D4.8: New services on sustainable mobility in Antalya
First Version
WP 4, T 4.5.2
30 September 2019 (M24)
### Technical References

<table>
<thead>
<tr>
<th>Project Acronym</th>
<th>MAatchUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title</td>
<td>MAximizing the UPscaling and replication potential of high-level urban transformation strategies - MAatchUP</td>
</tr>
</tbody>
</table>
| Project Coordinator | Ernesto Faubel  
Ayuntamiento de Valencia  
efaubel@valencia.es |
| Project Duration | 1 October 2017 – 30 September 2022 (60 Months) |

<table>
<thead>
<tr>
<th>Deliverable No.</th>
<th>D4.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissemination Level</td>
<td>Public</td>
</tr>
<tr>
<td>Work Package</td>
<td>WP 4 – Demonstration in Antalya</td>
</tr>
<tr>
<td>Task</td>
<td>T 4.5 – Sustainable Mobility</td>
</tr>
<tr>
<td>Lead beneficiary</td>
<td>14 (ANT)</td>
</tr>
<tr>
<td>Contributing beneficiary(ies)</td>
<td>15 (SAM) 16 (DEM) 18 (TAY)</td>
</tr>
<tr>
<td>Due date of deliverable</td>
<td>30.09.2019</td>
</tr>
<tr>
<td>Actual submission date</td>
<td>30.09.2019</td>
</tr>
<tr>
<td>Estimated person-month for deliverable</td>
<td>23 PM</td>
</tr>
</tbody>
</table>
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement N°774477

<table>
<thead>
<tr>
<th>Version</th>
<th>Person</th>
<th>Partner</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Semra Engin, Metin Mutlu Aydin, Taylan Engin</td>
<td>TAY</td>
<td>06 September 2019</td>
</tr>
<tr>
<td>1.0</td>
<td>Semra Engin, Metin Mutlu Aydin, Taylan Engin,</td>
<td>TAY, SAM</td>
<td>24 September 2019</td>
</tr>
</tbody>
</table>

Disclaimer

The information reflects only the author’s view and the Commission is not responsible for any use that may be made of the information it contains.
Table of Content

Abstract ......................................................................................................................... 9

1 Introduction ................................................................................................................. 10

1.1 Purpose and target group ......................................................................................... 10

1.2 Contribution of partners ......................................................................................... 10

1.3 Relation to other activities in the project ................................................................. 10

2 State of the art and future vision related to new services on sustainable mobility in Antalya ........................................................................................................... 12

3 Technical definition of the interventions ................................................................... 14

3.1 Action 18: Management of charging systems .......................................................... 14

3.2 Action 19: 2 Multimodal Hubs ................................................................................. 14

3.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport ...... 15

3.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station ................................................................. 15

3.5 Action 22: Management of e-fleet ........................................................................... 16

4 Executive project description of each action ............................................................... 17

4.1 Action 18: Management of charging systems .......................................................... 17

4.1.1 Management structure ......................................................................................... 17

4.1.2 Technical specification ......................................................................................... 17

4.1.3 Health, safety and waste management requirements ............................................ 18

4.1.4 Risks considered ex-ante and proposed risk-mitigation measures ....................... 18

4.2 Action 19: 2 Multimodal Hubs ................................................................................. 19

4.2.1 Management structure ......................................................................................... 19

4.2.2 Technical specification ......................................................................................... 19

4.2.3 Planning of the tasks .......................................................................................... 20

4.2.4 Health, safety and waste management requirements ............................................ 20

4.2.5 Risks considered ex-ante and proposed risk-mitigation measures ....................... 20

4.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport ...... 21

4.3.1 Management Structure ......................................................................................... 21

4.3.2 Technical specifications ......................................................................................... 21

4.3.3 Planning of the tasks .......................................................................................... 21

4.3.4 Health, safety and waste management requirements ............................................ 22

4.3.5 Risks considered ex-ante and proposed risk-mitigation measures ....................... 22

4.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station ................................................................. 23

4.4.1 Management Structure ......................................................................................... 23

4.4.2 Technical specifications ......................................................................................... 23

4.4.3 Planning of the tasks .......................................................................................... 24

4.4.4 Health, safety and waste management requirements ............................................ 25

4.4.5 Risks considered ex-ante and proposed risk-mitigation measures ....................... 25

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement N°774477
4.5 Action 22: Management of e-fleet ................................................................. 26
   4.5.1 Management structure............................................................................. 26
   4.5.2 Technical specifications........................................................................... 26
   4.5.3 Planning of tasks ..................................................................................... 26
   4.5.4 Health, safety and waste management requirements.............................. 26
   4.5.5 Risks considered ex-ante and proposed risk-mitigation measures......... 27

5 Status of the intervention.................................................................................. 28
   5.1 Action 18: Management of charging systems ............................................ 28
      5.1.1 Status of the intervention .................................................................... 28
      5.1.2 Risks found and corrective actions performed ....................................... 30
      5.1.3 Business model and financial scheme applied ...................................... 30
      5.1.4 Citizen engagement strategy implemented .......................................... 31
      5.1.5 Next steps............................................................................................. 31
   5.2 Action 19: 2 Multimodal Hubs.................................................................. 32
      5.2.1 Status of intervention ........................................................................... 32
      5.2.2 Risks found and corrective actions performed ....................................... 32
      5.2.3 Business Model and financial scheme applied ...................................... 32
      5.2.4 Citizen engagement strategy implemented .......................................... 32
      5.2.5 Next steps............................................................................................. 33
   5.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport ........................................................................................................ 34
      5.3.1 Status of the intervention .................................................................... 34
      5.3.2 Risks found and corrective actions performed ....................................... 35
      5.3.3 Business model and financial scheme applied ...................................... 35
      5.3.4 Citizen engagement strategy implemented .......................................... 35
      5.3.5 Next steps............................................................................................. 35
   5.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station ................................................................................. 36
      5.4.1 Status of intervention ........................................................................... 36
      5.4.2 Risks found and corrective actions performed ....................................... 36
      5.4.3 Citizen engagement strategy implemented .......................................... 36
      5.4.4 Next steps............................................................................................. 37
   5.5 Action 22: Management of e-fleet ................................................................. 38
      5.5.1 Status of intervention ........................................................................... 38
      5.5.2 Risks found and corrective actions performed ....................................... 38
      5.5.3 Business model and financial scheme ................................................... 38
      5.5.4 Citizen engagement strategy implemented .......................................... 38
      5.5.5 Next steps............................................................................................. 38

6 Conclusions ...................................................................................................... 39

7 References ........................................................................................................ 40
List of Tables

Table 1: Contribution of Partners .................................................................................. 11
Table 2: Relation to other activities in the project ......................................................... 11
Table 3: Relation to D4.8 of the other activities in the project .................................... 102
List of Figures

Figure 1: Antalya urban transportation master plan.................................................................12
Figure 2: Gantt chart of Action 18 ..........................................................................................12
Figure 3: Locations of suggested 2 multimodal hubs ...............................................................20
Figure 4: Gantt chart of Action 19 ..........................................................................................21
Figure 5: Gantt chart of Action 20 ..........................................................................................23
Figure 6: Developed ITS application ......................................................................................25
Figure 7: Gantt chart of Action 21 ..........................................................................................25
Figure 8: Gantt chart of Action 22 ..........................................................................................28
Figure 9: Locations of suggested e-vehicle charging stations (Plan 1).................................30
Figure 10: Locations of suggested e-vehicle charging stations in Demo area (Plan 2) 31
Figure 11: Locations of suggested e-vehicle charging stations (Plan 3) ...............................32
Figure 12: Suggested integration Existing Light Rail with e-Bike Station and Bus Transport .................................................................................................................................36
Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT</td>
<td>Antalya Metropolitan Municipality</td>
</tr>
<tr>
<td>TAY</td>
<td>Taysim</td>
</tr>
<tr>
<td>DEM</td>
<td>Demir Energy</td>
</tr>
<tr>
<td>SAM</td>
<td>Sampas</td>
</tr>
<tr>
<td>SUMP</td>
<td>Sustainable Urban Mobility Plan</td>
</tr>
<tr>
<td>EV</td>
<td>Electric Vehicles</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transportation Systems</td>
</tr>
</tbody>
</table>
Abstract

This task focuses on the new services on sustainable mobility to be designed for 2 Multimodality Hub including services such as Charging Points Demand Management, integration of light rail with e-Bike station and bus transport, last mile mobility for citizens through integrated station and management of e-Fleets. The actions include developments of innovative mobility solutions and measures defined in Antalya to boost the e-Mobility in the city. The deliverable focuses on a new operating concept of intermodal mobility and on a mobility planning application oriented to regular public transport users. The project mainly aims to increase the awareness of e-vehicle use and renewable energy utilization and dissemination of public transport by applying different actions. The details of the development are shown in related chapters.
1 Introduction

1.1 Purpose and target group

This report includes Deliverable “D4.8: New services on mobility in Antalya – 1st version”, which is one of the main outcomes of Task “T4.5: Sustainable mobility” with the Subtask “ST 4.5.2: New services on sustainable mobility”. The final version of the report (i.e. D4.20) will be delivered in September 2020 (project month M36). One of the core objectives of this document is to describe the detailed design of the interventions in regard to innovative mobility solutions and measures defined in Antalya to boost the e-mobility in the city. Moreover, the project should serve as a demonstration of the utilization of sustainable technologies, the development of new business strategies and as a support of urban transformation.

1.2 Contribution of partners

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

Table 1: Contribution of Partners

<table>
<thead>
<tr>
<th>Participant</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT</td>
<td>ANT is one of the lighthouse cities of the project and work package leader of WP4.</td>
</tr>
<tr>
<td>SAM</td>
<td>SAM is an intelligent city expert of the local team in Antalya. SAM is involved in the monitoring activities and the Urban Platform developments in ANTALYA within WP4. It is also responsible for mobility actions in regard to electric vehicles, charging stations and new services on sustainable mobility.</td>
</tr>
<tr>
<td>DEM</td>
<td>DEM is a main actor in the energy actions carried out in Antalya within WP4. It is also responsible for mobility actions in regard to electric vehicles, charging stations and new services on sustainable mobility.</td>
</tr>
<tr>
<td>TAY</td>
<td>TAY is a main actor in the mobility actions carried out in Antalya within WP4.</td>
</tr>
</tbody>
</table>

1.3 Relation to other activities in the project

The main relationship of this actions (as shown in Table 2) deliverable to other activities (or deliverables) (as shown in Table 3) developed within MAtechUP and that should be considered along with this document for further understanding of its contents.

Table 2: Relation to other activities in the project

<table>
<thead>
<tr>
<th>Action</th>
<th>Relation to other Actions in the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 18</td>
<td>A22</td>
</tr>
<tr>
<td>A 19</td>
<td>A20; A21</td>
</tr>
<tr>
<td>A 20</td>
<td>A19; A21</td>
</tr>
<tr>
<td>A 21</td>
<td>A19; A20</td>
</tr>
</tbody>
</table>
Table 3: Relation to D4.8 of other activities in the project

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Relation to D4.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4.2</td>
<td>D4.5 is related to this deliverable</td>
</tr>
<tr>
<td>D4.4</td>
<td>D4.5 is related to this deliverable</td>
</tr>
<tr>
<td>D4.8</td>
<td>D4.5 is related to this deliverable</td>
</tr>
<tr>
<td>D4.14</td>
<td>D4.14 describes the detailed design of the interventions to be implemented in the city of Antalya and is the basis for all further tasks and deliverables in WP4. Therefore, D4.14 is the basis for all further tasks and deliverables in WP4.</td>
</tr>
<tr>
<td>D4.7</td>
<td>D4.7 is the outcome of WP4 task 4.5.1 and describes deployment of electrical vehicles and charging infrastructure in Antalya. Therefore, D4.7 and D4.8 together provide a complete overview on mobility interventions.</td>
</tr>
<tr>
<td>D5.x</td>
<td>The objective of WP5 “Technical, social and economic evaluation” is to setup a strong evaluation framework to be deployed in each lighthouse city with the aim to assess the effectiveness of the proposed intervention, deployed in the associated individual actions. Therefore, D4.8 is linked to WP5 deliverables.</td>
</tr>
<tr>
<td>D6.x</td>
<td>The objective of WP6 “Exploitation and market deployment – innovative business models” is to design innovative business models and financial mechanisms to foster the implementation of smart city solutions, to identify exploitable results and to design an ad hoc strategy for their deployment and replication. Therefore, D4.8 is linked to WP6 deliverables.</td>
</tr>
</tbody>
</table>
2 State of the art and future vision related to new services on sustainable mobility in Antalya

With around 2.4 million inhabitants, the historical city of Antalya is the 5th largest city in Turkey. Located on the Mediterranean, in the south-west of the country, it is a well-known international touristic destination and has been the tourism capital of Turkey. By 1993, Antalya became a Metropolitan Municipality. As an international showcase city, Antalya looks forward to achieve sustainable local development by providing a high quality of life, skilled employment and competitive service, agricultural and clean industries.

The 2015-2019 Strategic Plan of the Metropolitan Municipality envisions Antalya to have a transparent, participatory and efficient administration dedicated to its cultural, historical and ecological heritage. Despite its rapid growth in urban migration, its local government is aware of the need to protect the city’s and its hinterland's natural, ecological and historical endowments. Moreover, it wants to transform the city by letting it be a smart service hub of the region, modernizing its agricultural sector and maximising its resource efficiency while diversifying the tourism sector.

According to Antalya Mobility Master Plan, Antalya Metropolitan Municipality is presently involved in the preparation of a revised Mobility Master Plan. The new plan that is being prepared to create a sustainable mobility plan for the fast growing city, and will aim to expand pedestrian and bike infrastructures in Antalya, create new public transportation...
routes, smarten the transportation management system, increase the Municipality use of electric vehicles, both service and buses, prepare for the connection of Antalya to the national high speed train network and, in general, try to decarbonize urban transport. Stakeholders are widely consulted for the Plan which is aimed to be "human oriented" and not machine centred, as announced by the Municipality.

Mobility in Antalya is basically focused on electric and diesel fuel consumption. In this sense, the most part of the transportation systems is diesel-fuelled, i.e., taxi, school-work services and pick-up buses. Nevertheless, it is remarkable that the private vehicle and pedestrian are the most used transport modes. Objective of the municipality is to reduce these numbers with the aim of avoiding CO₂ and increase the sustainable mobility in the city. Regarding mobility, a new fleet of electrical vehicles will be deployed with the corresponding charging points, complemented by services for sustainable mobility.

MArchUP is an additional module to implement specific measures in order to shape the future vision of Antalya as a smart and innovative city as basis for a sustainable way of living.

Focusing on sustainable mobility services, the following MArchUP actions are key components of this deliverable D4.8:

- Action 18 – Management of charging systems
- Action 19 – 2 Multimodal Hubs
- Action 20 – Integrating Existing Light Rail with e-Bike Station and Bus Transport
- Action 21 – Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station
- Action 22 – Management of e-fleet

The implementation of the aforementioned actions contributes to the achievement of the objective to strengthen the mobility services for citizens in the environmental alliance.
3 Technical definition of the interventions

3.1 Action 18: Management of charging systems

The integration of data coming from the monitoring equipment of the Action 16 and Action 17 will be developed under this action in order to feed the Antalya urban platform. Besides, with the information that comes from the monitoring system, a demand management service will be implemented as an urban platform service with the objective of optimally managing the charging demand from the EV and charging systems. In this way, the service will provide smart charging functionalities to the stakeholders, including scheduling and billing activities in order to perform demand management operations to optimize the use of the grid. During the project period, a demand management service will be implemented as an urban platform service with the objective of optimally managing the charging demand from the EV and charging systems (including 5 e-vehicles and 5 e-bikes charging stations).

The selection of optimum charging station types will be determined by considering most suitable model for management, city conditions and characteristics. For this purpose, technical criteria for charging stations will be determined by evaluating optimum battery characteristics, investment cost, operating cost, etc. According to predicted operating and management conditions, the determination of effective charging stations will be done according to the technical criteria. Specially, the cost / benefit index studies will be conducted for the determination of optimum charging stations. Additionally, suitable monitoring and management systems will be searched for the selected charging stations’ physical structure.

Utilization of charging systems will result in lower CO₂, air pollutant emissions and reduction in energy costs. On the other hand, utilization of charging systems will result an increase on energy efficiency, environmental awareness for the utilization of all e-vehicle types (Including e-buses and e-bikes). To supply quality charging systems and effective operation and management will increase the utilization all e-vehicle types (Including e-busses and e-bikes), public acceptance all e-vehicle types, sustainability use of all e-vehicle types. It will also contribute to transportation authorities' strategic plan on e-vehicles and the utilization of e-vehicles.

3.2 Action 19: 2 Multimodal Hubs

This innovative concept will increase the capability of the city in terms of sustainable mobility. Then, 2 multimodal hubs will be built in city center and Kepez Santral zones. These multi modal hubs will allow the shift between sustainable public transports such as e-Buses and e-Bikes, including EV chargers. The ultimate goal is to allow citizens to use sustainable mobility in the daily journeys.

In this action, a demand management service will be implemented as an urban platform service with the objective of optimally managing the charging demand from the EV and charging systems. The selection of optimum charging station types and e-vehicles will be conducted to determine most suitable model for management, city conditions and selected hubs. Additionally, technical criteria for charging stations and e-vehicles will be
conducted to determine optimum battery characteristics, investment cost, operating cost, etc. According to predicted operating and management conditions, the determination of effective charging stations and e-vehicles will be done according to the technical criteria. On the other hand, the cost / benefit index studies will be conducted to the determination of effective 2 multimodal hubs such as e-Buses and e-Bikes. Hence, suitable monitoring and management systems will be done for the selected two multimodal hubs.

Utilization of charging systems and e-vehicles will result in lower CO$_2$, air pollutant emissions and reduction in energy costs. This action will also supply, an increase on energy efficiency, environmental awareness for the utilization of all e-vehicle types (Including e-buses and e-bikes) and multimodal hubs. Therefore, it results increase the capability of the city in terms of sustainable mobility, the shift between sustainable public transports such as e-Buses and e-Bikes, including EV chargers, the utilization of sustainable mobility in the daily journeys, public acceptance all e-vehicle types (Including e-buses and e-bikes).

### 3.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport

Following the same concept of multimodal hubs, this action treats the integration of a shift station where citizens would be capable of shifting between light rail public transport, e-Bike station (including the chargers) and bus transport stations inside the Kepez Santral urban transformation region. Both will be integrated providing sustainable mobility to the citizens.

The integration of light rail with e-bike station and bus transport treats the integration of a shift station where citizens would be capable of shifting between light rail public transport, e-Bike station (including the chargers) and bus transport stations inside the Kepez Santral urban transformation region (demo area). Both will be integrated providing sustainable mobility to the citizens. With the help of this integration, modal hubs will allow the shift between sustainable public transports such as light rail, e-Buses and e-Bikes and Light Rail with e-bike station and bus transport will be examined and evaluated.

Utilization of e-vehicles utilization and charging systems will also result in lower CO$_2$, air pollutant emissions and reduction in energy costs. Utilization of charging systems and e-vehicles will result an increase on energy efficiency, environmental awareness for the utilization of all e-vehicle types (Including e-buses and e-bikes) and multimodal hubs.

### 3.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station

According to the Action 20, this Intelligent Transport System will be implemented into the Antalya urban platform with the objective of providing citizens with a service for last mile delivery by means of shifting between rail and e-Bikes. This service will also allow the shifting between fossil fuel vehicles towards e-Bikes. In this way, the action will contribute to the reduction of energy consumption by reducing the use of fossil vehicles, noise levels, pollution and traffic congestion.
According to the project aim, this Intelligent Transport System (ITS) will be implemented into the Antalya urban platform with the objective of providing citizens with a service for last mile delivery by means of shifting between light rail station and e-Bikes. To determine the performance of this integration and supply necessary information for citizens, new functionalities in Antalya urban platform will be developed. This platform will have an objective to apply data statistics of e-Bikes and light rail integration so as to determine the performance of integration. For this action, there is no need of many specifications. Because this platform needs e-Vehicles and e-charger utilization data. After all of the purchases completed utilization data will be collected and then all information will be summarized and shared in this platform for the authorities and citizens.

3.5 Action 22: Management of e-fleet

Through the data monitored from the e-vehicles, a new service on top of the urban platform will be developed with two objectives: management of the e-fleet and optimally manage the charging activities for this e-fleet. In this sense, the manager will be able to schedule the charging and circulation of the e-fleet with the goal of maximizing the battery use.

Additionally, 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 e-Vehicles into the municipality fleet. Management of e-Fleets will complement the e-buses one 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 Executive project description of each action

4.1 Action 18: Management of charging systems

4.1.1 Management structure

The action is led by TAY with contributions from SAM and DEM. ANT coordinates overall management plans and all management plans within the structure of the project.

4.1.2 Technical specification

Action 18 examines the progress the integration of data coming from the monitoring equipment of the Action 16 and Action 17 will be developed under this action in order to feed the Antalya urban platform. Besides, with the information that comes from the monitoring system, a demand management service will be implemented as an urban platform service with the objective of optimally managing the charging demand from the EV and charging systems. In this way, the service will provide smart charging functionalities to the stakeholders, including scheduling and billing activities in order to perform demand management operations to optimize the use of the grid.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q5</td>
</tr>
</tbody>
</table>

Figure 2: Gantt chart of Action 18

(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 to until end of year 5: Analysis process (M2)
4.1.3 Health, safety and waste management requirements

No Health, safety and waste management requirements

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

There is no significant risk for management charging stations. Attention shall be paid to keep the waiting areas wide within the land use characteristics.
4.2 Action 19: 2 Multimodal Hubs

4.2.1 Management structure

This innovative concept will increase the capability of the city in terms of sustainable mobility. Then, 2 multimodal hubs will be built in city center and Kepez Santral zones. These multi modal hubs will allow the shift between sustainable public transports such as e-Buses and e-Bikes, including EV chargers. The ultimate goal is to allow citizens to use sustainable mobility in the daily journeys. With the help of this multimodal planning and determined route, transportation connection between demo area and city center will be supplied by integrating new, sustainable and different transportation modes. The technical specifications (technical standards for purchasing) for e-Bikes, e-Bike charging stations, e-Bus and e-Bus chargers are completed. This action is carried out by ANT. The placement of the multimodal hubs is planned by TAY considering bus routes and minimum distance conditions.

4.2.2 Technical specification

In the scope of the project, Light Rail with e-Bike Station and Bus Transport will be supplied. Technical specifications for ANT are listed as follows:

- Determination of multimodal hubs
- Delay and queue analysis according to multimodal hubs
- Choosing the right location for multimodal hubs
- Monitoring and reporting

![Figure 3: Locations of suggested 2 multimodal hubs](image-url)
4.2.3 Planning of the tasks

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 Q2 Q3 Q4</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Q5 Q6 Q7 Q8</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4: Gantt chart of Action 19**

(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 5: Analysis process (M2)

4.2.4 Health, safety and waste management requirements

No Health, safety and waste management requirements

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

- Complex coordination of partners
- Evaluation of the design concept from the different point of views (marketing, urban design, cooperate design)
- Building of multimodal hubs
4.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport

4.3.1 Management Structure

The action is led by ANT in cooperation with TAY and SAM. The integration of light rail with e-bike station and bus transport treats the integration of a shift station where citizens would be capable of shifting between light rail public transport, e-Bike station (including the chargers) and bus transport stations inside the Kepez Santral urban transformation region (demo area). Both will be integrated providing sustainable mobility to the citizens. With the help of this integration, modal hubs will allow the shift between sustainable public transports such as light rail, e-Buses and e-Bikes. The integration will be determined by using all current data. Additionally, determining process of technical specifications (technical standards for purchasing) for e-Bikes and e-Bus will be done according to the project calendar. After completing prepare technical standards and purchase all vehicles and chargers, the integration performance of Light Rail with e-bike station and bus transport will be examined and evaluated.

4.3.2 Technical specifications

The location design of the Integrating Existing Light Rail with e-Bike Station and Bus Transport has already been determined. Technical characteristics of the stations will be clarified according to the alternatives whether the vehicle to be used by the administration is bicycle or scooter.

4.3.3 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>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 (1)</td>
<td>Q5 (1)</td>
<td>M1 (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2 (1)</td>
<td>Q6 (1)</td>
<td>M2 (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3 (1)</td>
<td>Q7 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 (1)</td>
<td>Q8 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5: Gantt chart of Action 20

(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 end of year 3: Monitoring and Data collection process (M1)
In the beginning of year 4 to end of year 5: Analysis process (M2)

4.3.4 Health, safety and waste management requirements

No Health, safety and waste management requirements

4.3.5 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.
4.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station

4.4.1 Management Structure

The action is led by ANT in cooperation with TAY and SAM. According to the project aim, this Intelligent Transport System (ITS) will be implemented into the Antalya urban platform with the objective of providing citizens with a service for last mile delivery by means of shifting between light rail station and e-Bikes. This service will also allow the shifting between fossil fuel vehicles towards e-Bikes. In this way, the action will contribute to the reduction of energy consumption by reducing the use of fossil vehicles, noise levels, pollution and traffic congestion.

4.4.2 Technical specifications

To determine the performance of this integration and supply necessary information for citizens, a new Antalya urban platform will be developed. This platform will have an objective to apply data statistics of e-Bikes and light rail integration so as to determine the performance of integration. For this action, there is no need many specifications. Because this platform needs e-Vehicles and e-charger utilization data. After all of the purchases completed utilization data will be collected and then all information will be summarized and shared in this platform for the authorities and citizens.
4.4.3 Planning of the tasks

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>(1)</td>
<td>Q5</td>
<td>Q8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>(1)</td>
<td>Q6</td>
<td>(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>(1)</td>
<td>Q7</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>(1)</td>
<td></td>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>(1)</td>
<td></td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Developed ITS application.

Figure 7: Gantt chart of Action 21
(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 5: Analysis process (M2)

4.4.4 Health, safety and waste management requirements

Not applicable

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

Meetings are held to speed up the decision process of the new local government.
4.5 Action 22: Management of e-fleet

4.5.1 Management structure

The action is led by ANT in cooperation with TAY and SAM. Through the data monitored from the e-buses, a new service on top of the urban platform will be developed with two objectives: management of the e-fleet and optimally manage the charging activities for this e-fleet. In this sense, the manager will be able to schedule the charging and circulation of the e-fleet with the goal of maximizing the battery use. The manager will be able to schedule the charging and circulation of the e-fleet with the goal of maximizing the battery use. Additionally, 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 e-Vehicles into the municipality fleet. Management of e-Fleets will complement the e-buses one in increasing the public sustainable mobility.

4.5.2 Technical specifications

E-vehicles will be fully monitored and integrated into the Antalya urban platform in order to extract aggregated data to evaluate the sustainability. In current situations, the technical specifications (technical standards for purchasing) for e-vehicles of fleet will be done. Because there are limited company that produces e-vehicles and chargers in Turkey. For this reason, many products of different companies are examining and evaluate to determine most economic and quality e-Vehicles and chargers from all over the world.

4.5.3 Planning of tasks

![Gantt chart of Action 22](image)

Figure 8: Gantt chart of Action 22

(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 5: Analysis process (M2)

4.5.4 Health, safety and waste management requirements

Not applicable

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

None
5 Status of the intervention

5.1 Action 18: Management of charging systems

5.1.1 Status of the intervention

The studies carried out after the 12th month reporting 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, electric vehicle charging station locations were decided to be made at different locations in the city center. In this context, the locations determined in the picture below are presented.

Figure 9: Locations of suggested e-vehicle charging stations (Plan 1)

As it can be seen from the figure, 1 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, 1 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 Antep 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 10: Locations of suggested e-vehicle charging stations in Demo area (Plan 2)

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, 1 fast charging station and Muratpaşa, existing bus station stations 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.
Figure 11: Locations of suggested e-vehicle charging stations (Plan 3)

As a result of the latest interviews, electric vehicle charging station locations have been decided as shown in the picture above.

Next Milestones (M36):

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.

5.1.2 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.

5.1.3 Business model and financial scheme applied

Electronic equipment for integrating city level PV-storage - Eligible budget: 5,000 €

Integration and commissioning of monitoring equipment – Eligible budget: 5,000 €
5.1.4 Citizen engagement strategy implemented

Within this action tenants of ANT are enabled to use the electric cars and their charging stations

5.1.5 Next steps

Development of the e-charging booking system
5.2 Action 19: 2 Multimodal Hubs

5.2.1 Status of intervention

Selection of the most promising mobility hub regarding different aspects (quality of public transport, accessibility for e-buses, e-bikes suitability as a pilot project, suitability for upscaling process, …)

- Technical specifications are determined
- The locations of waiting and charging points of the vehicles are determined.
- The type of data to be collected from the vehicles and will be used in the analysis were determined.
- Work plans for monitoring and data transfer have been completed.

The bus stop area with the Meydan Kavağı bus stop is designated as the application area. For this purpose, a system that will integrate light rail system, electric bicycle, electric bus, standard bus and special vehicle components is planned. Current plans will be prepared with the current map supply of the areas.

Next Milestones (M36):
- The supply process of the vehicles will be initiated
- Monitoring equipment will be installed on vehicles
- Data transfer tests will be performed.
- Application phase will be started.

5.2.2 Risks found and corrective actions performed

A special assignment program will be established for the vehicles against the risk of multimodal hub.

5.2.3 Business Model and financial scheme applied

- Further grand applications planned for more mobility hubs
- Further expenses covered by own capital resources

5.2.4 Citizen engagement strategy implemented

- Better access to public transportation, also to sharing economy
- Less space necessary for private parking: livable design of the urban space
- Change of the modal split; less (private) car traffic; more green modes of transport,
- Modify the entrenched pattern of mobility,
- Raise the public acceptance of mobility.
- Enhance the multimodal and environmentally-friendly transport behaviour
- Mobility hub as a point of social meeting with high quality
- Increased accessibility to areas which are poorly serviced by the public transportation
5.2.5 Next steps

- New management decision for the system to be used
- Installation of monitoring equipment
- Application
- Monitoring
5.3 Action 20: Integrating Existing Light Rail with e-Bike Station and Bus Transport

5.3.1 Status of the intervention

The integration was determined by using all current data but to determine final location study is still continuing. Additionally, determining process of technical specifications (technical standards for purchasing) for e-Bikes and e-Bus are still continue according to the project calendar. After completing purchase all vehicles and chargers, the integration performance of Light Rail with e-bike station and bus transport will be examined and evaluated.

In line with the new planning, the light rail route in the demo area was changed by the municipality. Meetings were held with Antalya Metropolitan Municipality in order to develop solutions for this new situation and new alternatives were produced. There is a possibility that the planned light rail system within the demo area will rather be converted from light railway to public minibus system or other motorized transport method in accordance with the plans of the new local government. The final decision will yet to be made by the municipality. Either of the solution, the integration of different transportation methods as described in the action will be provided.

In this context; Multimodal Hubs areas planned in 2 areas, the 1st suggestion site within the demo area was changed in consultation with the administration. It is planned to move the area to the north of the demo area, which is currently a triage area, by making a new planning. Efforts are underway to ensure that the electrical infrastructure is appropriate and applicable to this situation.

Figure 12: Suggested integration Existing Light Rail with e-Bike Station and Bus Transport
5.3.2 Risks found and corrective actions performed

A special assignment program will be established for the vehicles against the risk of integration

5.3.3 Business model and financial scheme applied

- Further grand applications planned for integration
- Further expenses covered by own capital resources

5.3.4 Citizen engagement strategy implemented

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

5.3.5 Next steps

- Purchase of e-buses, e-bikes and placement of charging stations
- Integration with existing system
- The inventory collection process will begin, as the number of miles and charge times of a travel with a charge within the enterprise.
5.4 Action 21: Last Mile Delivery for Citizens via Integration of e-Bike Station with the Light Rail Station

5.4.1 Status of intervention

To determine the performance of this integration and supply necessary information for citizens, new functionalities in Antalya urban platform will be developed. This platform will have an objective to apply data statistics of e-Bikes and light rail integration so as to determine the performance of integration. For this action, there is no need many specifications since this platform needs e-Vehicles and e-chargers utilization data. After all purchases are completed, utilization data will be collected and then all information will be summarized and shared in this platform for the authorities and citizens. To work on this action will began after completed all related previous actions. Additionally, there are some issues as given below:

- There are some ITS applications, especially in Public Transportation.
- There are Public Transport Data (Supplied from Smart Cards for Fare Payment).
- In the scope of the project, Antalya Metropolitan Municipality will be developed a city council system to supply all current (new) data for users.

There is a possibility that the planned light rail system within the demo area will rather be converted from light railway to public minibus or other motorized transport method in accordance with the plans of the new local government. Last mile application is planned to be implemented in the demo area. If the light rail system is changed, the alternative transport method for the rail system would be the continuation of the system, which is currently the last stop north of the demo area. According to our new proposal, electric bicycle station area planning is made at the last stop of the rail system. Plans will be updated by TAY with the overlap of the current and proposed situation. In order to make the electrical infrastructure suitable and applicable to this situation, TAY studies will continue with DEM.

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 Citizen engagement strategy implemented

- Better access to public transportation, also to sharing economy
- Less space necessary for private parking: livable design of the urban space
- Change of the modal split; less (private) car traffic; more green modes of transport,
- Modify the entrenched pattern of mobility,
- Raise the public acceptance of mobility.
- Enhance the multimodal and environmentally-friendly transport behaviour
- Increased accessibility to areas which are poorly serviced by the public transportation
- Marketing for sustainable and socially viable mobility due to a visible infrastructure element in public transport areas.
- Beneficial effects on environment by reducing external factors (noise, emission, traffic jam).

5.4.4 Next steps

- Installation of monitoring equipment
- Monitoring
5.5 Action 22: Management of e-fleet

5.5.1 Status of intervention

Progress done from D4.1 Action Card:

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 one (Action 13) in increasing the public sustainable mobility. Similarly, these e-vehicles will be fully data to evaluate the sustainability.

In the municipal fleet, e-vehicles used in the past 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. Up to the present;

- The waiting and charging points of the vehicles are determined.
- The data to be collected from the vehicles were determined.
- Work plans for monitoring and data transfer have been completed.

Next Milestones (M36):

- The supply process of the vehicles will be initiated
- Monitoring equipment will be installed on vehicles
- Monitoring and data transfer tests will be performed.
- The monitoring process will be started by transferring to the whole very urban platform.

5.5.2 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.

5.5.3 Business model and financial scheme

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%

5.5.4 Citizen engagement strategy implemented

No particular participation anticipated.

5.5.5 Next steps

- Installation of monitoring equipment and Monitoring
6 Conclusions

Mobility choices affect the environment in several ways, directly and indirectly. Choice of travel mode and amount of travel have a large direct impact on the total emissions of a trip. The amount of travel comprises the overall mileage travelled, including number of trips, trip distance and duration. A large impact is also due to vehicle characteristics, such as powertrain and size. In addition, several situational factors affect the level of emissions produced.

All these mobility deliverables in the project aim at giving a broad overview on innovative solutions and measures to boost the e-mobility in the city. The focus lies on a new operating concept of intermodal mobility and on a mobility planning application oriented to regular public transport users. The combined actions were carried out through a strong cooperation between MA前瞻 partners ANT, TAY, DEM and SAM from various branches and with different competences.

In Antalya; which hosts millions of tourists every year, the use of electric vehicles will have a very different effect on the tourists. With this project, energy costs will be reduced and a traceable system will be constructed. All these developments in management of public transportation and e-vehicles and their substructure will contribute to Antalya becoming a European city.

It is also thought that individual users will be encouraged within the project. With this deliverable additionally, the use of electric vehicles and public transport effectiveness in Antalya is expected to increase and the mobility develops positively.
7 References


Antalya Metropolitan Municipality (2016). Transportation Master Plan
