D4.7: Electrical vehicles and charging stations roll-out in Antalya
First Version

WP 4, T 4.5.1

30 September 2019 (M24)
Electrical vehicles and charging stations in Antalya (1st)

Technical References

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<td>Maximizing the UPscaling and replication potential of high-level urban transformation strategies - MAtechUP</td>
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| Project Duration | 1 October 2017 – 30 September 2022 (60 Months) |

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List of Acronyms

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<td>Combined heat and power</td>
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<tr>
<td>DH</td>
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<td>EV</td>
<td>Electric vehicle</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
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<tr>
<td>IUDP</td>
<td>Integrated Urban Development Plan</td>
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<tr>
<td>LHD</td>
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<td>RES</td>
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<td>SECAP</td>
<td>Sustainable Energy and Climate Action Plan</td>
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<td>SUMP</td>
<td>Sustainable Urban Mobility Plan</td>
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Abstract

In this work description, it is aimed to introduce electric vehicles which are not in the public transportation fleet of Antalya Metropolitan Municipality and to integrate e-vehicles and e-bikes into the city traffic.

The fundamental expectation is to raise awareness within the city. It is also aimed to increase the use of e-vehicles in the city and to increase the e-vehicle utilization. The projects that submitted to Antalya Metropolitan Municipality have been revised twice. The details of these projects are presented in the report.
1 Introduction

1.1 Purpose and target group

This report includes the current developments in “D4.7: Electrical vehicles and charging stations roll-out in Antalya” and “Subtask 4.5.1 “ in which ANT will define the replacement strategy of its municipal fleet, including the deployment of electrical chargers.

The main goal of the report is to cover the proposed actions for MAchUP Antalya project which include the variety of electric vehicles and the plans to install the charging stations required for the successful integration of the e-vehicles into existing transportation network of Antalya. For this purpose, the following actions were examined in the report.

Action 13: 2 e-Buses
Action 14: 20 e-Vehicles for Municipality Fleet
Action 15: 30 e-Bikes
Action 16: 5 e-Vehicle Charging Stations
Action 17: 5 e-Bike charging stations
Action 23: 2 e-Buses charging stations

As mentioned before, the aim of the project to prevent environmental pollution caused by traffic in the Antalya Metropolitan City, but also to reduce fossil fuel consumption, increase energy efficiency and contribute to the awareness for a conscious society. In these report, all latest development was explained.

1.2 Contribution of partners

Table 1 shows the main contributions from MAchUP partners in the development of this deliverable.

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Relation to other activities in the project

Table 2 shows the main relationship of this deliverable to other activities (or deliverables) developed within MAchUP. These relations should be considered within this document for further understanding of its content (Table 3).

Table 2. Relation to other actions in the project

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Table 3. Relation to other activities in the project

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<td>The detailed design of Antalya’s lighthouse interventions includes also detailed financial plans and the accompanying business model structure of each single action.</td>
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2 State of the art and future vision related to Electrical vehicles and charging stations roll-out in Antalya

a) State of the art of Energy Infrastructures in Antalya

In current status, Antalya is not ready for the use of e-vehicles with its energy infrastructure. The use of e-vehicles in the city is almost non-existent and there is not a charging stations network established. The current electric infrastructure is also not used for the electric vehicles. In Turkey, fuel costs for the fuel engine vehicles are very high comparing other countries. This situation supplies many advantages for the e-vehicle utilization and can act as a booster for the decrease emission gases. Thus, there is a positive perspective among the citizens of Antalya regarding the utilization of all e-vehicle types.

![Electricity Consumption by Sector](image)

**Figure 1. Breakdown of electricity consumption of Antalya**

The publication of national regulations on the efficient use of energy and support of renewable energy sources are very effective in the dissemination of e-vehicles. In Turkey, rapid progress on the use of all e-vehicle types is encouraging and to be expected to increase from the authorities.

In the scope of energy generation of Antalya, today, there are overall 72 electricity generation facilities with a total installed capacity of 2,050 MW, with a total electricity generation of 6,706 GWh/year. The majority of the electricity generation belongs to a 1,150 MW capacity Natural Gas Power Plant (Aksa Energy) which is responsible for approximately 70% total electricity generation of Antalya.

27.9% of the generation is based on renewable energy sources, while 71% of generation is based on fossil fuels. The majority of the renewable energy generation is based on Hydro Power with a share of 97% of total generated renewable energy.
Renewable Energy Generation of Antalya

![Renewable Energy Generation of Antalya](image)

Figure 2. Breakdown of renewable energy generation by source in Antalya

The total installed capacity of Solar Power is 38 MW in Antalya with 39 Power Plants. Total electricity generation from Biogas Utilization is 4.1 MW with 2 Operational facilities.

Antalya is a part of the interconnected electricity system. An interconnected electrical grid system is described as the system where several energy generation stations are connected in parallel. Although hot spots for electricity generation and consumptions can be identified within the grid and there are no dedicated or isolated grids. This means that generated electricity in Antalya is not exclusively consumed by Antalya.

Turkish electricity system has a mixed energy generation capacity. The majority of generation is based on Natural Gas, Hydro Power Resources and Coal. Natural Gas has 37.2% in generation followed by Coal Power with 33.3% and Hydro Power with 14.1%. There are total of 1,625,174 registered electricity user (Medium and Low Voltage Level), and only 41,433 of them use smart meters\(^1\).

b) The future vision of Energy Infrastructures in Antalya

The Sustainable Energy Action Plan was prepared in 2014 for Antalya’s future energy vision. Metropolitan Municipality has created an inventory of Sustainable Energy Action Plan (SEAP). The Municipality has also implemented a Sustainable Energy Action Plan by 2020 to reduce greenhouse gas emissions 20% in 2012. Following the signing of the contract, the Metropolitan Municipality, which applied to the grant support of the Western Mediterranean Development Agency (BAKA) Direct Activity Support Program for both its

own institutional inventory and Antalya city inventory, completed the Carbon Footprint Inventory and Antalya Energy Action Plan.

According to the report, total carbon exhaust of Antalya province for 2012 is 8,966,179 tons of CO₂, while 1.6% of this 144,200 tons is under the responsibility of the municipality. In this report, according to the data of Energy and Natural Resources Ministry, annual energy consumption is increased by 4-5% and electricity consumption increased by 7-8%. In current situation, Turkey need many new resources to meet the primary energy consumption. The rate of energy demand is met by domestic production from 48% in 1990, while today it was pointed out that the rate dropped to 29% level.

In the inventory survey for Antalya, a Sustainable Energy Action Plan was prepared by considering the total energy consumption (15,139,894 MWh) of the city. In the plan, the total 5,840,104 tons of CO₂ exhaust decrease were aimed by the authorities. Hence in 2012, targets and actions were set for emission reduction as given below:

- Firstly, energy efficiency plan for the new residential areas, energy efficient renovations in houses and commercial buildings, energy efficient applications in municipal buildings and street lighting systems with an investment cost of 1,568,153 Turkish Lira (TL) were conducted. Hence total 475,672 tons of CO₂ reduction was supplied.
- Secondly, public transport, pedestrian and bicycle use, integration to public transport technology and fuel use with an investment cost of 7,821,463 Turkish Lira (TL) were conducted. Hence total 669,641 tons of CO₂ reduction was supplied.
- Thirdly, renewable energy plan for solid waste storage areas and wastewater treatment plants with an investment cost of 30,419,40 Turkish Lira (TL) were conducted. Hence total 129,149 tons of CO₂ reduction was supplied.

**c) Short summary of related MATchUP actions and how they contribute to the vision**

**Action 13: 2 e-Buses**

With the utilization of e-buses in Antalya, they will be introduced to the daily life in the city. The utilization of e-vehicles into the public transportation will be an important step in the public transportation. In current situation, diesel buses are operating in the city and their emission rates are very high. It is clear that public transport is one of the main causes of high fuel consumption and high amount of gas emissions. The utilization of e-buses will decrease the fuel consumption and emission rates. Therefore, the air quality of the city will increase. This action will have some modifications changed in an amendment to the Grant Agreement.

**Action 14: 20 e-Vehicles for Municipality Fleet**

In the scope of the project, Antalya city will have total 20 e-vehicles for its municipal fleet and thus it will have a significant impact on the e-vehicle utilization habits of the citizens in Antalya.
Utilization of 20 e-vehicles for municipality fleet will be a pilot example of e-vehicle utilization. In order to popularize and to extend the use of e-vehicles throughout the city, charging stations will be put into service within the scope of the project for these vehicles. This will also increase the use of e-vehicles and therefore make it visible the use of e-vehicles throughout the city. Additionally, the use of these vehicles will promote renewable energy sources and contribute renewable energy production.

**Action 15: 30 e-Bikes**

30 e-bikes, which will be available for individual public use, are very important in terms of energy efficiency. The utilization of E-Bikes, which will serve to the people of Antalya in terms of increasing mobility will also reduce the use of fossil fuel. They will be a good zero – emission alternative to the conventional motor vehicles in short distance travels. Apart from this, e-bikes are a good last mile application and a significant improvement in health and energy utilization.

Normally cycling is not preferred in Antalya's extremely hot climate. Generally, activities such as walking, jogging or cycling in the warm weather of the city are not favored by the people of Antalya. Instead of the classic bikes, the faster and less physically challenging e-bikes in a short distance travel in hot weather conditions will be a more suitable option. This action will have some modifications in an amendment to the Grant Agreement.

**Action 16: 5 e-Vehicles Charging Points**

An increased utilization of e-vehicles is only possible with the expansion of the charging station network in the city. For this reason, 5 charging stations will be established for e-vehicles within the scope of the project. These stations will supply all electric vehicles in the city. In this way, individual users will also be benefited from the stations therefore support the use of e-vehicles.

In addition, a monitoring system of charging stations will be established and the usage statistics will be stored and deficiencies will be determined. At the same time, the change in the rate of electric vehicle use in the city will be determined.

**Action 17: 5 e-Bike Charging Stations**

Within the scope of the project, charging stations will be established in different points of the city for 30 e-bikes which will be available for individual use. These stations will be located mainly in and around the demo area. In this way, the use of e-bikes will be facilitated and individual users will be encouraged to choose this transport mode.

Using the monitoring system which will record the usage rates, statistics and deficiencies will be a great source for determining the city’s e-bike usage habits. In this way, e-bikes, which are an important tool to increase mobility in cities, will be used more effectively with these charging stations.
Action 23: 2 e-Bus Charging Stations

The stations will support the utilization of e-Buses, one of the most effective actions of the project for Antalya. The locations of the charging stations are very crucial since it is very important that buses are charged as quickly as possible for optimal service. Correct selection of charging station points will ensure efficient use of e-buses. With this action, the importance of using electric vehicles in public transportation will be emphasized. As this action is linked to A.13, it could be amended during the following months.
3 Technical definition of the interventions

3.1 Action 13: 2 e-Buses

As above mentioned, this action is going to be included in an amendment of the project and will have some modifications. But the original description of the action is as follows:

In this action, which would have been the beginning for the transition of Antalya Metropolitan Municipality to electric vehicles, the municipality would have provided 2 e-buses. These vehicles would have been integrated into the current public transport system and would have been monitored throughout the system.

In current situation, total 4,186 vehicles (buses, taxis, etc.) provide public transportation services in Antalya city to be aware of the widespread use of electric vehicles and these vehicles will be integrated into the system must be used by citizens in the city center.

All data from the provided buses will be used in Antalya City Platform. The criteria such as charging times, utilization status and range of the buses, uses of A/C to be monitored for the first time and will be evaluated daily. Antalya is a city with high temperatures due to its location and climate. Due to the high temperature, the levels of use of the air conditioning in vehicles may be different in actuality.

Two new electric buses, which we know to have little effect in the existing transportation system, will be a first for the city and their importance will be significant. In addition, temporary measures will be taken into account to prevent situations that may affect the mobility of vehicles by considering possible power outages (Action 23. 2 e-bus charging station).

3.2 Action 14: 20 e-Vehicles for Municipality Fleet

There are many vehicles used in municipal services. The personnel are traveling during the day by using municipal vehicles. Within this project, the electric vehicles that will be added to the municipal fleet which will be seen by the citizens in different locations in the city as a transportation vehicle.

In addition to the municipal vehicle fleet which operates with fossil fuel, the current movements, route lengths and efficiency of the electric vehicles will be measured and reported regularly. The results created by the vehicle tracking system within the municipal fleet will be evaluated by making benefit / cost analysis.

The eventual objective is to replace all conventional municipal vehicles with innovative vehicles that will allow them to commute using renewable energy sources (such as e-vehicles).

3.3 Action 15: 30 e-Bikes

In scope of the project, 30 new e-bikes will be integrated into the current e-bike rental system in Antalya. The most important criteria in the current cycling system is to increase the number of users to ride these vehicles during their daily trips. There are 5 rental
Electrical vehicles and charging stations in Antalya (1st)

points in the system registered at this stage. The data will be monitored regularly which includes the duration of the use of rented bikes in the scope of the project.

3.4 Action 16: 5 e-Vehicle Charging Station

In order to serve the 20 e-vehicles which will be provided by the municipality, e-vehicle charging stations will be established. All Antalya citizens will be able to use these charging stations. With the use of charging stations by municipal vehicles and citizens, the information of users will be collected and evaluated. This action will be a big step for the dissemination of electric vehicles and 5 charging stations will be built in the scope of the action.

In determination process of charging stations' locations, supply-demand balance is essential. These charging stations will also be shared on the urban platform. Information such as location, availability, status etc. will provide support for citizens' convenience. The application areas of the fast and normal charging stations have also been proposed considering traffic density maps.

3.5 Action 17: 5 e-Bike Charging Station

The existing bikes of the municipality, which is considered as a vehicle used for sightseeing purposes, are attractive in Antalya with their roads and e-bike rental points. 30 electric bikes will be purchased and 5 new e-bike charging stations will support the transportation system.

Applications such as charging units, supply-demand balances and efficiency will be continuously monitored. Its usage will be increased with the information that will be included in the city information system.

3.6 Action 23: 2 e-Bus Charging Station

As this action is linked to A.13, it could be amended during the following months.

With the electric buses, which will be a new era for the public transportation system in Antalya, the charging stations for these buses will be a big step for the city.

Efficiency of charging units and e-buses will be monitored regularly due to being a new system. Route planning was made for 2 new buses to be provided in the plan.
4 Executive project description of each action

4.1 Action 13: E-mobility for public sector: 2 e-buses

4.1.1 Management structure

The action is led by ANT, dept. for Energy Storage Systems, with contributions from SAM and DEM, planning for using the vehicles; with contributions from TAY.

4.1.2 Technical specification

As above mentioned, this action is going to be included in an amendment of the project. In Chapter 5 (Status of interventions) this eventual problem is described more in depth. Nevertheless, the original description is as follows:

The vehicles acquired by the ANT will be equipped with a monitoring and telematics platform developed by SAM; the software that will be prepared and it will follow the relevant platform. All data will be analyzed by SAM. While the use of the e-Bus and the planning of the bus stops are carried out by TAY, DEM will assist in determining the technical characteristics of the buses. A website will be used for storing the data to be collected from the buses and following them. These data can be monitored by the users.

Figure 3. Schematics of the telematics activity
4.1.3 Planning of the tasks

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(1) Design phase  
(2) Selection of equipment and installers  
(3) Installation of hard-/software  
(4) Start of operation  
(5) Monitoring  
(M) Next milestones (M1, M2,...)

In the beginning of year 4: Monitoring and Data collection process (M1)  
In the beginning of year 4 until end of year 5: Analysis process (M2)

4.1.4 Health, safety and waste management requirements

None (software topic).

4.1.5 Risks considered ex-ante and proposed risk-mitigation measures

The availability of the necessary cooperation was considered before and may well pose a risk, see below.

4.2 Action 14: 20 e-vehicles for municipality fleet

4.2.1 Management structure

Project led by business development within ANT. SAM and TAY will support their subjects appropriately. The smart district is already planned to be pedestrian and bike friendly with a large green corridor facilitating this development. With the objective of sustainable mobility, Antalya is committed to reduce pollution by the incorporation of 20 electrical vehicles into the municipality fleet. Then, this action will complement the e-buses (Action 13) in increasing the public sustainable mobility. Similarly, these e-vehicles
will be fully monitored and integrated into the Antalya urban platform in order to extract aggregated data to evaluate the sustainability.

### 4.2.2 Technical specification

Technical specification for vehicles: Charging infrastructure, power supply via usage planning, back-end integration, is not defined yet.

### 4.2.3 Planning of the tasks

<table>
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**Figure 5. Gantt chart of Action 14**

(1) Design phase  
(2) Selection of equipment and installers  
(3) Installation of hard-/software  
(4) Start of operation  
(5) Monitoring  
(M) Next milestones (M1, M2,...)

In the beginning of year 4: Monitoring and Data collection process (M1)  
In the beginning of year 4 until end of year 5: Analysis process (M2)

### 4.2.4 Health, safety and waste management requirements

Not applicable.

### 4.2.5 Risks considered ex-ante and proposed risk-mitigation measures

Currently, there is a lack of infrastructure in order to promote the use of electric vehicles which are very low in Antalya.

Therefore, some measures have been prepared to encourage the use of electric vehicles. Apart from that, the income is too high compared to the cost of fossil fuels in Turkey has a structure that encourages the preference of electric vehicles.
4.3 Action 15: 30 e-bikes

4.3.1 Management structure

Action 15 is led and coordinated by ANT. For the implementation, the following departments will work together: Planning, Technology. ANT will be responsible for providing the e-Bikes. TAY and SAM will contribute to the determination of e-bike usage, routes and stations.

Municipality has several fleets for regular bikes under ANTBIS affiliate. With charging stations, the studies have started for e-bikes in the district and most likely to also integrated with Konyaaltı beach side.

4.3.2 Technical specification

Technical specification for ANT: The bike rental system in Konyaaltı will be revised and will be implemented in the working area. In order to expand the use of e-bike, special usage areas will be selected and easy charging will be provided.

4.3.3 Planning of the tasks

<table>
<thead>
<tr>
<th>Year 1</th>
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Figure 6. Gantt chart of Action 15

(1) Design phase  
(2) Selection of equipment and installers  
(3) Installation of hard-/software  
(4) Start of operation  
(5) Monitoring  
(M) Next milestones (M1, M2,…)

In the beginning of year 4: Monitoring and Data collection process (M1)  
In the beginning of year 4 until end of year 5: Analysis process (M2)

4.3.4 Health, safety and waste management requirements

Not applicable.
4.3.5 Risks considered ex-ante and proposed risk-mitigation measures

e-Bike use is not a very common habit for Antalya citizens. Instead of e-bike, e-Scooter is on the agenda as a different alternative. The high temperature in Antalya will be effective in preferring the use of e-bikes.

4.4 Action 16: 5 E-vehicle Charging Points

4.4.1 Management structure

In this action carried out by ANT, SAM and DEM play a crucial role in the technical characteristics of charging stations. TAY supports the layout and the usage characteristics of the stations.

ANT coordinates overall management plans and all related plans within the structure of the project.

4.4.2 Technical specification

Technical specifications for ANT are listed as follows:

- Determination of charging infrastructure
- Supply of energy over existing network
- Delay and queue analysis according to charging times
- Choosing the right location for charging points
- Monitoring and reporting

4.4.3 Planning of the tasks

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<td>Q1</td>
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<td>Q3</td>
<td>Q4</td>
<td>(1)</td>
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</table>

Figure 7. Gantt chart of Action 16
4.4.4 Health, safety and waste management requirements

Not applicable.

4.4.5 Risks considered ex-ante and proposed risk-mitigation measures

There is no significant risk for charging stations. Attention shall be paid to keep the waiting areas wide within the land use characteristics.

4.5 Action 17: 5 E-bike Charging Stations

4.5.1 Management structure

This action is carried out by ANT. SAM, DEM and TAY are the partners assisting in the design of the stations suitable for the e-bike or alternative vehicles to be used and their technological infrastructure.

4.5.2 Technical specification

The location design of the e-bike charging stations has already been determined. The interior design, energy characteristics and charging time of the stations that will be located in the designated locations are studied. Technical characteristics of the station will be clarified according to the alternatives whether the vehicle to be used by the administration is e-bicycle or e-scooter.
4.5.3 Planning of the tasks

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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Figure 8. Gantt chart of Action 17

(1) Design phase
(2) Selection of equipment and installers
(3) Installation of hard-/software
(4) Start of operation
(5) Monitoring

(M) Next milestones (M1, M2,....)
In the beginning of year 4: Monitoring and Data collection process (M1)
In the beginning of year 4 until end of year 5: Analysis process (M2)

4.5.4 Health, safety and waste management requirements

Health and safety criteria for the established stations are designed to be compliant with applicable laws and standards in Turkey.

4.5.5 Risks considered ex-ante and proposed risk-mitigation measures

There is no identified direct risk for the stations. In case the scooter is the type of vehicle, the alternative structure is kept ready and the risks associated with it are reduced.

4.6 Action 23: 2 E-bus Charging Stations

4.6.1 Management structure

This action is carried out by ANT. The placement of the stations is planned by TAY considering bus routes and minimum and optimal distance conditions. Technical specifications of the station and plans for technology infrastructure are supported by SAM and DEM.
4.6.2 Technical specification

Design work for bus charging stations that will meet EN61851-1 / 23/24 standards is almost finished. With the selection of the type of bus to be used; charging infrastructure will be installed with the appropriate units. One of the stations is planned to be located within or near the demo area.

4.6.3 Planning of the tasks

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
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Figure 9. Gantt chart of Action 23

(1) Design phase
(2) Selection of equipment and installers
(3) Installation of hard-/software
(4) Start of operation
(5) Monitoring

(M) Next milestones (M1, M2,....)
In the beginning of year 4: Monitoring and Data collection process (M1)
In the beginning of year 4 until end of year 5: Analysis process (M2)

4.6.4 Health, safety and waste management requirements

Health and safety criteria for the established stations are designed to be compliant with applicable laws and standards in Turkey.

4.6.5 Risks considered ex-ante and proposed risk-mitigation measures

The apparent risk for e-bus stations is that there are no vehicles in operation yet. In order to reduce the delay caused by this risk, the location of the stations and the requirements for the infrastructure have been determined and only the units that will be used remain in the decision stage.
5 Status of the intervention

5.1 Action 13: 2 e-Buses

5.1.1 Status of the intervention

At the current status of the project (M24) the initial plan is mainly preserved with some minor changes. In the assessments made with the new coordinators of the local government and the technical team; electric bus and hybrid bus alternatives will be investigated and the vehicle type is to be decided. As the mobility partner of the project, the reached information to this stage and the available information were shared with Antalya Metropolitan Municipality (ANT). In current situation of the project, a change has been made in terms of the fact that the buses in the project will be small buses. The decision on the number and energy characteristics of the decided bus types is expected to be finalized by the beginning of December 2019. There are several alternative suggestions that is being discussed in Antalya:

First Alternative: Vehicles will be purchased and operated by the municipality

<table>
<thead>
<tr>
<th>Brand Name</th>
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<th>8 m</th>
<th>10 m</th>
<th>12 m</th>
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<td>10^3 Euro</td>
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<tr>
<td>Karsan</td>
<td>200x10^3 Euro</td>
<td>310x10^3 Euro</td>
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<td>Temsa</td>
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<td>600x10^3 Euro</td>
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Second Alternative: Build-Operate-Transfer (YID)
The build-operate-transfer model means that all costs are covered by the private enterprise within the framework of a contract between public institutions or organizations of a public service and national or international private sector actors. The obtained facility is operated by the private enterprise that meets the expenses, the expiry of the period specified in the contract. It is a form of public investment and financing that ensures that the facility is transferred to the relevant institutions or organizations in a functioning condition, free of any commitments and debts. For the implementation of the model, the most important actor of this project should be a local or foreign capital company. These companies sometimes appear as joint venture companies. Joint venture companies are multinational structures established by local and foreign private sector representatives. Depending on the scope of the project, this company can become a consortium and sometimes the existing consortium(s) establish a company.

The goods and services produced as a result of the investment made by the joint venture company are produced and marketed by the company. This is an exception to the principle that public service is provided by public institutions and organizations. However, it should be noted that the authority is not taken from the relevant public institution, i.e. there is no transfer of authority indefinitely. However, the power of producing and marketing public services for a certain period of time may cause some problems between
public institutions and corporations and joint venture companies. With the expiration of the contract, which is organized according to the BOT model, the investments and services are self-managed without any debts and commitments, free of charge, in working and usable condition. In other words, management has the authority to monitor, audit, and sanction to determine the price to be collected from the beneficiaries.

Municipalities may award public transportation works by tender. Within this scope, the bus line and the electric bus line whose route has been determined, will be tendered for 9 years. Charging stations, maintenance and repairs for the relevant enterprise are directly owned by the operator and will be inspected by the municipality. Municipalities may award public transportation works by tender. Within this scope, the bus line and the electric bus line whose route has been determined will be tendered for 9 years. Charging stations, maintenance and repairs for the relevant enterprise are directly owned by the operator and will be inspected by the municipality.

The company, which has the right to operate for 9 years, will leave the job at the end of 9 years and the vehicle used on the route will be the property of the municipality.

Approximately 25 km and 32 km 2 different routes proposed in this plan for the purpose of the municipality of the electric bus system in the financial sense is to facilitate the municipality.

**Third Alternative: Rent**

2 electric buses provided by the municipality will be tendered and rented. This alternative, which is foreseen for a period of 9 years, aims to minimize the financial burden of the investment made by the municipality. The proposal will alternatively make the municipality to invest in charging stations. Maintenance and repairs are directly owned by the operator and will be inspected by the municipality.

In addition, other progress done with the following major points:

- Requirement specification for buses is finished
- The working route of the buses was determined
- Stop points for the buses was determined

Next milestones:

- Local government's decision on whether the vehicle to be used is hybrid or electric
- Final decision process on the size of buses
- Revision of specifications according to the type of selected bus
- Procurement process
- Installation of equipment
- Bus monitoring software studies are still continue
- Web based monitoring infrastructure - studies are still continue

**5.1.2 Risks found and corrective actions performed**

Meetings are held to speed up the decision process of the new local government.
5.1.3 Business model and financial scheme applied

Three different scenarios have been proposed to Antalya Metropolitan Municipality. The cost of the procurement of buses will be covered by ANT and the possibilities of procurement with different operating methods are discussed. Three scenarios were determined as given below:

A. Supply of 2 electric buses. According to this scenario, the cost of the 2 buses to be procured is determined to be approximately 1,600,000 €. All of the financing is owned by Antalya Metropolitan Municipality and there are different procurement methods.

B. Supply of 6 small e-buses. According to this scenario, considering the clutter of the travel demand, it is planned to provide small buses which are planned to travel more frequently. Under this scenario, the cost of 6 e-buses costs € 1.2 million.

C. Supply of 2 hybrid buses. For hybrid buses with a length of 8.4 m, the procurement price is approximately 800,000 €, whereas for 2 hybrid buses of 10m and above, this price is around 1,500,000 €.

Apart from these, there is a budget of monitoring equipment of € 900. The total cost is expected to be € 1200.

Duration: 4 years - Use in the project 3 year - Depreciation ratio: 75%

5.1.4 Citizen engagement strategy implemented

No particular participation anticipated.

5.2 Action 14: 20 e-vehicles for Municipality fleet

5.2.1 Status of the intervention

In the municipal fleet, e-vehicles used in the past and they have not performed successfully. Due to insufficient charging stations, vehicles were used for a short time and returned. In this study, the location of the charging stations has been carefully chosen for the efficient use of electric vehicles. In addition, long battery life will be preferred by paying attention to the technology used in vehicles. Progress done up to the present (M24);

- Technical specifications are determined for the e-vehicles.
- The locations of waiting and charging points of the vehicles are determined.
- Work plans for monitoring and data transfer have been completed.

Slight deviation is expected in the purchasing process. Developed suggestions for this action are presented below:
First Alternative: Purchase and operation of vehicles by the municipality
Cost: Average 50,000 Euro to 20 Vehicles Cost 1,000,000 Euro

Second Alternative: Rental
20 electric vehicle rental services will be obtained by the municipality. In this tender which will be 24-36 months alternative, maintenance, repair, insurance etc. expenses of the vehicles will be covered by the service provider.
Cost: The cost to the municipality will be quite low compared to the purchase.

Next Milestones:
- The supply process of the vehicles will be initiated
- Application phase will be started.
- The monitoring process will be started by transferring to the whole very urban platform.

5.2.2 Risks found and corrective actions performed
A special assignment program will be established for the vehicles against the risk of active use of electric vehicles in the municipality.

5.2.3 Business model and financial scheme applied
The total expected cost for this action is € 900,000. This part, which covers only the cost of the vehicle, will be covered by Antalya Metropolitan Municipality. The municipality can also provide these vehicles with the long term rental method.

There is a budget of 9,000 € for the monitoring costs to be used after the supply of vehicles and communication costs with the web-based application. The total cost is € 12,000.

Duration: 4 years - Use in the project 3 year - Depreciation ratio: 75%

5.2.4 Citizen engagement strategy implemented
No particular participation anticipated.

5.3 Action 15: 30 e-bikes

5.3.1 Status of the intervention
Technical specifications and requirements for bikes have already been determined. After the local current government change, the new administration is expected to make a choice about different scenarios. Management evaluates the option of the alternative to
continue with e-scooters instead of using e-bikes. The final choice will be amended after the exact decision.

Slight deviation is expected in the purchasing process. Three alternatives are given below:

**First Alternative** Purchase and operation of electric bicycles entirely by the municipality
Cost: 30 EUR e-bike cost from EUR 1,200 to EUR 36,000

**Second Alternative** Rental
30 electric vehicle rental services will be obtained by the municipality. In this tender which will be 24-36 months alternative, maintenance, repair, insurance etc. expenses of the vehicles will be covered by the service provider. Cost: The cost to the municipality will be quite low compared to the purchase.

**Third Alternative** E-scooter proposal
Changing the type of transport to be taken as e-scooter is also an alternative.

### 5.3.2 Risks found and corrective actions performed

Operating conditions have already been determined for e-bike in accordance with Antalya's previous experience. New management is informed in order to minimize delays due to a change in management.

### 5.3.3 Business model and financial scheme applied

E-bike will be supplied by ANT. The decision-making process is awaited primarily for the purchase and putting into service of e-bikes.

Monitoring equipment will be provided after the purchase of the e-bike. The total cost of monitoring equipment amounts to € 12,000. € 9,000 of this budget will be covered by ANT. Duration: 4 years - Use in the project 3 year - Depreciation ratio: 75%

### 5.3.4 Citizen engagement strategy implemented

Information on the use of bicycles was shared with the non-governmental organizations in Antalya at WS1 and WS2 meetings. NGOs have provided significant support for cycling and mobility.
5.3.5 Next steps

- New management decision for the system to be used
- Supply of e-bikes or e-scooters
- Installation of monitoring equipment
- Testing
- Application
- Monitoring

5.4 Action 16: 5 e-Vehicle Charging Station

5.4.1 Status of the intervention

The studies carried out are presented below. Between 12 and 24 months, the plan changed twice. Plans, reasons for change are presented below.

First Plan:

As a result of the decisions taken in the negotiations with the municipality of Antalya, e-vehicle charging station locations were decided at different locations in the city center. In this aim, the locations determined in the picture below are presented.

As it can be seen from the Figure, an e-vehicle charging station was proposed to the new bus terminal in the Transportation Master Plan. In addition, 2 (one of the fast one normal) demo area, an existing bus station (fast), one of the city's central Muratpasa district was proposed.
In the foreground, density, dissemination and productivity were the main priorities of these proposals. However, this plan was changed upon the request of Antepe and Antalya Metropolitan Municipality and a new proposal was developed.

**Second Plan:**

In the new plan, 2 e-vehicle charging stations were taken to the roadside parking areas within the demo area. In this context, the proposal prepared by the demands of Antepe and Antalya Metropolitan Municipality is presented in the picture below.

![Figure 11. Locations of suggested e-vehicle charging stations in Demo area (Plan 2)](image)

While only one of the fast charging stations in the previous plan was in the demo area, 2 fast charging stations were included in the demo area in this plan.

**Third Plan:**

In this plan, a fast charging station in Muratpaşa were preserved within the demo area, and Konyaaltı Port and Meydan Kavağı Bus stops were added.

Another charging station, which is supposed to be in the new bus station, was cancelled considering the application time of the new bus station.
As a result of the latest interviews, e-vehicle charging station locations have been decided as shown in the picture above.

**Next Milestones:**

Supply of charging stations: Reconsidering the technical specifications for procurement of charging station units by taking into account the selected vehicles and obtaining them by tender.

Provision of monitoring equipment: Provision of monitoring equipment to be included in the monitoring system of existing municipal vehicles

Inclusion of urban platform via web interface: Making publicly accessible applications for dissemination possible.

Implementation: Application of stations by making purchases of intermediate works.

**5.4.2 Risks found and corrective actions performed**

The biggest challenge we face in planning and implementation is the long decision-making process. Administrative differences, differences in needs of the city and financially delayed implementation of municipal priority business plans.

In this sense, lagging behind the implementation time of the project will shorten the time required for monitoring. We estimate that our data may be limited due to the decrease in the collected data.
5.4.3 Business model and financial scheme applied

The budget of the Antalya municipality for this action can be summarized as given below:

E-vehicle charge station monitoring & control equipment
Eligible equipment according innovation criteria (innovative monitoring equipment)
Eligible budget: 36,750 €
Depreciation (Total Cost: 49,000 € - Duration: 4 years - Use in the project 3 year – Depreciation ratio: 75%)

Other goods
Antalya - Action 16: 5 e-vehicle charging stations (monitoring)
Electronic equipment for integrating city level PV-storage - Eligible budget: 5,000 €

Subcontract.
Antalya - Action 16: 5 e-vehicle charging stations (monitoring)
Integration and commissioning of monitoring equipment – Eligible budget: 5,000 €

5.4.4 Citizen engagement strategy implemented

Within this action tenants of ANT are enabled to use the electric cars.

5.4.5 Next steps

- Development of the vehicle booking system
- Drawing up contracts for the rental of electric cars to ANT

5.5 Action 17: 5 e-Bike Charging Station

5.5.1 Status of the intervention

The studies carried out are presented below. Between 12 and 24 months the plan changed. Reasons for change are presented below.

First Plan:

E-bike charging station locations are shown in the figure below. Planned bus station area, demo area, University Campus area, Konyaalti and Meydan stop areas e-bike charging station locations have been proposed.
Second Plan:

In this plan, the proposal prepared by the demands of Antepe and Antalya Metropolitan Municipality is presented in the picture below.
According to this plan; e-bike charging station units are located in the green band, 1 of which is a religious facility, 1 of which is a training area and 3 of which are within the study area.

Next Milestones:

Supply of Charging Stations: Reconsidering the technical specifications for procurement of charging station units by taking into account the selected vehicles and obtaining them by tender.

Provision of monitoring equipment: Provision of monitoring equipment to be integrated into the existing municipal bicycle system

Inclusion of urban platform via web interface: Making publicly accessible applications for dissemination possible.

Implementation: Application of stations by making purchases of intermediate works.

5.5.2 Risks found and corrective actions performed

The biggest challenge we faced in planning and implementation is the long decision-making process. Administrative differences, differences in needs of the city and financially delayed implementation of municipal priority business plans.

5.5.3 Business model and financial scheme applied

The budget of the Antalya municipality for this action can be summarized as given below:

Action 17: 5 e-bikes charging stations (monitoring)

5 e-bike charge station monitoring & control equipment

Eligible equipment according innovation criteria (innovative monitoring equipment)

Eligible budget: 36,750 €

Depreciation (Total Cost: 49,000 € - Duration: 4 years - Use in the project 3 year - Depreciation ratio: 75%)

5.5.4 Citizen engagement strategy

With the inclusion of URBAN in the platform, it will be ensured that the citizen participation will be increased and expanded by integrating with the existing bicycle rental system.

5.5.5 Next steps

- Purchase of bicycles and placement of charging stations
- Integration with existing system
- Establishing regulations to determine the conditions of use of electric bicycles
5.6 Action 23: 2 e-Bus Charging Station

5.6.1 Status of the intervention

The studies carried out are presented below. Between 12 and 24 months, the plan changed twice. Plans, reasons for change are presented below.

First Plan:

In the first plan, charging station locations for electric buses were determined as the bus station area of the square junction with the existing bus station area.

![Map of suggested e-bus charging stations (Plan 1)](image)

Figure 15. Locations of suggested e-bus charging stations (Plan 1)

The main objective here was to support the efficient operation of new electric buses, taking into account the planned routes. However, a new plan was prepared as a result of the discussions on the change of the plan.

Second Plan:

The electric bus charging stations are located in and around the demo area. The planned new charging stations are shown in the following figure.
The areas marked green to indicate the location of the proposed e-charging station in this plan.

**Third Plan:**

It is the same as the locations agreed on first plan.

**Next Milestones:**

Supply of Charging Stations: Reconsidering the technical specifications for procurement of charging station units by taking into account the selected vehicles and obtaining them by tender.

Provision of monitoring equipment: Provision of monitoring equipment to be integrated into the existing municipal public transport system

Inclusion in urban platform via web interface: Including public transportation system internet applications currently used.

Implementation: Application of stations by making purchases of intermediate works.

### 5.6.2 Risks found and corrective actions performed

As stated in each work item, delays in the decision-making phase constitute the greatest risk of the project.
5.6.3 Business model and financial scheme applied

The budget of the Antalya municipality for this action can be summarized as given below:

**Equipment**

Antalya - Action 23: 2 e-buses charging stations (monitoring)
2 e-bus charge station monitoring control equipment
Eligible equipment according innovation criteria (innovative monitoring equipment)
Eligible budget: 11,640 €
Depreciation (Total Cost: 15,520 € - Duration: 4 years - Use in the project 3 year – Depreciation ratio: 75%)

**Other goods**

Antalya - Action 23: 2 e-bus charging stations (monitoring)
Electronic equipment for integrating city level PV-storage - Eligible budget: 2,000 €
Subcontract.
Antalya - Action 23: 2 e-bus charging stations (monitoring)
Integration and commissioning of monitoring equipment – Eligible budget: 2,000 €

5.6.4 Citizen engagement strategy

With the operation of the system, it will be expected that the citizen will be supported to make announcements and disseminate them.

5.6.5 Next steps

- Purchase of electric buses and placement of charging stations
- Integration with existing system
- The inventory collection process will begin, as the number of miles the electric bus charge times travel with a charge within the enterprise.
6 Conclusions

This deliverable aims to increase the usage levels of the various types of electric vehicles in Antalya. In this way, the efficient use of energy sources and better air quality which is highly correlated to the use of renewable energy sources rather than the fossil fuels will be resulted.

Especially in Antalya, a city known for its natural richness and tourism which hosts millions of tourists every year, the use of e-vehicles will have a very striking effect not only on the local residents but also on the tourists. With this project, energy costs will be reduced and a traceable system will be constructed. All these developments will contribute to Antalya to become a more resilient and smarter city.

It is also to be emphasized that the individual users (both local inhabitants and tourist) will be encouraged to participate within the project. With this deliverable additionally, the use of e-vehicles will increase in Antalya and the mobility in transportation will also develops positively. Additionally, the usage of renewable energy sources in e-vehicles’ charging process will supply an increase on renewable energy sources in the city electricity network.
7 References


Antalya Metropolitan Municipality (2016). Transportation Master Plan

Antalya Metropolitan Municipality (2016). City traffic count data.