CLICK Requirements and Targets

D2.1 – CLICK Requirements and Targets

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Abstract

The aim of USER-CHI work package 2 is to design, specify, implement and test a decision support system for the planning of charging infrastructure called “Charging Infrastructure LocatIon and HolistiC Planning Kit (CLICK)”. CLICK will be an easy to use question-and-answer online tool for the top-down location planning for charging infrastructure, whose purpose is to optimise location planning for new charging infrastructure in cities and TEN-T corridors.

Within task 2.1, the cornerstones of CLICK are set and elaborated. The aim was, to set the major building blocks of CLICK for the upcoming tasks in WP2. The first step towards this planning kit was to collect goals and requirements of the USER-CHI partners and pilot cities as well as their experience in the process of location planning for charging infrastructure.

The results of interviews and workshops are documented in the present document. They are outlined in the “4+1 View Model of Software Architecture” as a high-level specification of CLICK. Based on the findings of T2.1 and the cornerstones outlined in this document, the software tool CLICK will be specified in terms of functionality, algorithms and interfaces in the upcoming task T2.2.

Keywords

CLICK, Holistic Planning, Charging Location Planning, Decision Support System, High-Level Specification, High-Level Architecture, Goals, Targets, Requirements

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1 Introduction

1.1 Purpose of the Document

With the present deliverable D2.1 “CLICK Requirements and Targets”, the results of the work carried out in Task 2.1 are documented.

T2.1 has gathered the current situation, data available and targets of the project partners and pilot cities with regard to the planning platform CLICK. Based on this, the requirements for planning of charging infrastructure locations and technology were derived. Basic constraints have been discovered. With the work done, the core components of the location and holistic planning kit software (backend and frontend) were outlined. The requirements of the main user group of city planners and municipality planning departments were collected and special user groups as housing companies and planners of charging point operators (CPO) were taken into account as potential users of CLICK.

1.2 Scope of the Document

Based on previously executed tasks, within T2.1 the cornerstones of CLICK are set and elaborated. The aim of D2.1 is therefore, to set the major building blocks of CLICK for the upcoming tasks in WP2.

Based on the findings of T2.1 and the cornerstones outlined in this document, the software tool CLICK will be specified in terms of functionality, algorithms and interfaces in the upcoming Task T2.2. The information were collected from previous works within the USER-CHI project and enriched with information gathered throughout multiple interviews and pilot specific workshops with project partners. The results are documented using the “4+1 View Model of Software Architecture”. This view model is used throughout several work packages of the project in order to specify software components. Since the current Task 2.1 will be followed by the specification of CLICK, some aspects of the model are not fully covered yet.

1.3 Structure of the Document

The present document consists of three major parts:

The following chapter 2 “Methodology: The 4+1 View Model of Software Architecture” outlines the methodology chosen for the high-level specification of CLICK, “The 4+1 View Model of Architecture”.

Chapter 3 outlines the fundament and history of CLICK as well as the result of the information gathering process throughout workshops and interviews. It therefore collects the requirements and targets.

Chapter 4 applies the 4+1 View Model to the findings of the above mentioned process. It outlines the results of the high-level specification and results in more specific use cases as a base for the upcoming specification.

Chapter 5 summarizes the findings and draws the outlook.

1.4 Connection to Other Tasks

Task 2.1 builds upon Work Package 1, the analysis of user needs and patterns for requirements definition, especially

- the user requirements gathered in Task 1.1,
- the usage scenarios gathered in Task 1.2,
- the technical and legal requirements gathered in Task 1.3.

Furthermore, so called Product Cards were collected per pilot site and product during the work package containing valuable information for the specification of the different products.

Task 2.1 summarizes these findings and outlines the high-level architecture of CLICK.

It therefore is the base for the specifications of functionalities, frontends, backends, algorithms and interfaces of CLICK within task 2.2 and all further tasks in WP2.

2 Methodology: The 4+1 View Model of Software Architecture

The following chapter outlines the methodology used for the high-level specification of CLICK.

2.1 Introduction in the 4+1 View Model

For the specification of Software, the "4+1 View Model of Software Architecture"[1] is an often used methodology, which was also chosen in the context of USER-CHI for the specification of other software products. Therefore, this methodology will also be applied for the specification of CLICK in the upcoming Task 2.2. Since the current task with its requirements and targets is seen as a high-level specification phase, the 4+1 View Model will already be used to structure the findings and results. Due to the high-level of specification, some aspects of the model will not be fully developed at this stage and will be further elaborated and specified during Task 2.2.

The 4+1 View Model defines a set of views that address different perspectives of different stakeholders and in combination aim at fully describing a software architecture.

The following Figure 1 shows the different views defined in the model:

(1) The logical view / logical architecture that describes the object model.

(2) The process view that describes concurrency and synchronization aspects of the design.

(3) The physical view that reflects the deployment of the software onto hardware.

(4) The development view, which describes a static organization of the software in its development environment.

These views are partially completed and partially derived by a fifth view, the so called scenario view, which illustrates the design decisions. Within the proposal of the 4+1 View Model in [Kruchten], the model is described in a generic way and the notations and tools used to describe the architectures are let open to the architect. For the current phase of CLICK, the high-level architecture specification, a mix of the Unified Modelling Language (UML) and the Business Process Model Notation (BPMN) is used in order to follow the general ideas of the 4+1 View Model in preparing the upcoming task.

[1] See [Kruchten].

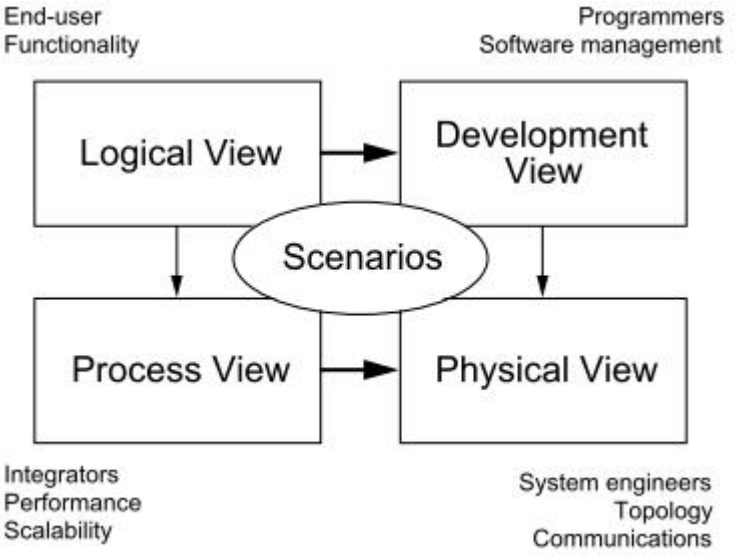

Figure 1 4+1 View Model (source: [Kruchten] Figure 1)

2.2 The Fifth View: from Scenarios to Use Cases

The fifth view of the above described 4+1 View Model uses so called user stories that bring together the first four views in a vivid way. Within Task 1.2, user stories were developed for all products of the project in a user driven approach. In this Task 2.1 these user stories are split and advanced in use cases which further detail the CLICK system from the user perspective as will be shown below.

2.2.1 Use Cases Concept

A use case is a technique for capturing potential requirements of a new system. Each use case provides one or more action flows indicating how the system should interact with the user or with another system to achieve a specific goal. In other words, a use case is a sequence of interactions that will take place between a system and its actors in response to an event that a main actor initiates on the system itself. The definition of use cases is the first step to define how the CLICK platform should be implemented and what actually should be demonstrated during the project. They define and illustrate the scope of each CLICK functionality and describe how the system will interact with users and other systems.

2.2.2 Use Case Definition Methodology

While different approaches for the definition of use cases exist, for the current task the following methodology was chosen in order to present and document the use cases: Each use case is defined and documented in a dedicated use case table. The specification of each use case always follows the same format:

- Use Case Title: Identification code and descriptive name/title of the use case.
- Short description: Summary of the use case.
- Stakeholders: Anyone or anything that performs a behaviour (who is using the system). A use case defines the interactions between external stakeholders and the system under consideration to accomplish a goal. The stakeholders can be either natural persons or system stakeholders.
- Pre-conditions: Refer to the state of the system and its environment that is required before the use case can be started. It can be helpful to use preconditions to clarify how the flow of events starts.
- Trigger: This is the event that causes the use case to be initiated.
- Flow of events: The description of the normal, expected path through the use case ("Happy Flow"). This is the path taken by most of the users most of the time.
- Expected results: Shows the expected outcomes after the use case execution.

The following Table 1 shows the template table for the use case definition in chapter 4.5.

Use Case	CL-1:
Short Description	•
Stakeholders	•
Preconditions	•
Trigger	•
Flow of Events	•
Expected Results	•

Table 1 Use Case Template Table

3 Foundation for the Application of the 4+1 View Model

The following chapter outlines the foundation of CLICK and the results obtained in workshops and interviews during Task 2.1. First, an introduction on the scope and historical background on the product is given, following by the results of the interviews and workshops. The information collected in this chapter set the base for the application of the 4+1 View Model in the following chapter 4.

3.1 CLICK Goals and Background

CLICK will be an easy-to-use question-and-answer online tool that supports location planning for charging infrastructure in cities and is based on a guided step-by-step process. Its purpose is to optimize the location planning for electric vehicle supply equipment (EVSE) in urban areas. It is organized in a top-down demand oriented approach, i.e. based on expected demand in urban areas, an recommendation of amount and locations for charging infrastructure is derived.

The process matches user needs, preferences and habits, the existing charging technologies, and typologies available in the market, the location, amongst other aspects.

The results generated by CLICK address proposed locations, preferred technologies as well as the number of charging points needed, amongst other factors.

Furthermore, the CLICK platform will enable a post-planning monitoring process by offering interfaces to be fed with actual utilization data of EVSE. This aims at fostering the demand-oriented expansion of the charging infrastructure network.

The CLICK Platform will be made available online as an internet service. CLICK will consist of a web-frontend for interaction with the urban planner and for presenting the results, and a backend that stores knowledge, runs the calculations and derives the recommendations.

CLICK is designed to provide a top-down location planning. This means, the scope of the planning is to derive a recommendation for the provision of charging infrastructure on an area by area level, dividing the area into cells and giving a recommendation on number of charging stations and type of charging stations within the cells. A fine placement of charging infrastructure (e.g. in which exact location within a street) is not within the scope of CLICK.

The requirements and targets for CLICK build upon a wide range of input. First, the foundations of CLICK lay in a decision support system (DSS) used for the creation of the location concept for charging infrastructure for the city of Berlin in 2013. This was a professional simulation based tool that required a high amount of sophisticated input data as well as much local experience and data sources.

In contrast, CLICK will be an easy to use online tool for the generation of charging infrastructure location concepts in various surroundings. The knowledge and experience gained in the past as well as the boundaries of this legacy planning system was evaluated as well as adapted to the new situation:

The work carried out in USER-CHI WP1 is used to gain the specific requirements of CLICK. One aim of this current task is to collect the requirements and targets and consecutively set up the high-level architecture of CLICK in order to lay the foundation for the specification in Task 2.2.

Within the requirement specification phase in Task 1.3, the VOLERE methodology[2] and an Online-Tool were used in order to derive requirements for all USER-CHI products.

49 of the requirements addressed the product CLICK, whereof 30 addressed functional and data requirements, seven the scope of CLICK, three each the users as well as legal requirements, two the purpose, and one each cultural and political requirements, look and feel, performance and the scope of the work.

From the requirements, the users, use cases, barriers and functional building blocks mentioned below are derived.

3.2 Users of CLICK

The aimed users of CLICK are divided into two user groups:

First, the users that have a city-wide or area-wide view on charging infrastructure. The main targeted group are urban planners in cities planning departments that generate charging infrastructure master plans on a city-wide or area-wide scale. The user group of cities administrations mostly has a public service focus combined with a “best value for money” directive. Their goal typically is to provide a basic coverage with charging infrastructure to be accessible and available non-discriminatory of all citizens.

Furthermore, charging point operators (CPO) could be potential users in this first user group, whose goal is to implement charging infrastructure in the most relevant spots in cities and areas according to the demand. They usually have a business focus with a positive return-on-investment ratio.

A second user group are area owners that plan on providing charging infrastructure on private grounds or semi-public grounds. Those users can be (as are partners in the project) housing companies that want to provide charging infrastructure for their renters within their premises. Further potential users could be shopping mall or garage operators that want to attract customers and do not charge for the energy provision. A third example are other area owners, that want to build a clear business model on providing charging infrastructure on their premises. Within this user group of area owners, the intentions and the drivers – as well as the requirements and targets – vary from user to user.

[2] See [Volere] based on [Robertson].

The product CLICK targets a productive use within cities throughout Europe. Within the project lifetime it will be tested and showcased by all pilot partner cities:

- Area Metropolitan of Barcelona, Spain
- Berlin, Germany
- Budapest, Hungary
- Rome, Italy
- Turku, Finland

While all five partner cities of the USER-CHI project aim at testing and using the product, for the replication cities Florence and Murcia the implementation of a planning process using CLICK has a second priority within the project.

As for other user groups, within the project housing companies in the pilot sites and the CPO qwello are interested in using CLICK. The specification of CLICK therefore focuses on the additional demand of these user groups.

3.3 Common Planning Aspects within the Pilot Cities

The core functionality of CLICK, the location planning of charging infrastructure with a city-wide scope e.g. for a charging infrastructure masterplan is planned to be conducted in all five pilot sites.

	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
city wide application	✓	✓	✓	✓	✓
contributing partner	AMB	VMZ / SenUVK (associated)	BUD	RSM	TUR

Table 2 City-wide Location Planning within Pilot Cities

Following the development of EVSE deployment and extension, one important aspect of the location planning is the inclusion of the private and semi-public space in the planning. In many cities, a shift of scope from the usage of public space to the inclusion of the publicly accessible space can be seen. Within the planning, cities take the provision of EVSE in publicly accessible areas (e.g. on shopping centres parking lots and garages also by third parties) into account.

Within the USER-CHI partner cities, the public, private and semi-public space is differently regarded in terms of the location planning. The following table marks spaces that are relevant for the planning of charging infrastructure within the cities. This reflects also the fact, that in Berlin and Turku pilot sites, semi-public area holders/owners are present.

	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
public space	✓	✓	✓	✓	✓
semi-public space		✓			✓
private space					

Table 3 Spaces to be covered for the City Wide Planning Process within Pilot Cities

Within the Turku pilot site, placement of charging infrastructure is a key aspect for a non-discriminatory tendering process. Therefore the semi-public space (e.g. shopping malls etc.) plays a major role and should be covered in the planning aspects.

Also in the Berlin Pilot site, the semi-public space gains importance in the planning of charging infrastructure. Therefore it should be implemented in the planning process.

The consideration of energy grid aspects is a key factor within the planning of EVSE on a wide scale. The energy grid needs to be capable of providing the amount of energy necessary for charging infrastructure. While for the extension of charging hubs (parking lots with multiple DC fast chargers), a medium voltage access point to the net close to the location is necessary, for single on-street AC chargers, low voltage outlets are sufficient. Typically Distribution System Operators (DSO) can provide outlets wherever needed in the cities, however, the extension of the net is a factor on cost and time of the extension. Therefore, the grid aspects shall be reflected in the planning process.

Within the requirements specification phase electric grid aspects were seen as relevant within two pilot sites for the planning of charging infrastructure.

	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
Grid Aspects relevant		✓		✓	✘
Remark					
Local Grid Operator (DSO)	Endesa / ENEL	Stromnetz Berlin		ENEA	ENER

Table 4 Grid Aspects to be covered for the City Wide Planning Process within Pilot Cities

Besides the actual planning process, a dashboard shall be used to monitor usage of the charging infrastructure and to monitor the development of charging demand within the cities.

	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
Dashboard and Monitoring relevant	✓	✓	✓	✓	✓

Table 5 Usage of a CLICK Dashboard with Monitoring Functionality within Pilot Cities

3.4 Special User Groups

Complementary to the city wide planning view that the above mentioned city partners represent, in some pilots special user groups are planning to use CLICK for the planning of charging infrastructure w.r.t. their needs. In three pilot sites, housing companies are partners of the project and aim to conduct a bottom-up planning using the results of a top-down planning.

Barcelona (AMB)	Berlin	Budapest	Rome	Turku
	Housing Company (GEW)	Housing Company (BKK)		Housing Companies (TVT, VASO)

Table 6 Special User Groups

3.5 Data Availability in Pilot Sites

Within Deliverable D 1.3 “Technical and legal requirements for USER-CHI solutions”, the requirement of CPOs to provide real-time availability data of their EVSE to other stakeholders is asked. The following table summarizes the answers[3] given in D 1.3. In essence, there is no requirement by law for CPOs to provide real-time data.

Obligation to provide	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
Location Data	✘	Notification[*1]	n.r.[*2]	n.r.	✘
Online Availability Data	✘	✘	n.r.	n.r.	✘
Online Usage Data (API)	✘	✘	n.r.	n.r.	✘

[*1] n.r.: not reported

[*2] notification: The LSV lays down notification requirements of commissioning and decommissioning of EVSE.

Table 7 Data Available within for the Planning Process and the Monitoring Functionalities

The same holds for the need to provide historic charging station usage data[4] and the data sharing processes between CPOs[5].

For the Big Data Analysis of Task 1.1 within the USER-CHI project, the pilot sites provided historical usage data of the existing charging infrastructure within the areas. The following list shows the data that is available within the pilot sites.

For the planning process, the locations and kind of charging infrastructure are important input data. This data is available for all pilot cities. Furthermore, historic usage data gives a base for city specific aspects and usage. This data so far could be acquired for four of the five pilot sites as shown below.

For monitoring of the usage and the demand oriented updates of the planning, either offline data or online data can be used. While some pilots have single / central CPOs and contracts to provide such kind of offline usage data, other pilot sites have not.

[3] Cf. Table 10 in the annex.
[4] Cf. Table 11 in the annex.
[5] Cf. Table 12 in the annex.

Online Data could be available in two appearances: Availability Data shows the actual occupancy state of charging infrastructure and is generally used for location finder apps or websites. From this data it can be derived, if charging stations are currently used (i.e. occupied, cable is connected), or not. No data about current charging processes, energy consumed etc. is transferred via this kind of interface. This kind of data via an online interface is available in the Berlin pilot site.

Opposed to this, online usage data could deliver data about current or historic charging processes with e.g. type of car connected, plug type used, energy consumed over time, etc. would be a valuable source of information w.r.t. the location planning and monitoring. This kind of data is currently not available within the pilot sites, while an inclusion via the USER-CHI product INCAR and project partner qwello is under evaluation.

For the future implementation and usage of CLICK, a monitoring functionality is foreseen as will be outlined below. Therefore, a provision of data to the CLICK platform is necessary that needs to be contracted between the cities as owners of the public ground and the CPOs as the collector of the data. Here, a GDPR-compliant provision of data is necessary (no user data required).

	Barcelona (AMB)	Berlin	Budapest	Rome	Turku
Location Data of existing EVSE	✓	✓	✓	✓	✓
Historic Usage Data	✓	✓		✓	✓
Online Availability Data		✓			
Usage Data Online (API)					

Table 8 Data Available within for the Planning Process and the Monitoring Functionalities

3.6 Technical Requirements and Usage Environments

The main user of CLICK is an urban planner. CLICK therefore is designed to be used within a professional environment with a desktop equipment setup (i.e. big high-resolution display, keyboard, and mouse usage). A design for tablet or smartphone use is not in the focus of CLICK development.

The CLICK platform will be made available online as an internet service. CLICK will consist of a web-frontend for interaction with the urban planner and a backend that runs the calculations and derive the proposals. The frontend must be compatible with the most prevalent web browser (at time of writing this deliverable: Chrome 89.0), while it should be compatible to the top 3 most common web browsers by market share (additionally Mozilla Firefox, Microsoft Edge).

3.7 Usage Scenarios

Within D1.2 “Usage Scenarios”, for each pilot sites and product, user stories were developed in order to derive requirements. A chosen user story for the product CLICK within the City of Berlin is presented below. The further scenarios are presented in the annex[6]. Starting from this, in chapter 4.5 the fifth view of the 4+1 View Model is generated by bringing the first four views together with the user stories.

“Sarah is an urban mobility planner within the Berlin Senate Department for environment transport and climate protection (SenUVK).

She is the key planner for charging infrastructure in Berlin who will use and assess the Charging Location and Holistic Planning Kit (CLICK), a platform for supporting city planners to define where to install chargers.

Sarah receives introduction documents on how to register and use the platform (tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

She accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Sarah starts a first planning process:

She is guided through a multistep-process. In the first step she enters the city's goals and preferences for the planning: SenUVK wants the city to continue being a lighthouse of charging infrastructure. SenUVK wants to extend the charging station network with a mix of AC and DC chargers and considers public and semi-public space for the installation. She uploads a list of existing charging stations and formatted condensed usage data from a previous analysis. Furthermore, Sarah enters some basic data of the region (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected number of EVs at the planning horizon.

Next, Sarah is asked for geo-information on the area of Berlin. She uploads a shape file containing the area boundaries with structural information and socio-economic information. SenUVK also wants to promote special user groups as e-car sharing companies. Sarah enters this information alongside with the location of POIs (Point of Interest) for this.

The data entry is competed. Sarah gets a map with a recommendation for the extension of the charging network.”

[6] See „Excerpt of D1.2: CLICK Usage Scenarios“ in the annex, page 37.

4 Application of the 4+1 View Model

4.1 High-Level Logical View

The logical view shall support the functional requirements, e.g. which services the system will provide to its users. Therefore an object-oriented style is used to visualize a class model.

The main interaction with the user will be via a map interface. The map interface should be implemented by standard solutions and tools (e.g., leaflet based on OpenStreetMap). Data transfer as far as needed should use standard interfaces and protocols.

CLICK results should be made available to the user via the web interface. A provision of the results in file format for export (e.g., csv, xlsx) should be considered, a provision of the result in standard geo exchange formats (e.g., shape format) could be considered. CLICK could offer a monitoring functionality. Usage data of existing charging points should be importable to CLICK via a file-based transfer (comma separated file) and online interfaces (API). CLICK could implement an interface to INCAR to receive actual usage data and could implement interfaces to other existing platforms (e.g. Hubject).

The following figure depicts the high-level logical view of CLICK.

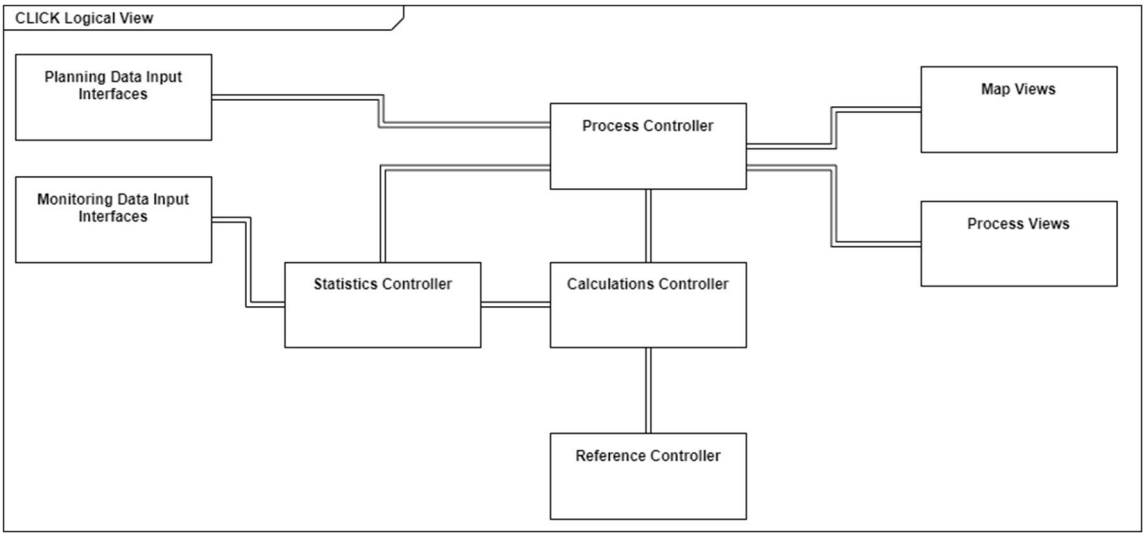

Figure 2 High-Level Logical View

4.2 High-Level Process View

The frontend will have a public and a private area, where the publicly accessible area will contain basic information and the access restricted area will contain the planning process. The following high-level process views describe the starting point for the specification of algorithms and frontend designs within the upcoming task 2.2.

4.2.1 High-Level User Process View

The following Figure 3 depicts the high-level user process view in the interaction of the user with the CLICK platform. Consecutively the user can

- register to the platform
- execute a planning process
- store and revise/update a planning
- monitor actual usage data

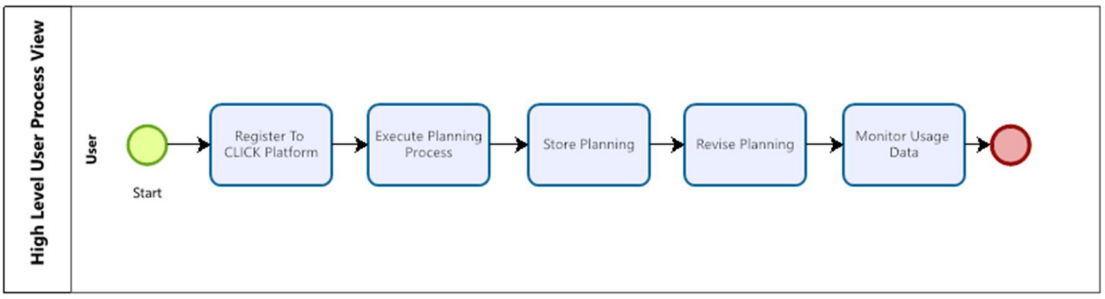

Figure 3 High-Level User Process View

4.2.2 Planning Process

As a major building block, the high-level planning process for charging infrastructure is shown below.

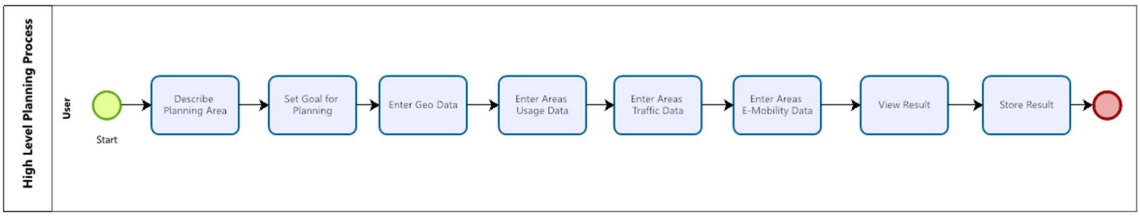

Figure 4 High-Level Planning Process

4.3 High-Level Physical View

The following Figure 5 shows the high-level physical view of the CLICK system. The CLICK environment itself consists of a backend part and a frontend part.

The backend contains the algorithms, processes that provide the actual functionality. Furthermore, a storage system needs to be in place in order to handle and store data used for the planning (e.g. net data) as well as monitoring data (e.g. charging infrastructure usage data)

The frontend part of CLICK consists of a web frontend that is reachable via a common internet browser. The frontend contains functionalities to guide the user through the planning process, to show results on map views and to visualize monitoring data.

The CLICK backend must support the storage of results and inputs. The user must be able to save the planning process status and results at specific stages of the process. A reprocessing of calculations should be possible. Therefore, a database should be used.

External to the system are third parties providing data for planning and monitoring services of CLICK. Therefore, interfaces for the acquisition of (online or offline) planning data (e.g. shape files) as well as usage data of charging infrastructure of third parties are to be designed.

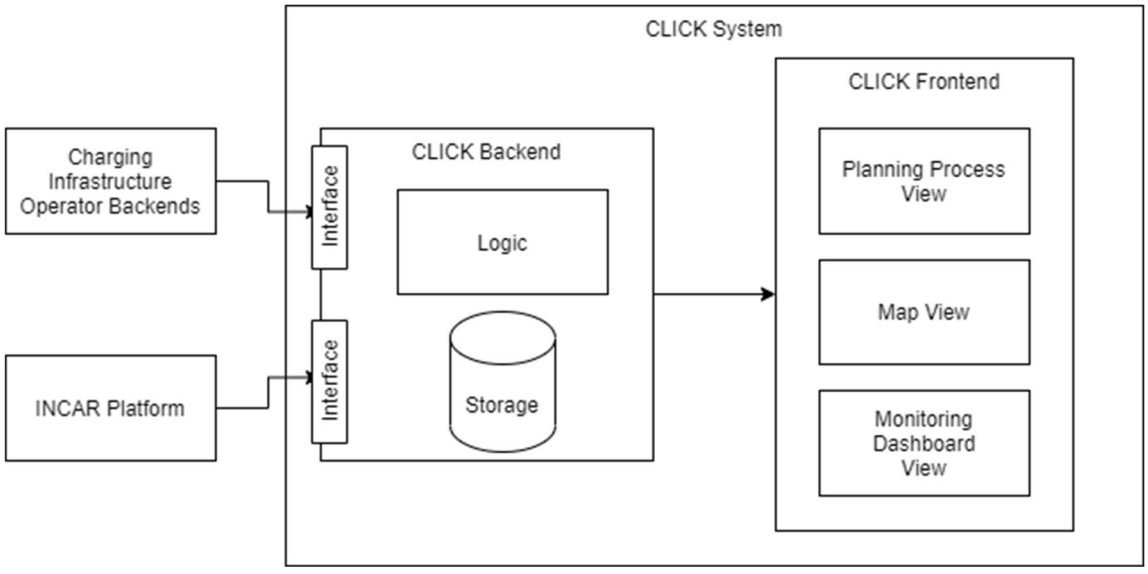

Figure 5 High-Level Physical View

4.4 High-Level Development View

The development view looks at the software module organization on the software development environment with its aim to serve as a base for the allocation of work to teams and as a base for development controlling and management. To complete the development view, it is necessary that all elements of the software have been identified[7]. This will be possible after the specification task T2.2, however the basic rules shall be visualized already in early stage as the proposed layered architecture does:

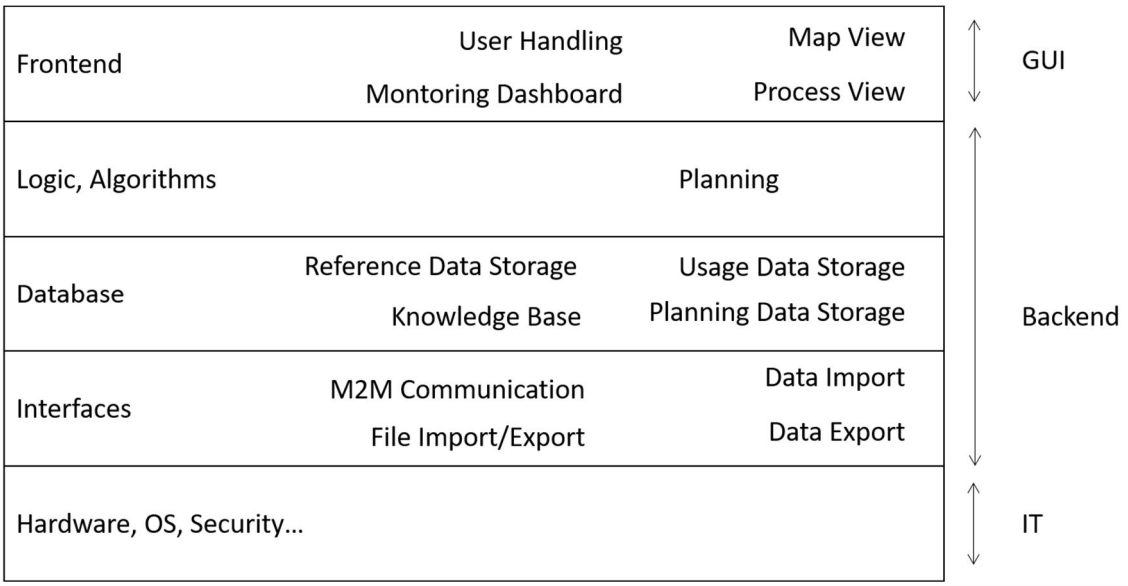

Figure 6 High-Level Development View

[7] Cf. [Kruchten] page 6.

4.5 The Fifth View: Use Case Scenarios

Within Task 1.2 user stories were developed as so called usage scenarios in order to showcase the use of CLICK within the different pilot sites. In the following chapter, the user stories are broken down into use cases relevant for CLICK. These use cases are illustrated and further elaborated in order to provide information for the behaviour of the CLICK system. In total, 22 use cases are presented below.

Use Case	CL-0: Company is invited to CLICK platform
Short Description	• A company, agency or authority is provided with a company access to the CLICK platform
Stakeholders	• company / agency member
Preconditions	• -
Trigger	•
Flow of Events	• A company / agency account is created on the platform • A company / agency member can invite other users to the platform
Expected Results	• The company is registered, users can be invited

Use Case	CL-1: User registers to CLICK platform
Short Description	• A user is granted first access to the CLICK platform
Stakeholders	• user, company member
Preconditions	• The users' company / agency is registered to CLICK and was verified • User got an invitation with a personalized link
Trigger	• User uses the link, accesses the CLICK frontend and logs in
Flow of Events	• The user is redirected to a form that asks to check basic data (username, password, e-mail address) • User changes / accepts data • User account will be created by the platform • User has to confirm his e-mail address by clicking a link • User can log in now with his credentials
Expected Results	• User is registered to the platform and can log in to the CLICK platform

Use Case	CL-2: User logs in to the CLICK platform
Short Description	• A registered user logs in to the CLICK platform
Stakeholders	• CLICK user
Preconditions	• User has completed CL-1 and is aware of his user credentials
Trigger	• User clicks “Log-in”
Flow of Events	• User enters his credentials and logs in • He is forwarded to his personal dashboard • If he logs in for the first time, a short tutorial is shown with the areas of the portal (planning, monitoring, setup) • If he has not entered basic data about his area / city, he is asked to do so
Expected Results	• User is logged in and can use the functionality of CLICK

Use Case	CL-3: User enters basic data of the city
Short Description	• User enters basic data of the city
Stakeholders	• CLICK user– urban planner
Preconditions	• User has completed CL-2
Trigger	• User clicks a “basic data” button
Flow of Events	• User enters the city’s name • CLICK platform considers basic facts (size, population…) • CLICK platform searches for existing data • User enters / completes cities basic facts
Expected Results	• City is known to the platform

Use Case	CL-4: User starts planning process
Short Description	• The User starts a planning process on the platform
Stakeholders	• CLICK user– urban planner
Preconditions	• User has completed CL-3 • User selects a city / area for the planning
Trigger	• User starts new planning process
Flow of Events	• CLICK platform checks for existing data about the city • CLICK changes to planning process mode (guided process)
Expected Results	• Beginning of Step-by-Step planning process with basic knowledge of the city filled out

Use Case	CL-5: User enters goals and preferences of the planning process
Short Description	• The user sets the goals for the planning of charging infrastructure
Stakeholders	• CLICK user– urban planner
Preconditions	• User has completed CL-4 start planning process
Trigger	• CL-4 is completed
Flow of Events	• User selects a high-level goal (e.g. “provide basic coverage”, “become a lighthouse of charging infrastructure provision”, “assist and be prepared for the Mobility Turnaround”) • Based on the information provided so far, CLICK suggests a number of charging stations for the area • User selects the (high-level) number of charging stations planned to be installed / extended in the area
Expected Results	• Basic goals set for the planning

Use Case	CL-6: User enters e-mobility specific data and expectations
Short Description	• The user enters data on e-mobility key facts and predictions (if available)
Stakeholders	• CLICK user– urban planner
Preconditions	• User has completed CL-5
Trigger	• CL-5 is completed
Flow of Events	• User is presented with a list of mobility key facts and e-mobility key facts to be valuable for the planning • The list contains pre-set values for the facts, the user can however override these standard values with his better knowledge. • User fills out, which data he has and enters numbers according to his knowledge • The data is stored in the CLICK database and referenced to the city and planning
Expected Results	• Key facts about the city are stored

Use Case	CL-7: User sets the specifics to be covered in the planning
Short Description	• The user selects, which specific aspects shall be covered in the planning
Stakeholders	• CLICK user – urban planner
Preconditions	• User has completed CL-6
Trigger	• CL-5 is completed
Flow of Events	• User selects which areas shall be covered (e.g. public space, semi-public space, private space) • If EVSE exists in the area, the user selects, if existing charging infrastructure shall be considered within the planning • User selects, which user groups (e.g. private owners, car sharing operators, others) shall be supported in which priority • User selects, which charging station types (e.g. AC, DC, HPC) and plug types shall be considered • The data is stored in the CLICK database and referenced to the city and planning
Expected Results	• Aspects for the planning are set

Use Case	CL-8: User uploads data
Short Description	• The user uploads data that is useful for the planning process.
Stakeholders	• CLICK user
Preconditions	• User has completed CL-7 • Data types, upload types and data organization aspects are documented and known to the user
Trigger	• User has completed CL-7

Flow of Events	• User is presented a list of data potentially valuable for the planning process
	• User refers to the FAQ-page for data formats and data structure aspects for the different data sources
	• User selects data he has available
	• User is guided through a multistep upload process
	• Data covered[8]
	  o Locations of charging infrastructure w/ type, power, etc.
	  o Historic Usage data of existing charging infrastructure
	• The uploaded data is stored in the CLICK database and referenced to the city and planning

Expected Results	• User has uploaded structured data valuable for the planning process

[8] List not complete.

Use Case	CL-9: User uploads geo-data
Short Description	• The user uploads geo data valuable for the planning
Stakeholders	• CLICK user
Preconditions	• User has completed CL-8
Trigger	• CL-8 is completed
Flow of Events	• User is presented a list of geo-data valuable for the planning process • User refers to the FAQ-page for data formats and data structure aspects for the different data sources • User selects data and format (e.g. ESRI Shape) he has available • User is guided through a multistep upload process for geo-data • Data covered (not complete): o City structure / structural data o Socio-economic information o Special areas within the city (e.g. operational areas) o POI (e.g. airport…) • The data is stored in the CLICK database and referenced to the city and planning
Expected Results	• CLICK has knowledge on geo-information relevant for the planning

Use Case	CL-10: User is shown the recommendation
Short Description	• The user gets the result of the planning
Stakeholders	• CLICK user – urban planner
Preconditions	• User has completed a step of the planning and looks at the recommendation
Trigger	• User clicks “view recommendation”
Flow of Events	• Based on the step the user is in, CLICK backend calculates a recommended amount and spread of charging infrastructure within the area • CLICK uses the algorithms and statistics stored in the backend • CLICK frontend shows a map with the recommendation of charging infrastructure extension based on the data previously inserted • CLICK shows an indication, how relevant the recommendation is based on the knowledge acquired so far • The result is stored in the CLICK database and referenced to the city and planning
Expected Results	• User gets a map with the recommendation

Use Case	CL-11: User downloads recommendation
Short Description	• The user gets the result of the planning as a downloadable package
Stakeholders	• CLICK user – urban planner
Preconditions	• User has completed CL-10
Trigger	• User clicks “download results”
Flow of Events	• User is presented a package of e.g. o a printable file (e.g. pdf) with key facts of the recommendation of charging infrastructure o a geo-file with information on the recommendation
Expected Results	• user can download the recommendation in several formats

Use Case	CL-12: User refines result
Short Description	• The user got a recommendation for his planning process and changes / updates input or goals
Stakeholders	• CLICK user – urban planner
Preconditions	• User has completed CL-11
Trigger	• User clicks “revise-button”
Flow of Events	• User goes through the planning process and changes / updates some information • Process continues with CL-10
Expected Results	• Updated planning

Use Case	CL-13: User releases planning for further planners
Short Description	• After completing a planning process, a urban planner releases the result to be used / reviewed by third parties
Stakeholders	• CLICK user – urban planner
Preconditions	• User has completed CL-10
Trigger	• User clicks “release planning” or “invite”
Flow of Events	• User invites registered third parties to view or use the planning
Expected Results	• Third parties can view the results of the planning

Use Case	CL-14: User checks specific area
Short Description	• A local planner (e.g. a housing company planner) uses the result of a previous planning to check a specific area
Stakeholders	• CLICK user – local planner
Preconditions	• Another user has invited the user by completing CL-13
Trigger	• User clicks invitation link
Flow of Events	• User checks specific area
Expected Results	• User can monitor the results

Use Case	CL-15: User looks for highest demand cells
Short Description	• A planner (e.g. CPO) reviews the result of a previous planning in order to draw his extension plan
Stakeholders	• CLICK user – CPO
Preconditions	• Another user has completed CL-13
Trigger	• User clicks invitation link
Flow of Events	• User checks result
Expected Results	• User can monitor the results

Use Case	CL-16: User saves current planning status
Short Description	• The user saves the current stage of data entry or planning
Stakeholders	• CLICK user
Preconditions	• User has started planning process
Trigger	• User clicks SAVE-button
Flow of Events	• Current planning process is saved • Input data is saved in the CLICK database • User can continue at saved position
Expected Results	• User can pause planning process at several points without loss of previous steps.

Use Case	CL-17: User continues planning process
Short Description	• The user loads a previously saved state of the planning
Stakeholders	• CLICK user
Preconditions	• User has completed CL-16
Trigger	• User clicks LOAD
Flow of Events	• User confirms the continuation of the saved state
Expected Results	• User can resume planning process with the previously saved state.

Use Case	CL-18: User sets up monitoring
Short Description	• A user initiates a monitoring job to monitor usage of existing EVSE
Stakeholders	• CLICK user (city administration)
Preconditions	• API with online-data according to CLICK interface available (contract between city and CPO demands the provision of data to the platform)
Trigger	• User initiates job
Flow of Events	• User sets up a monitoring job for his city • User enters URL of a web service providing online usage data in a format that is specified within CLICK • User grants access to the API • CLICK backend collects data from the URL • CLICK ensures data collection and storage according to GDPR – non GDPR-compliant data is discarded and not stored in CLICK database
Expected Results	• CLICK collects usage data

Use Case	CL-19: CLICK calculates statistics
Short Description	• Based on CL-18 data, CLICK calculates statistics on usage
Stakeholders	• CLICK
Preconditions	• CL-18
Trigger	• CL-18 completed
Flow of Events	• CLICK collects usage data from Online-API • CLICK stores data in database • CLICK computes statistical analysis for the data provided
Expected Results	• CLICK stores statistics of actual usage of charging infrastructure

Use Case	CL-20: User views statistics
Short Description	• A user observes statistics on CLICK EVSE usage dashboard.
Stakeholders	• User
Preconditions	• CL-19 • User logged in
Trigger	• User clicks “show statistics”
Flow of Events	• User is provided with a map with current usage of charging infrastructure is his area • User is provided with basic statistics on usage of charging infrastructure in his area
Expected Results	• CLICK shows statistics in different formats to users

Use Case	CL-21: User compares planning to actual usage
Short Description	• A user observes statists on CLICK EVSE Usage dashboard.
Stakeholders	• User
Preconditions	• CL-20 • User logged in
Trigger	• User clicks “compare”
Flow of Events	• User is provided with a map with current usage of charging infrastructure is his area • User is provided with a map with planning results of previous planning
Expected Results	• CLICK shows comparison of planning and actual usage

5 Conclusions and Outlook

Task 2.1 of the USER-CHI project was a preparation task, whose goal was to derive the high-level-architecture of product 1 of the USER-CHI project, called “CLICK”. The “Charging Infrastructure LocatIon and HolistiC Planning Kit” will be a decision support system that assists urban planners and other users in the planning process of charging infrastructure.

The current deliverable D2.1, “CLICK Requirements and Targets” summarizes the work done within Task 2.1 “Requirements and Targets”. It contains the different requirements and goals for the platform that were collected and derived from previous tasks of the project and in interviews and workshops with the relevant project partners.

The findings of T2.1 are structured using the “4+1 View Model of Architecture” in order to set up the cornerstones of the CLICK design. It therefore acts as a high-level specification of CLICK based on user needs. Within the five views of the model, the requirements and goals are reflected and put together. The first four views were designed as a high-level specification of CLICK and act as a base for the detailed specifications in the upcoming task 2.2. The 5th view, that combines and enriches the findings of the first four views, consists of 22 use cases that describe the basic functionalities of the CLICK platform in a vivid and illustrative form.

With the work done within Task 2.1, the cornerstones for the upcoming specification of CLICK in Task 2.2 are set and the methodology is prepared.

Acronyms

Acronym	Meaning
AC	Alternating Current
API	Advanced Programming Interface
BPMN	Business Process Modelling Notation
CLICK	Charging infrastructure LocatIon and HolistiC Planning Kit (product of USER-CHI)
CPO	Charging Point Operator
D	Deliverable
DC	Direct Current
DoA	Description of Action
DSO	Distribution System Operator
DSS	Decision Support System
EVSE	Electric Vehicle Supply Equipment
GDPR	General Data Protection Regulation
ICT	Information and Communication Technology
INCAR	Interoperability, Charging and Parking Platform (product of USER-CHI)
POI	Point of Interest
T	Task
TEN-T	Trans-European Transport Network
UML	Unified Modeling Language
USER-CHI	Project Title: innovative solution for USER centric CHarging Infrastructure
VMZ	VMZ Berlin Betreibergesellschaft mbH (project partner)
w.r.t.	with respect to

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Annexes

Excerpt of D1.2: CLICK Usage Scenarios

CLICK Usage Scenario for Barcelona

Scenario 1. Barcelona

Usage Scenario 4. Holistic planning kit

CLICK

Objective: To assess the location prediction and holistic planning kit utilities included in CLICK online tool.

User's profile: Urban mobility planners, transport planners, city planners.

User's sample: 5-10 urban mobility planners in Barcelona.

Resources: AMB Mobility department is carrying on an ambitious expansion project with more than 40 quick chargers, 10 normal chargers with photovoltaic production and 30 normal chargers in order to spread electromobility around all the municipalities of Barcelona metropolitan area. The CLICK online tool could support this project to confirm the chargers' location.

Location: AMB Mobility department

Scenario 1. Barcelona
Usage Scenario 4. Holistic planning kit

User story (i):

Carlos is a urban mobility planner within AMB.

He is one of the five participants who are going to use and assess the Charging Location and Holistic Planning Kit (CLICK), a platform for supporting city planners to define where to install chargers.

Carlos receives a document for use the platform (tasks and tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

He accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Carlos starts a first planning process:

He is guided through a multistep-process. In the first step he enters the City's goals and preferences for the planning: AMB wants the region to become a lighthouse of charging infrastructure. AMB already has a number of new charging stations and a mix of technologies in mind and wants to extend the charging station network by ~80 charging stations, a mix of 10 normal AC, 40 DC and 30 AC chargers based on p/v.

AMB wants to primarily focus on public space extension and short range users. Carlos uploads a list of existing charging stations and formatted condensed usage data from a previous analysis. Furthermore, Carlos enters some basic data of the region he obtained from the open data portal (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected #of EVs at the planning horizon.

Scenario 1. Barcelona
Usage Scenario 4. Holistic planning kit

User story (ii):

Next, Carlos is asked for geo-information on the area of Barcelona. He uploads a shape file containing the area boundaries with structural information and socio-economic information. AMB also wants to promote special user groups as taxi cabs and airport traffic. Carlos enters this information alongside with the location of POI for this.

The data entry is competed. Carlos gets a map with a recommendation for the extension of the charging network. He reviews all the recommendations to install EVSE according to user demand, territory coverage, access and grid integration with AMB real data.

As time goes by, an unexpected growth of EV takes place that lets Carlos review the parameters set within CLICK. He and his team uses several parameters to adapt the assumptions and gets a new recommendation. CLICK provides an adjusted suggestion and saves it in order to refine and review it later.

CLICK Usage Scenario for Berlin

Scenario 2. Berlin
Usage Scenario 6. Holistic planning kit

CLICK

Objective: To assess the location prediction and holistic planning kit utilities included in CLICK online tool.

User's profile: Urban mobility planners, transport planners, city planners.

User's sample: 5-10 urban mobility planners in Berlin.

Resources: Berlin city council staff, Berlin Housing company staff.

Location: Berlin

Usage Scenario 6. Holistic planning kit
Click Usage Scenario - Urban Mobility planer - user

User story A:

Sabrina is a urban mobility planner within Berlin Senate Department.

She is the key planner for charging infrastructure in Berlin who will use and assess the Charging Location and Holistic Planning Kit (CLICK), a platform for supporting city planners to define where to install chargers.

Sabrina receives a document for use the platform (tasks and tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

She accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Sabrina starts a first planning process:

She is guided through a multistep-process. In the first step she enters the City's goals and preferences for the planning: SenUVK wants the city to continue being a lighthouse of charging infrastructure. SenUVK wants to extend the charging station network a mix of AC and DC chargers and consider public and semi-public space for the installation. She uploads a list of existing charging stations and formatted condensed usage data from a previous analysis. Furthermore, Sabrina enters some basic data of the region (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected #of EVs at the planning horizon.

Next, Sabrina is asked for geo-information on the area of Berlin. She uploads a shape file containing the area boundaries with structural information and socio-economic information. SenUVK also wants to promote special user groups as e-car sharing companies. Sabrina enters this information alongside with the location of POI for this.

The data entry is competed. Sabrina gets a map with a recommendation for the extension of the charging network.

Usage Scenario 6. Holistic planning kit
Click Usage Scenario - Urban Mobility planer - user

User story B:

Richard is a public housing company mobility planner. He wants to add to the mobility turnaround (Mobilitätswende) and looks for ways to support the uptake of e-mobility by implementing charging infrastructure on premises of his housing companies. Since these spaces need to add to the revenue of the company, Richard can only implement charging infrastructure in areas with a high demand and a low availability of other charging infrastructure.

User story C:

Lars is a charging point supplier and operator. He looks for spaces with high parking turnover, parking pressure and high utilization of charging infrastructure in proximity to place best fit additional infrastructure. He uses the CLICK tool to facilitate the search. After entering the tool, he enters the business focus (public space etc.), type of infrastructure (AC, DC) and the search radius. CLICK shows a heatmap with best fit locations (as radius). The CPO can use the indications for a detailed onsite-search within given heatmap

CLICK Usage Scenario for Budapest

Scenario 5. Budapest
Usage Scenario 15. Holistic planning kit

CLICK

Objective: To assess the location prediction and holistic planning kit utilities included in CLICK online tool.

User's profile: Urban mobility planners, transport planners, city planners.

User's sample: 5-10 urban mobility planners in Budapest.

Resources: Budapest city council staff, Budapest Housing company staff.

Location: Budapest.

Scenario 5. Budapest
Usage Scenario 15. Holistic planning kit

User story A (i):

Anna is a urban mobility planner within the City of Budapest mobility planning department.

She is one of the five participants who are going to use and assess the Charging Location and Holistic Planning Kit (CLICK) within Budapest, a platform for supporting city planners to define where to install chargers.

Anna receives a document for use the platform (tasks and tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

She accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Anna starts a first planning process:

- She is guided through a multistep-process. In the first step she enters the City's goals and preferences for the planning: Budapest wants [the region to become a lighthouse of charging infrastructure | to provide a basic coverage of charging infrastructure]. Therefore, Budapest wants to add the installation of charging infrastructure as one cornerstone to the mobility Masterplan for the city. Budapest wants to focus on public space extension and short range users.
- Anna uploads a list of existing charging stations and formatted condensed usage data from a previous analysis.

Scenario 5. Budapest
Usage Scenario 15. Holistic planning kit

User story A (ii):

Furthermore, she enters some basic data of the city she has obtained from the open data portal (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected #of EVs at the planning horizon.

Next, Anna is asked for geo-information on the area of Budapest. She uploads a shape file containing the cities boundaries with structural information and socio-economic information. Budapest also wants to promote special areas as housing projects. Anna enters this information alongside with the location of POI in the city.

The data entry is competed. Anna gets a map with a recommendation for the extension of the charging network. She reviews all the recommendations to install EVSE according to user demand, territory coverage, access and grid integration with Budapest real data.

As time goes by, an unexpected growth of EV takes place that lets Anna review the parameters set within CLICK. She and her team use several parameters to adapt the assumptions and gets a new recommendation. CLICK provides an adjusted suggestion and saves it in order to refine and review it later.

Scenario 5. Budapest
Usage Scenario 15. Holistic planning kit

User story B:

Máté is a public housing company planner within BKK. He wants to add to the mobility turnaround in Budapest and looks for ways to support the uptake of e-mobility by implementing charging infrastructure on premises of his housing company. Since these spaces need to add to the revenue of the company, Máté can only implement charging infrastructure in areas with a high demand and a low availability of other charging infrastructure.

CLICK Usage Scenario for Turku

Scenario 3. Turku
Usage Scenario 7. Holistic planning kit

CLICK

Objective: To assess the location prediction and holistic planning kit utilities included in CLICK online tool. Validation of the city-wide master plan of EV.

User's profile: Urban mobility planners, transport planner, city planners

User's sample: 5 urban mobility planners in Turku.

Resources: Turku city council staff, Turku Housing Company staff

Location: TURKU Mobility department is carrying on a city-wide master plan for EV expansion project with quick chargers and standard chargers (with and without photovoltaic production) in order to spread electromobility around all the Turku city. The CLICK online tool could support this project to confirm the chargers location.

Scenario 3. Turku
Usage Scenario 7. Holistic planning kit

User story A (i):

Mika is a **urban mobility planner** within the City of Turku's mobility planning department.

He is one of the five participants who are going to use and assess the Charging Location and Holistic Planning Kit (CLICK) within Turku, a platform for supporting city planners to define where to install chargers.

Mika receives a document for use the platform (tasks and tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

He accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Mika starts a first planning process:

He is guided through a multistep-process. In the first step he enters the City's goals and preferences for the planning: Turku wants [the region to become a lighthouse of charging infrastructure | to provide a basic coverage of charging infrastructure]. Therefore, Mika wants to add the installation of charging infrastructure as one cornerstone to the mobility Masterplan for the city. Turku wants to focus on public space extension and short range users. Mika opens a list of existing charging stations and formatted condensed usage data from a previous analysis.

Scenario 3. Turku
Usage Scenario 7. Holistic planning kit

User story A (ii):

Furthermore, he opens some basic data of the city he obtained from the open data portal (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected #of EVs at the planning horizon.

Next, Mika is asked for geo-information on the area of Turku. He opens a shape file containing the area boundaries with structural information and socio-economic information. Turku also wants to promote special areas as housing projects. Mika enters this information alongside with the location of POI in the city.

The data entry is competed. Mika gets a map with a recommendation for the extension of the charging network. He reviews all the recommendations to install EVSE according to user demand, territory coverage, access and grid integration with Turku's real data. Mika is able to see the parameters behind the recommendation and alter them if needed.

As time goes by, an unexpected growth of EV takes place that lets Mika review the parameters set within CLICK. He and his team uses several parameters to adapt the assumptions and gets a new recommendation. CLICK provides an adjusted suggestion and saves it in order to refine and review it later.

Scenario 3. Turku
Usage Scenario 7. Holistic planning kit

User story B:

Richard is a public housing company **planner within TVT**. He wants to add to the mobility turnaround in Turku and looks for ways to support the uptake of e-mobility by implementing charging infrastructure on premises of his housing company. Since these spaces need to add to the revenue of the company, Richard can only implement charging infrastructure in areas with a high demand and a low availability of other charging infrastructure.

CLICK Usage Scenario for Rome

Scenario 4. RSM
Usage Scenario 11. Holistic planning kit

CLICK

Objective: To assess the location prediction and holistic planning kit utilities included in CLICK online tool. Support the generation of the City's Traffic Masterplan

User's profile: Urban mobility planners.

User's sample: 5-10 urban mobility planners in RSM.

Resources: Several computer terminals with access to the CLICK online tool (website). Connection to the RSM databases and other open data websites (to provide the majority of urban and territorial data required by CLICK).

Location: Rome.

Scenario 4. RSM
Usage Scenario 11. Holistic planning kit

User story (i):

Marco is a urban mobility planner within the City of Rome mobility planning department.

He is one of the five participants who are going to use and assess the Charging Location and Holistic Planning Kit (CLICK) within Rome, a platform for supporting city planners to define where to install chargers.

Marco receives a document for use the platform (tasks and tutorial), and a personalized link to the web frontend of the platform to perform planning activities.

He accesses the CLICK platform by inserting the personalized code and explores the functionalities. After reading through the tutorial, Marco starts a first planning process:

He is guided through a multistep-process. In the first step he enters the City's goals and preferences for the planning: Ronme wants [the region to become a lighthouse of charging infrastructure | to provide a basic coverage of charging infrastructure]. Therefore, Rome wants to add the installation of charging infrastructure as one cornerstone to the mobility Masterplan for the city. Rome wants to focus on public space extension and short range users. Marco uploads a list of existing charging stations and formatted condensed usage data from a previous analysis.

Scenario 4. RSM
Usage Scenario 11. Holistic planning kit

User story (ii):

Furthermore, he enters some basic data of the city he obtained from the open data portal (as size, population etc.) and some E-Mobility key facts of the region, e.g. the expected #of EVs at the planning horizon.

Next, Marco is asked for geo-information on the area of Rome. He uploads a shape file containing the area boundaries with structural information and socio-economic information. Rome also wants to promote special areas as housing projects. Marco enters this information alongside with the location of POI in the city.

The data entry is competed. Marco gets a map with a recommendation for the extension of the charging network. He reviews all the recommendations to install EVSE according to user demand, territory coverage, access and grid integration with Rome real data.

As time goes by, an unexpected growth of EV takes place that lets Marco review the parameters set within CLICK. He and his team uses several parameters to adapt the assumptions and gets a new recommendation. CLICK provides an adjusted suggestion and saves it in order to refine and review it later.

Excerpt of D1.3: Requirements

Req.-ID	Description	Type
CLK_002	A feasible location search and location optimization must be based on detailed information: Building structure, type of area, parking pressure, #of registered vehicles, movements per day (ideally on basis of cell phones), means of mobility,	Functional and data requirements
CLK_003	Data availability should be supported by cities, access to city information should be granted free of charge	Functional and data requirements
CLK_004	National regulations should be included	Functional and data requirements
CLK_005	AI learning integration: Lessons learned on certain locations (type of area, type of street, traffic, etc.) should be shared and an AI function should make best guess based on those learnings	Functional and data requirements
CLK_006	CLICK should be a question-and-answer online tool that current usability requirements to guide the user through the planning process.	Look and feel requirements
CLK_007	The focused user of CLICK should be an urban planner.	Users of the product
CLK_009	CLICK must follow a top-down-approach.	The scope of the product
CLK_010	CLICK could implement interfaces to charging station backends in order to retrieve usage data for monitoring functionalities	Functional and data requirements
CLK_011	CLICK must have a multi-step planning functionality	Functional and data requirements
CLK_012	CLICK could have a Monitoring functionality	Functional and data requirements
CLK_014	CLICK should gather information about the goals and targets of the cities in the first step	Functional and data requirements
CLK_015	CLICK should gather basic information about the city (e.g. population, size etc.) in the second step	Functional and data requirements
CLK_016	CLICK should gather information about the city structure in the third step	Functional and data requirements
CLK_017	CLICK should gather city structure information in the fourth step	Functional and data requirements
CLK_018	CLICK should give a recommendation on charging station placement within areas after completion of data input	Functional and data requirements
CLK_019	CLICK should provide an option to change inputs and recalculate the recommendation	Functional and data requirements

Req.-ID	Description	Type
CLK_020	CLICK results should be provided as a map and a basic data table	Functional and data requirements
CLK_021	CLICK must provide location-based forecasts of charging demands	The purpose of the product
CLK_022	CLICK should produce reliable statements for the business model of charging infrastructure	The scope of the work
CLK_024	CLICK should be designed to support housing companies in the planning process of charging infrastructure	Users of the product
CLK_025	CLICK should be designed to support charging operators in the planning process of charging infrastructure	Users of the product
CLK_026	CLICK should forecast how many charging processes per day can be expected at a certain location in the city	Performance requirements
CLK_027	Click should provide information on the availability of electrical power in the local grid	Functional and data requirements
CLK_028	CLICK should evaluate the frequency of site visits	Functional and data requirements
CLK_030	CLICK must display all charging points already in place	The scope of the product
CLK_031	CLICK should provide advice for dimensioning new charging stations (quantity vs power)	The scope of the product
CLK_032	CLICK should categorize the attractiveness of a planned charging infrastructure location based on the collected data	The scope of the product
CLK_033	CLICK could give a prospect of charging infrastructure demand for a certain time period ahead	The scope of the product
CLK_034	CLICK could support information on time spent on hotspots (shops, work), so information can be used to decide power of the charger	Functional and data requirements
CLK_035	CLICK should interconnect all forms of travel (busses, bikes, walking…)	Functional and data requirements
CLK_036	Should support estimations of future EV population and calculate needed charging infrastructure	Functional and data requirements
CLK_037	Should support estimations of future population change	Functional and data requirements
CLK_038	Easily use open access data	Functional and data requirements
CLK_039	Ability to add already existing/set future plans into CLICK	Functional and data requirements
CLK_040	Should support different simulation of predicting future population	Functional and data requirements

Req.-ID	Description	Type
CLK_041	Click could differentiate between demand created by different users (private/commercial: fleet, freight transportation).	The scope of the product
CLK_042	CLICK should take into account the permits needed for building infrastructure in public spaces	Legal requirements
CLK_043	CLICK should take into account SUMP (Sustainable Urban Mobility Plans) of cities - if available	Cultural and political requirements
CLK_046	CLICK should consider requirements of public / stakeholder participation in regard to infrastructure planning - if mandatory / existing	Legal requirements
CLK_047	CLICK should consider requirements deriving from national laws on preservation of historical monuments	Legal requirements
CLK_048	Click could provide information on the availability of fibre network	Functional and data requirements
CLK_049	CLICK could use "Connection Time" or "Grid Connection Time" as one dimension instead of or in combination with "charging time".	Functional and data requirements
CLK_050	CLICK should have a public and a private section, where the public contains general information and the private (user restricted) holds the actual planning process	Functional and data requirements
CLK_051	CLICK should use standard tools and components (e.g., leaflet)	Functional and data requirements
CLK_052	CLICK should have a storage functionality in order to pause and resume the process	Functional and data requirements
CLK_053	CLICK could consider other data as legal requirements, data from existing charging points, data about new plans, grid availability, fibre network availability	Functional and data requirements
CLK_054	CLICK could consider special user groups as e-taxi drivers, carsharing operators, commuters.	Functional and data requirements
CLK_055	CLICK should consider the suitability of the distribution grid for potential charging infrastructure locations as well as potential grid-side effects.	The scope of the product

Table 9 Summary of CLICK specific requirements

Excerpt of D1.3: Legal Questionnaire Answers

Table 65 Requirement of CPOs to provide real-time availability data of their charging points to other stakeholders

Barcelona	Berlin	Graz	Murcia	Turku
There is no legal requirement for CPO's to provide real-time location data regarding the availability of their charging points. However, in Catalonia the "Institut Català d'Energia (ICAEN)" has organized a tool, which offers real-time location and availability data concerning charging points in the region.	There is no legal requirement for CPOs to provide real-time availability data. § 5 (1) LSV merely lays down the duty to notify the commissioning as well as the decommissioning of charging points but does not include duties on further data access.	There is a legal requirement for CPO's to provide real-time location data regarding the availability of their charging points.	CPOs might have to provide data regarding the use of their charging points to local authorities in case the city council includes such requirements in the technical specifications and terms of contract.	No such requirement applies towards CPOs.

Table 10 USER-CHI Legal Questionnaire: Q. No.43: D1.3 page 119

Table 66 Legal requirement of CPOs to provide historic consumption data of their charging points to local authorities

Barcelona	Berlin	Graz	Murcia	Turku
The national legal framework does not imply the legal requirement of CPOs to provide historic consumption data of their charging points to local authorities.	There is no duty to provide historic consumption data as such to local authorities. However, the duty to provide information on electricity consumption generated by one charging point may arise out of measuring and calibration law regarding consumers. Moreover, reporting requirements may also arise out of § 12 (4) EnWG towards electricity supply network operators.	The national legal framework does not imply the legal requirement of CPOs to provide historic consumption data of their charging points to local authorities.	The national legal framework does not imply the legal requirement of CPOs to provide historic consumption data of their charging points to local authorities. However, regarding the city of Murcia this kind of requirements might arise on the basis of contractual terms established with the city authorities.	The national legal framework does not imply the legal requirement of CPOs to provide historic consumption data of their charging points to local authorities.

Table 11 USER-CHI Legal Questionnaire: Q. No.44: D1.3 page 120

Table 67 Provisions for data sharing processes among CPOs regarding minimum standards and interoperability

Barcelona	Berlin	Graz	Murcia	Turku
There are currently very few data sharing processes among EMSPs or/and CPOs. Some existing agreements between CPOs and EMSPs has been established under the OCPI protocol.	There are currently no provisions for the data sharing processes among providers of charging services regarding minimum standards of interoperability. However according to § 3 (4) Amendment Draft of the LSV the requirement to use standardized communication protocols for charging points operators is included.[156]	Information not yet reported.	Interoperability is a requirement within all public procurement tenders concerning charging infrastructure in Spain. Local administrations require the operators to use the Open Charge Point Protocol (OCPP). This pursues the goal to enable interoperability between different charging points (operators) within the same city.	Information not yet reported.

Table 12 USER-CHI Legal Questionnaire: Q. No.45: D1.3 page 121