the project and how it derives from the interregional learning process. For instance, which good practice from one of the partner regions or which learning project activity was the inspiration for the action?
2. Objective: The main objective(s) of the action and the reason this action was chosen to be implemented are presented.
3. Relevance: In this part, it is described thoroughly how the action is connected to the policy instrument addressed. It should be clarified how the action contributes to improve the policy instrument(s) and in case influence other policy instruments).
4. Activities: The description of the individual activities should have the following characteristics:
 - The content of the described action should be precisely defined.
 - The specific activities/measures should be listed and described.
 - The activities should be clearly related to the action.
5. Bottleneck: The bottlenecks / problems encountered that trigger the need to intervene with the project are mentioned.
6. Stakeholders involved: The organisations in the region who are involved in the development and implementation of the action are listed and their role is explained.
7. Timeframe: Duration of the action
8. Indicative Funding Sources: Describe how this action will be financed. Is it through the policy instrument addressed?
9. Clarification about the funding sources. As concrete information as possible, i.e the process of applying for the funding (e.g. if the funding source is the ROP, provide information on the available budget, the deadline of the targeted call for proposals etc. In case there is already an approval it should be also mentioned. In case of multiple sources, each amount should be also mentioned.
10. Indicative Costs: Costs related to the implementation of the action (even if no budget is required or the action implementation is financed by your own staff costs it should be indicated).
11. Expected economic, territorial and environmental impact as well as the impact on e-mobility
12. Transferability: Describe the level of transferability of the action in other regions/territories.

4.6 Monitoring process

As it has already been mentioned, the actions described in the action plan will be implemented during the second phase of the project. The success of the implementation of the action plan highly depends on the effective and efficient monitoring of the individual activities constituting the action. For this purpose, in this section of the action plan template, the monitoring phase should be described. This includes the detailed timeline where the main activities described in the previous section as well as other secondary activities that is important to monitor and their

deadlines are presented. Additionally, important milestones for the action plan realization should also be added and described.

5. The Action Plan for Attica Region

Based on the structure described in the previous section, the Action Plan for Region of Attica was formulated. The Action Plan includes concrete and targeted actions aiming to effectively promote electromobility in the region based on its needs and characteristics. The formulation of the Action Plan for the Region of Attica was inspired by various activities taken place within the framework of the eMOPOLI project such as the Interregional Learning Workshops, the Round Tables, the Field visits or the Staff exchange which enable the discussion, the ideas, knowledge and experience exchange among project partners. Additionally, one of the outputs of the project, the Sourcebook of Good Practices which includes Good Practices being or already implemented in the project partner regions and have contributed in the diffusion of electric vehicles in various sectors.

Furthermore, the Workshops of the Regional Stakeholder Group (RSG) had a significant impact in the formulation of clear and targeted actions based on the experts knowledge and experience. The RSG for the Region of Attica consists of 17 members experts from the academia/research, national and regional public authority, general public, industry, business association and infrastructure and (public) service provider. During the stakeholders meetings and according to the project requirements, the current situation in Region of Attica concerning electromobility has been described and the gaps existing or progress achieved in various sectors of electromobility have been identified through the GAP Analysis. Additionally, a SWOT analysis has been conducted for specifying strengths and weaknesses of the region that could favour and hinder the establishment of electric vehicles respectively as well as the opportunities arisen from this establishment and the threats lurking from the advent of this technology. Finally, recommendation have been formulated that could assist in promoting electromobility in the region based on the outcomes of all the previous analyses. The experience of the members of the RSG was significant in developing the regional profile and identify the sectors where we should focus on. Based on the above, this Action Plan has been developed including 5 actions that are considered to encourage the diffusion of electromobility in Region of Attica and will solve critical gaps towards the transition of zero emission technology.

In the next sections, the individual parts of the action plan described previously are presented concerning the case of the Region of Attica.

5.1 Attica Region: Policy Context

The Action Plan of the Region of Attica aims to impact the investment for growth and jobs program and the policy instrument addressed is priority axis 6 entitled “Improving Quality of Life in Urban Environment” included in the Regional Operational Program of Attica 2014-2020. The axis seeks to solve major problems related to the integration of environmental infrastructure and the improvement of urban environment in order to advance the quality of life of the residents. Measures to achieve this is urban revitalization and promotion of environmentally friendly mobility. Priorities of this axis are:

- waste prevention (volume reduction, recovery - material recycling and recovery of waste as productive and financial resources)
- combination of strengthening tourism development and urban rejuvenation
- management and distribution of drinking water
- protection and conservation of cultural heritage and development of cultural infrastructure
- sustainable mobility

Main aspects of this priority axis within the e-MOPOLI project are the following:

- Assessment of alternative fuel vehicles (AFV) in public transport and infrastructure in relation to quality of life
- Integration of e-mobility and AF infrastructure in spatial planning to facilitate penetration of private e-vehicles and smart mobility solutions based on alternative fuels.
- E-mobility and AFV solutions for tourism to address the minimization of local noise and air pollution due to the highly periodic demand in touristic areas.
- Integration of AFV solutions to existing infrastructure
- Promoting multimodality with AFV technologies to enhance public health and quality of life

5.2 Attica Region: Background

5.2.1 Current Situation

Despite the environmental benefits, electromobility is at an early stage of development in Greece and the number of electric vehicles (EV) in use is still very limited. High installation and maintenance costs for the charging infrastructure, extended recharging time, lack of adequate number of charging stations and supporting infrastructure (high-rise buildings without provision of parking places, narrow streets preventing the installation of roadside charging stations, etc), the lack of financial and non-financial incentives, the deficiency of proper legislation framework, low public awareness as well as fuel and purchase prices are some of the various factors bringing about the poor penetration rate of electric vehicles. The commercial availability of EV models in Greece is limited in comparison to the biggest EV markets in the EU. In 2017 the EV market share in Greece jumped up from 0.06% to 0.19 % with the market almost tripling in volume, achieving a market growth of +243%. The most significant trend is the turn of consumers towards Plug-in Hybrid Electric Vehicles (PHEVs) which accounted for 80.1% of the total sales (+821%). The sales of Battery Electric Vehicles (BEVs) remained stable (-3%), indicating market stagnation, due to lack of fiscal incentives and supporting infrastructure, was significant for electric mobility in Greece.

Moreover, concerning public transportation in the Region of Attica, Athens' main operator of buses and trolleys has a network of 300 bus and trolley lines and a fleet of some 2.022 buses (average age 13,9 years) and 354 trolley electric buses (average age 15,3 years). 610 of buses run on compressed natural gas (CNG) being one of Europe's largest fleets of CNG-powered buses. Diesel buses (1412) continue to represent the largest part of the bus fleet. Athens Urban Transport Organization (OASA) supports its fleet renewal in order to achieve green mobility, environmentally friendly vehicles and lower transport GHG emissions. Therefore, the

organization is planning to use 30 million euros in funds from the Attica Regional Authority for the purchase of 92 state-of-the-art buses, of which 80 will meet EURO VI emission standards and 12 will be electric ones.

Finally, there is inadequate information of the public regarding the urgent need to reduce atmospheric pollutants and carbon dioxide, in urban environment and also for the relevant (but hidden) high costs of public health. According to the most recent statistic data about CO₂ emissions in the Region of Attica, the transportation sector is the second contributing factor while road transportation is responsible for the highest share of CO₂ emissions, deteriorating the air quality for the citizens. Apart from the abovementioned issues provoking the further establishment of the concept of electromobility in Greece and in the Region of Attica particularly, some small but significant steps and efforts have already been achieved. First, Greece implemented for the first time a package for the support of EVs' penetration in the market in 2010, according to which, electric vehicles and low engine capacity hybrid and fuel cell cars registered before November 2010 were exempt from the annual circulation tax. Following November of 2010, the vehicle circulation tax was reformed to support green mobility and thus became CO₂ emissions based. Accordingly, vehicles are now taxed based on CO₂ g/km which ranks all EVs in the lowest category of 90 g/km which are exempt of circulation taxes. All-Electric Vehicles are also exempt from luxury and luxury commodity tax charge since 2013, while hybrids received a 50% discount respectively.

The governmental part plays an important role in the diffusion of electric vehicles and the shift towards a more sustainable mobility. Unfortunately, both in national and regional level, there is an urgent need for further simplification, rationalization and avoidance of multi overlaps of responsibilities throughout the legislative framework which regulates the issues of proliferation of electric vehicles and the creation of supporting infrastructure. Furthermore, immediate reconsideration of urban building regulations aimed at e-mobility friendliness of all new constructions and improvement of the existing buildings so that the electric vehicles to be recharged easily when parked and when traveling is necessary. A breakthrough step towards the increase of the number of electric vehicles was achieved through the first Greek law for electromobility established by the Greek government in July 2020, consisting of 6 parts and 65 articles in total. The main aims of this law are summarized in the following points:

1. Controlled parking spaces can be used by electric vehicle (of zero emissions of emissions up to 50gr CO₂/km) free of charge for the time period from 01/01/2021 to 31/12/2021.
2. Environmental tax enforcement in the industry for the imported old, second hand vehicles with high emission levels.
3. Tax incentives for promoting electromobility (e.g. for businesses producing electric vehicles or products related to electric vehicles)
4. Spatial planning regulations for the development of publicly accessible charging stations
5. Urban planning regulations and other requirements for the installation of charging stations
5. Grants for the purchase or leasing of electric vehicles

Additionally, the fragmentation of public authorities and services as well as the lack of coordination between the different Ministries and other involved public bodies deteriorates the deployment of electromobility.

5.2.2 SWOT Analysis

The results of the SWOT analysis conducted for the Region of Attica concerning the field of electromobility are summarized in Fig. 3.

<p>S1. Air pollution from vehicles is well acknowledged S2. Average per day trip for work is less than 50kms S3. Existing experience from the electromechanical industry S4. The Region has already participated in European funded programs concerning the development of EV charging stations and pilot actions for sustainable mobility and smart city. S5. More than 10 municipalities in the region conduct their own Sustainable Urban Mobility Plan. S6. Cooperation of several municipalities in Attica for Sustainable Mobility integration under the program of PEDDA. S7. Attica Region is in proximity to central government and decision-making centres S8. Attica Region can benefit from a great research force from the open market sector or from universities and research centres that have already been established in its territory. S9. The Municipality of Athens has already a strategy on electromobility promotion and a well-documented EV charging station network proposal.</p>	<p>W1. Higher production and purchase cost W2. Lack of standards W3. Low sales lead to low revenue and profits W4. Low penetration in Greek market W5. Low consumer awareness W6. High price of batteries W7. Administrative issues and government overrides due to unclear, or non-existing in some cases, legal background W8. Lack of charging infrastructure. W9. RIS3 Smart Specialization Strategy in Attica Region has not included electromobility in its key sectors for development. W10. Lack of charging infrastructure W11. Lack cooperation between EV stakeholders</p>
<p>O1. Technology development O2. Improve the governmental aim schemes for EVs and strengthen infrastructure O3. Growing public awareness about environmental protection O4. Growing demand of green technologies O5. Further uncontrolled increase in the price of fossil fuels O6. Improve of air quality O7. Unemployment – new jobs will be created O8. Traffic management could be easier O9. IBM cooperation in the smart city sector. O10. The local strategies of several municipalities on Urban Resilience. O11. Within the concept of Smart City evolution within Attica, strategic planning for developing a complete strategy to promote the deployment of a broad charging stations network for alternative fuels and EVs can increase (RES) penetration and storage system facilities.</p>	<p>T1. Different types of chargers T2. Battery durability T3. Unknown timeline of the decline in price of technology T4. Lack of financial resources for investments in development & manufacturing T5. EU automotive e-mobility industry underdevelopment influencing EU economy, import of Asian vehicles. T6. The greatest drawback in Greece is the lack of legislation regarding EV charging stations development and ownership, market entities' role in the development and management of such infrastructure. T7. Legally, not all involved entities are specifically defined, both their roles and means of intercommunication are still to be determined, leading to a great deal of confusion to any party wanting to participate in this market. T8. Greece is still a country enduring the impacts of a major economic crisis, making it harder to attract new investors, domestic or foreign. T9. The coexistence of public and private charging infrastructure is not a viable approach for a healthy and competitive market as seen in several EU countries and regions where e-mobility thrives, yet according to legislation it remains a possible outcome with doubtful results. T10. Lack of Banking support for new businesses and the uncertainty which prevent any small or medium scale investment T11. Significant low in EU fund-use T12. Large number of different stakeholders, at least for the main road network</p>

Figure 3: SWOT Analysis for Region of Attica in the field of electromobility.

5.2.3 Actions

The actions formulated for promoting electromobility in the Region of Attica are classified in three priority axes: vehicle/equipment, infrastructure and promotion. More specifically, the actions, analyzed in the next sections are the following:

1. Priority Axis 1: Vehicle/Equipment
 - Feasibility and Financial Studies for the scenario selected
 - Renewal of the vehicle fleet of the Region of Attica with electric vehicles
2. Priority Axis 2: Infrastructure
 - Feasibility and Financial Studies for the scenario selected
 - Installation of charging stations in 4 key locations
3. Priority Axis 3: Promotion
 - Organization of seminars/ exhibitions/ conferences for raising public awareness

5.2.3.1 Priority Axis 1

During the first action, a feasibility and financial study will be carried out for revealing the optimal scenario concerning the renewal of the vehicle fleet of the region of Attica with electric vehicles. Various scenarios will be developed based on the types of vehicles that will be substituted (passenger cars, trucks, professional vehicles) as well as the proportion of each type. Based on the results of this action, the Region of Attica will proceed with the purchase of the number and type of vehicles specified by the best scenario (action 2). The objectives of this action is summarized in the following three points:

- Substitution of the conventional diesel vehicles with electric ones → lower emissions for regional service purposes. This action can be a good example for other regions and municipalities of the country.
- Promote public awareness on electromobility and the different types of electric vehicles as people will see the electric vehicles driving around the regional network
- More publicly accessible charging stations will be added to the existing network. The station will be located in a central locations as it will be further described later in this section

The inspiration for both actions of this priority axis were the Good Practices that have already been implemented in project partner regions along with the activities of the interregional learning process during the project lifetime. The municipality of Kranj in Slovenia and in Jelgava city in Latvia have purchased electric vehicles for their fleet while in Lombardy region one of the principles of the metropolitan chart of electromobility deals with the diffusion of electromobility in last mile logistics, company fleets, local public transport, etc. The actions will result in finding the optimal solution and then substituting part of the regional vehicle fleet

with electric ones. The outcome will be more electric vehicles on the regional road network which have lower environmental footprint, i.e. lower emissions and energy consumption. Taking into consideration that the offices of the Region are located in and near the city center, where the air quality is highly overwhelmed due to heavy traffic and congestion phenomena especially during the peak hours, the substitution of conventional vehicles with electric ones will relieve the atmosphere in terms of emissions and noise levels. Therefore, both actions will be a preliminary but significant step in improving quality of life. These actions will also indirectly contribute in improving the policy instrument as the operation and maintenance costs of the vehicle fleet will be reduced and thus funds can be dedicated for additional actions towards this direction. The impact of these actions is threefold: (1) less operational and maintenance costs compared to the conventional diesel vehicles., (2) less emissions as the regional vehicle fleet needs to drive very often and for a long time around the region and (3) people will be attracted to the electric vehicles and be encouraged to buy/use one.

5.2.3.2 Priority Axis 2

Similarly to the previous priority axis, a feasibility and financial study will be carried out concerning the number of charging stations that will be installed based on the number and types of vehicles substituted with electric ones. Based on the results of the studies, the optimum number of charging stations for serving the electric vehicles will be defined and therefore, the second action will start for purchasing and installing the charging stations in 4 predefined key locations. The existence of electric cars instead of diesel ones will lead to less cruising time and driving distance for finding and reach the closest gas station as the regional electric vehicles do not need fuel and since there will be charged in any of the key locations there will be no need for driving around the network for fulfilling charging issues. Taking into consideration that the offices of the Region are located in and near the city center, where the air quality is highly overwhelmed due to heavy traffic and congestion phenomena especially during the peak hours, the substitution of conventional vehicles with electric ones and the reduction in the distance covered and cruising time for finding a gas station will relieve the atmosphere in terms of emissions and noise levels. Therefore, both actions will be a preliminary but significant step in improving quality of life. These actions will also indirectly contribute in improving the policy instrument as the operation and maintenance costs of the vehicle fleet will be reduced and thus funds can be dedicated for additional actions towards this direction. It is important to highlight that the charging stations may not be publicly accessible but they will be used apart from the regional vehicle fleet, also from the people working in the region and own a private electric vehicle. As a result, all these users will not have to use extensively the available public accessible charging infrastructure for charging the vehicle and thus occupy a free parking space for a long time. Practically, charging network will be expanded by these charging stations will serve solely the demand related to the Regional personnel.

The inspiration for formulating these two actions derived from various activities during the project lifetime. During all Interregional Learning Workshops (ILW) and the Interregional Policy Learning Round Table, the issue of charging stations was discussed and the importance of an efficient charging stations network was highlighted. For example, in Finland the different commercial chains are developing their own network of charging stations but still there is lack of charging facilities and the available infrastructure cannot support the electromobility concept

and the increase of the number of electric cars. In Calabria, energy providers are invited to participate and install charging stations as the lack of infrastructure and the high prices do not favour electric car purchase. Furthermore, the provinces of Brescia, Bucharest-Ilfov, Calabria and Flanders have already included the development of charging station network in their Good Practices. The reasons behind the introduction of such practices were the lack of charging infrastructure and the lack of reference for evaluation of costs for charging stations installation and they mention that such a network can accelerate the transition towards greener transport and mobility as well as zero emissions. Additionally, it is important to mention that the driver should not stop the electric vehicle when the battery needs to be charged but wherever he stops/parks the vehicle, the appropriate and necessary infrastructure should exist. As it was mentioned during the 1st meeting with the stakeholders in Region Attica, a vehicle remains parked for the biggest part of the day (approximately 21-22 hours) and therefore the main idea behind the development of an extensive and efficient network of charging station is that the owner of an electric vehicle could charge it when they stop/park. The drivers can plug in their vehicle within few seconds and during the charging time they can perform their activities (sleep, work, shopping, other outdoor activities, etc). All these advantages of the existence of an efficient and appropriate charging network for electric vehicles were evaluated as important for the promotion of electromobility and the shift towards a more sustainable mobility in the Region of Attica.

Finally, the impacts of the actions of this priority axis can be summarized in four points: (1) best solution in terms of feasibility and CBA ratio, (2) more regional employees will be encouraged to buy/use an electric vehicle as the charging anxiety will be reduced and they will be able to charge the vehicle during at work, (3) more EVs have positive environmental impact on noise levels and air quality, (4) less operational and maintenance costs compared to the conventional diesel vehicles for the Region of Attica.

5.2.3.3 Priority Axis 3:Promotion

The last priority axis aims to promote electromobility through raising public awareness and increase acceptance. During the project meetings in the project partner regions as well as the meetings with the stakeholders in Region of Attica, the issue of lack of knowledge and information on electric vehicles was discussed. There are regions where people are more aware of the advantages and characteristics of electromobility and are in favour of purchasing or use an electric car. On the other hand, there are regions where public awareness should be increased and further actions should be taken towards this direction. For example, in Flanders the Good Practice entitled “Website about environment friendly vehicles” aims to provide adequate and complete information about all kinds of zero emission cars, while in Lombardy Region a working group for electric mobility will be created for tackling the lack of coordination and communication between all relevant stakeholders in the region. One action will be implemented within the framework of this priority axis consisting of the organization of seminars/exhibition aiming to achieve the following objectives:

- Introduction of electric transport modes to the public and the authorities
- Raise public awareness about the new technology and thus promote the idea of electromobility

- Participants will get familiar with these new type of vehicles by driving and testing different types of vehicles
- Long term objective: Increase public acceptance
- Bring together all relevant stakeholders

This action will indirectly contribute to improving the policy instrument addressed. The event(s) will achieve in getting people familiar with electric vehicles, raising awareness concerning this technology and its advantages over conventional vehicles as well as their capabilities. This will result in minimizing or even alleviate any concerns or prejudices that drives or users may have and they will be encourage to abandon diesel vehicles and shift to electric ones. Therefore, these will lead to increase in the penetration rate of electric vehicles, bringing about less emissions and noise levels and thus improving life quality in the region. The impact of this action on the territory, the environment and the e- mobility is threefold: (1) long term environmental impact as this action may encourage people to buy/use/share electric vehicles, (2) this encouragement will to a higher number of electric vehicles in the territory., (3) participants and attendees will have the chance to get familiar with electric vehicles and learn more about electromobility and its advantages.

For effectively monitoring all the above described actions, a timeplan has been created indicating the duration of each action, its start and expected end date (Fig. 4). It should be ensured that ensuring that the timeplan will be closely adhered and no significant and unexpected delays will occur.

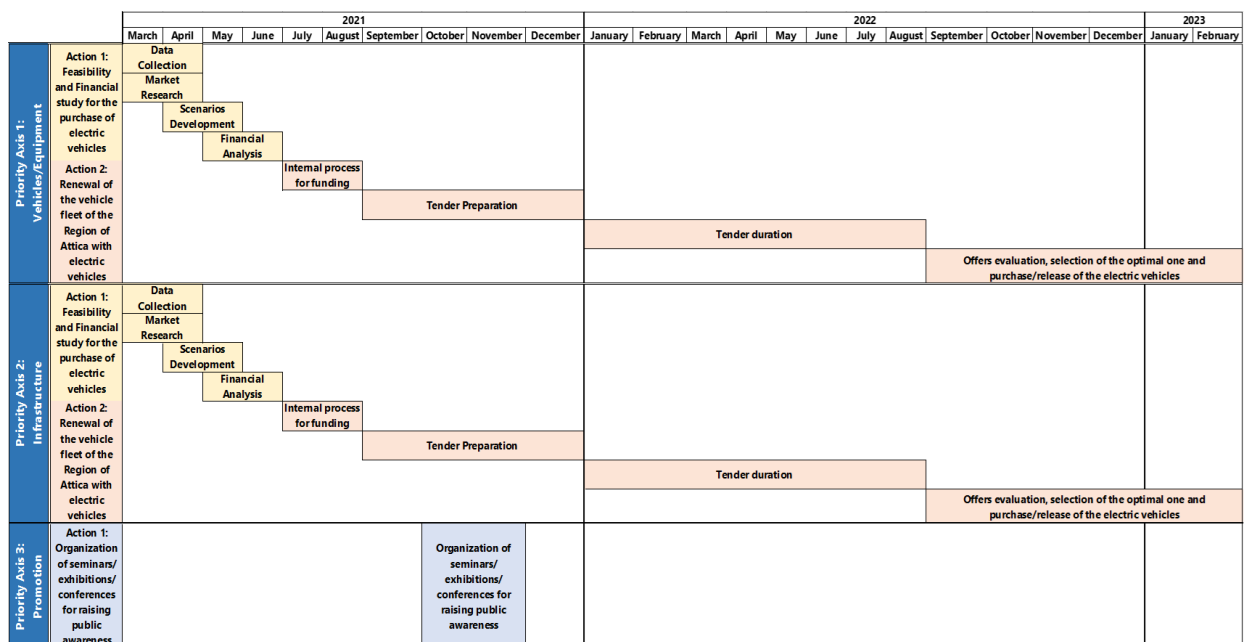


Figure 4: Timeplan for the actions implementation .

6. Conclusions

The reductions in emissions and energy consumption is a major target in international and national levels. The main focus is in road transportation sector as it highly contributes to energy consumption and is the leader in CO₂ emissions. Electromobility and alternative fuels are considered to be key solutions towards greener and cleaner transportation systems consisting a significant aspect of the broader concept of smart and sustainable cities which are gaining more and more attention. For promoting these technologies actions need to be taken and implemented, i.e. an Action Plan needs to be developed. This work presented a concrete methodology towards the formulation of a concrete and targeted Action Plan taken into consideration the region's needs and characteristics. In the methodology described in this paper, two significant steps were revealed to be necessary to be realized before the formulation of the actions. The first one is considered to be the analysis of current situation in order to identify deficiencies and gaps as well as the aspects that need to be further improved and fields where progress has been achieved. Additionally, the SWOT analysis will reveal assets of the region that can be further exploited and weaknesses that should be overcome. Both analyses will result in the creation of the regional profile concerning electromobility and aspects where actions need to be taken will be more effectively detected. The exchange of knowledge, ideas and experiences with experts and policy makers, as the second step, consists a very good source of inspiration towards the formulation of actions that can promote electromobility based on the region's needs and characteristics. In our case, this exchange was fulfilled through the project activities, the meetings, discussions and field visits. The above mentioned steps will significantly contribute in formulating an Action Plan with concrete, targeted and reasonable actions that will effectively promote electromobility and will not be abandoned as unrealistic. Apart from these characteristics, an Action Plan should be clear and precise, including detailed description of all the actions.

During the last years, electromobility has also gained much attention in Greece through various measures, such as the first Greek law for electromobility or the incentives for purchasing electric vehicles. Region of Attica, more specifically, has shown high interest in increasing the penetration rate of electric vehicles in its network. Through its participation in the eMOPOLI project (<https://www.interregeurope.eu/e-mopoli/>), Region of Attica aims to make significant steps towards the promotion of electromobility by developing a targeted Action Plan. The analysis of the current situation showed that the transportation sector contributes mostly to the CO₂ emissions and the air quality deteriorates gradually, having a negative influence on the residents' health. The shift towards more sustainable modes of transportation is urgent and electromobility as well as alternative fuels are considered important players towards this direction. Through the five actions developed and included in the Action Plan, Region of Attica wishes to promote the concept of electromobility and alternative fuels in the Region of Attica, inform the public and encourage potential users to shift towards eco-friendly vehicles. Therefore, this Action Plan will be the initiative for a more sustainable mobility in the Region of Attica, lower energy consumption and less emissions creating a better, cleaner and healthier environment for its residents and thus enhancing and improving their quality of life.

Finally, it is known that for promoting a new technology, it is necessary to transfer the knowledge and share experience. Good and effective Action Plans can be used as a guide for other regions, municipalities, stakeholders or policy makers in any administration level. The Action Plan presented in this work could also serve towards these direction as its actions can

be used as an inspiration and can be transferred to other territories with similar characteristics and regional profiles.

Acknowledgements

The analysis is conducted within the framework of eMOPOLI project (Electro MObility as driver to support POLicy Instruments for sustainable mobility) funded by the European Union within the framework of the Interreg Mediterranean (MED) Program.

7. References

Baabou, W., Grunewald, N., Ouellet-Plamondon, C., Gressot, M. and Galli, A. 2017. The Ecological Footprint of Mediterranean cities: Awareness creation and policy implications. *Environmental Science & Policy*. 69. 94-104. 10.1016/j.envsci.2016.12.013.

EU Transport in Figures – Statistical Pocketbook, 2018.

European Union. <https://ec.europa.eu/eurostat/statistics>

European Environment Agency. <https://www.eea.europa.eu/>

Interreg Europe. (n.d.). Retrieved April 8, 2019, from <https://www.interregeurope.eu/>.