



D4.1 – INDIMO Evaluation framework

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Document Number	D4.1
Document Title	INDIMO Evaluation framework
Version	2.0
Status	Final
Work Package	WP 4
Deliverable Type	Report
Contractual Date of Delivery	30.06.2020
Actual Date of Delivery	30.06.2020
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Keyword List	Evaluation framework, Impact assessment, accessibility, inclusivity, user acceptance, cybersecurity, applicability and transferability
Dissemination level	PU

INDIMO Consortium

The project *INDIMO - Inclusive Digital Mobility Solutions* has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875533. The consortium members are:

No	Participant Legal Name	Country
1	VRIJE UNIVERSITEIT BRUSSEL	BE
2	VDI/VDE INNOVATION + TECHNIK GMBH	DE
3	INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM	BE
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13	COOPCYCLE	FR
14	FONDAZIONE ISTITUTO SUI TRASPORTI E LA LOGISTICA	IT
15	POSTE ITALIANE - SOCIETA PER AZIONI	IT

Document change record

Version	Date	Status	Author (Partner)	Description
0.1	24/03/2020	Draft	Samyajit Basu (VUB)	Development of the first draft
0.2	17/04/2020	Draft	Samyajit Basu (VUB)	Modifications based on D4.1-D3.1-D6.1 co-ordination call
0.3	29/05/2020	Draft	Samyajit Basu (VUB)	Partners' 1 st contributions incorporated
0.4	15/06/2020	Draft	Samyajit Basu (VUB)	Partners' 2 nd contributions incorporated, and internal reviewers' involvement initiated
0.5	24/06/2020	Draft	Samyajit Basu (VUB)	Further revision
0.5	26/06/2020	Draft	Samyajit Basu (VUB)	Further revision
1.0	29/06/2020	Final	Samyajit Basu (VUB)	Version ready to be submitted
1.1	02/12/2021	Draft	Samyajit Basu (VUB)	Draft addressing the comments and revision requests by the EC
2.0	03/12/2021	Final	Samyajit Basu (VUB)	Final version ready to be submitted

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Executive summary

This deliverable, D4.1 INDIMO evaluation framework sets out the framework for assessing INDIMO's pilot activities and the impact pilots have achieved in relation to the objectives of the project. In terms of tasks, it relates to task 4.1 of WP 4, the work package of INDIMO which monitors and evaluates the pilot activities carried out in different pilot phases defined in WP 3. The aim of the evaluation is to assess to what extent the tools developed in WP2 and co-created within the project as the components of the INDIMO digital mobility toolbox (INDIMO DM tool box) can facilitate the impact expected from the pilots that serve as testbeds for these developed tools. Given the multifaceted expected impact of the INDIMO tools in various cultural, spatial and policy contexts on diverse set of user groups, especially vulnerable to exclusion ones and potential future users of the tools (stakeholders such as developers, policy makers, operators), the INDIMO evaluation framework is based on five pillars: (i) user acceptance; (ii) inclusivity and accessibility; (iii) cybersecurity and personal data aspects; (iv) process evaluation and (v) applicability and transferability. For each of these pillars the evaluation framework identifies the assessment indicators, data that needs to be collected, data collection methods, and possible limitations and mitigation strategies to the data collection process. However, it must be noted that although this framework is comprehensive, it has been kept general enough in nature so that the list of the final set of indicators, data to be collected and data collection timing durations during different pilot phases can be suitably adapted and updated in co-ordination with other tasks (especially tasks 4.2, 4.3, 4.4 and 4.5 that are associated with each evaluation pillar), deliverables (especially D3.1) and work packages if and when necessary as the project advances. In addition, this framework along with the pilot handbook (D3.1) develops a pilot evaluation plan to be used by the pilot coordinators to design the data collection and evaluation activities at INDIMO pilot locations. Therefore, in summary, the evaluation framework explained in this deliverable serves as the foundation of the impact assessment of one of the principal outputs of INDIMO, the co-created INDIMO digital mobility toolbox or in other words it enables us to determine if and to what extent INDIMO has been successful in achieving its goals and objectives. Task 4.1 to which this deliverable relates to is led by VUB with contributions from ZLC (pilot implementation and cybersecurity and data protection aspects), IMEC (user acceptance testing), cambiaMO (accessibility and inclusivity assessment) and POLIS (applicability and transferability assessment).



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List of acronyms

ACRONYM	
DMS	Digital mobility services
WP	Work package
DDS	Digital delivery services
DM	Digital mobility
CBA	Cost-benefit Analysis

1. Introduction

This deliverable relates to task 4.1 of WP4 of the INDIMO project. WP4 monitors and evaluates the pilots conducted in WP3. The aim of the evaluation is to assess to what extent the tools developed in WP2 can facilitate the impact expected from the pilots (WP3). In task 4.1, an evaluation framework will be developed guiding the project's pilot assessment activities. The pilots will serve as testbeds for the tools developed in WP2 and help to evaluate if the proposed tools in the INDIMO Inclusive Digital Mobility Toolbox (INDIMO DM toolbox) can have the expected impact under various cultural, spatial and policy contexts; with diverse user groups; and for all potential future users of the tools (developers, policy makers, operators).

1.1 The aim of the deliverable

The evaluation framework developed in task 4.1 and explained in this deliverable will guide the evaluation of the

- (i) user acceptance of the new or improved digital mobility applications (how do users perceive and use the improved services and applications?);
- (ii) the inclusivity and accessibility of the new or improved digital mobility or logistics services (implemented in Task 4.2)
- (iii) cybersecurity and personal data aspects (implemented in Task 4.5);
- (iv) the usability of the INDIMO Inclusive Digital Mobility Toolbox (how can the tools be used in practice to improve the current way of working?) (implemented in Task 4.3)
- (v) the applicability and transferability of the INDIMO tools to other European cities, regions or countries (implemented in Task 4.4)

The evaluation framework will provide, for each of these items, answers to the following questions:

- What are the assessment indicators to be used?
- What data need to be collected from the pilots?
- How will this information be collected and who will provide it?
- What are the methods to be used in performing the assessment?
- What are the limitations that may be faced regarding the data to be collected and the results of the assessment?

1.2 Relationship with other relevant deliverables and WPs

The general evaluation framework explained in this deliverable will be used by the pilot coordinators to as the project advances in coordination with the pilot handbook (D3.1), monitor activities and report the evaluation results to the evaluation manager (VUB). The pilot evaluation plans will outline how, when and by whom this information will be collected. The framework will be used in Tasks 4.2, 4.3, 4.4 and 4.5 to provide a uniform way to compare the possible impacts of the INDIMO tools across the pilots. The evaluation results will feed into the second iteration

of these tools in WP 2. Thus, WP 4 completes stage 4 and partly stage 5 of the INDIMO co-creation process.

1.3 Task participants and sharing of responsibilities

Task 4.1 to which this deliverable relates to is led by VUB with contributions from ZLC (pilot implementation and cybersecurity and data protection aspects), IMEC (user acceptance testing), cambiaMO (accessibility and inclusivity assessment) and POLIS (applicability and transferability assessment).

As part of the development of this evaluation framework, a brainstorming session was held during the kick-off meeting of the project where participants were divided into 4 groups to discuss and exchange ideas on the four pillars on which the evaluation framework will be built. Each group was led by the respective task leaders responsible for leading the task associated with that pillar.

1.4 Structure of the deliverable

This deliverable is subdivided into 10 sections.

Section 2 describes the INDIMO evaluation framework along with its scope, objectives and pillars.

Section 3 describes the user acceptance pillar of the evaluation framework along with the related indicators, data to be collected, data collection methods, assessment methods, limitations and expected impacts.

Section 4 describes the inclusivity and accessibility pillar of the evaluation framework along with the related indicators, data to be collected, data collection methods, assessment methods, limitations and expected impacts.

Section 5 describes the Cybersecurity and personal data aspects pillar of the evaluation framework along with the related indicators, data to be collected, data collection methods, assessment methods, limitations and expected impacts.

Section 6 describes the policy evaluation pillar of the evaluation framework along with the related indicators, data to be collected, data collection methods, assessment methods, limitations and expected impacts.

Section 7 describes the evaluation synthesis and feedback loop to tool development.

Section 8 describes the planning of evaluation in tandem with WP3.

Section 9 describes the overall project evaluation.

Section 10 is the conclusion.

2. INDIMO evaluation framework

This section gives an overview of the INDIMO evaluation framework along with its objectives, different pillars, methods, indicators and limitations. This evaluation process is also a part of the iterative co-creation process of the INDIMO project. Figure 1 shows the INDIMO co-creation process of the INDIMO digital mobility toolbox development and the role of the evaluation process.

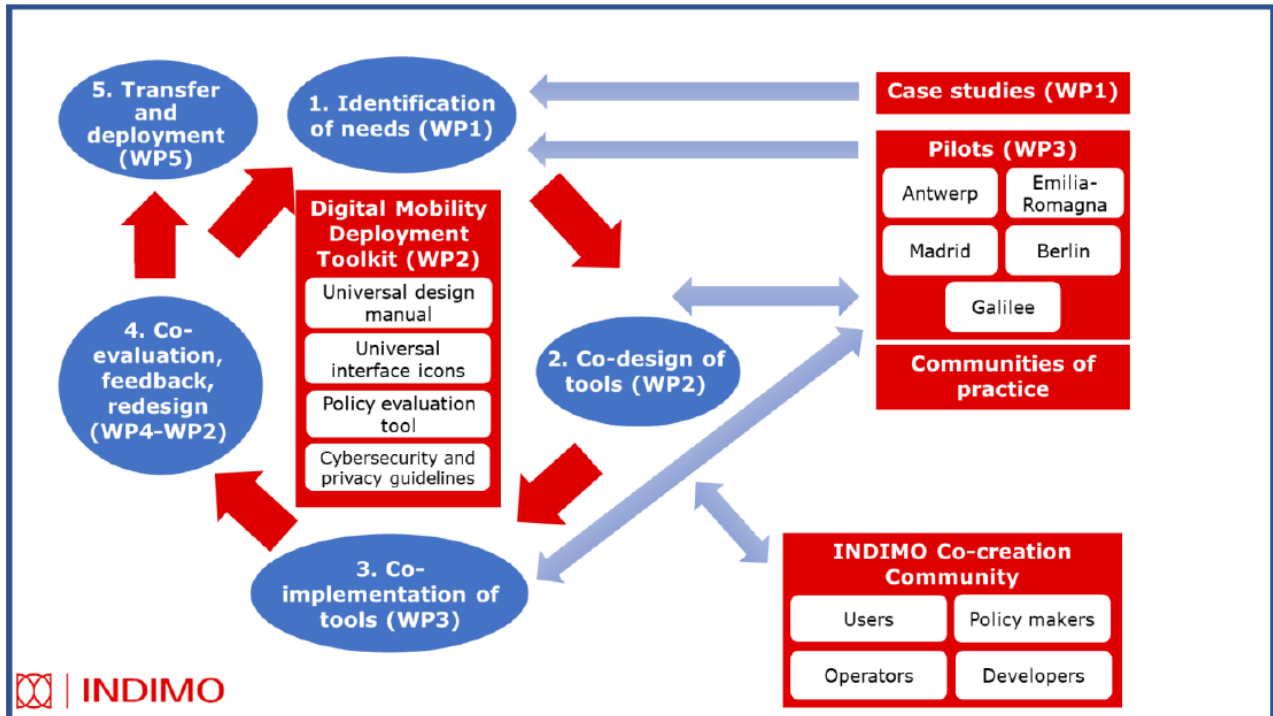


Figure 1: INDIMO co-creation process (Source: INDIMO DoA)

The evaluation results will feed into the second iteration of these tools in WP2. Furthermore, the transferability of the INDIMO tools to other European cities, regions or countries will be assessed. Thus, WP 4 completes stage 4 and partly stage 5 of the INDIMO co-creation process.

2.1 The scope and objective of evaluation

Evaluation for any project is defined as a systematic determination of the merit and significance of the measures that are being implemented in the project, using criteria governed by a set of standards (Dziekan, et al., 2013). It is not an isolated event in a project, but a part of the project management process that consists of planning, implementation and evaluation. Figure 2 illustrates the role of evaluation in a project with an overview of the common stages and key activities in project planning, monitoring and evaluation along with their interdependencies.

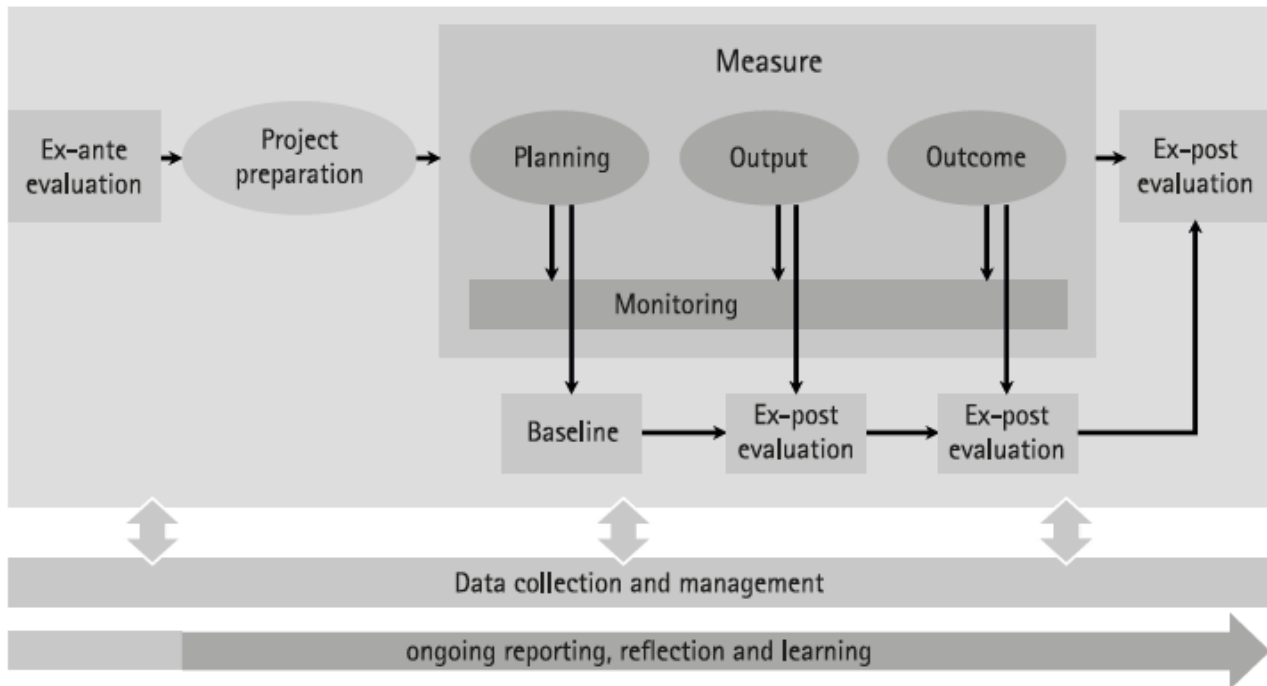


Figure 2: Role of evaluation in a project (Dziekan, et al., 2013)

This is a very important part of any project as this tells us what actually happened after the measure was implemented, rather than what was expected to happen. Additionally, we can also find out the reasons behind the results and the lessons that we can learn from any deviations that are present in the outcome. Therefore, evaluation helps us to determine if the project has achieved its intended goals. In short, the objective of the evaluation exercise in a project is to:

- measure the performance;
- learn for future projects;
- exchange experiences.

Two types of evaluations can be seen in figure 2, ex-ante evaluation and ex-post evaluation. This deliverable will mainly deal with ex-post evaluation. From the assessment point of view evaluations are of two types: impact evaluation and process evaluation. The main goal of the impact evaluation is to draw a balance of the effects of the measure's implementation and the situation before the implementation (illustrated in figure 3). The purpose is to assess the success of a mature project in reaching its stated goals.

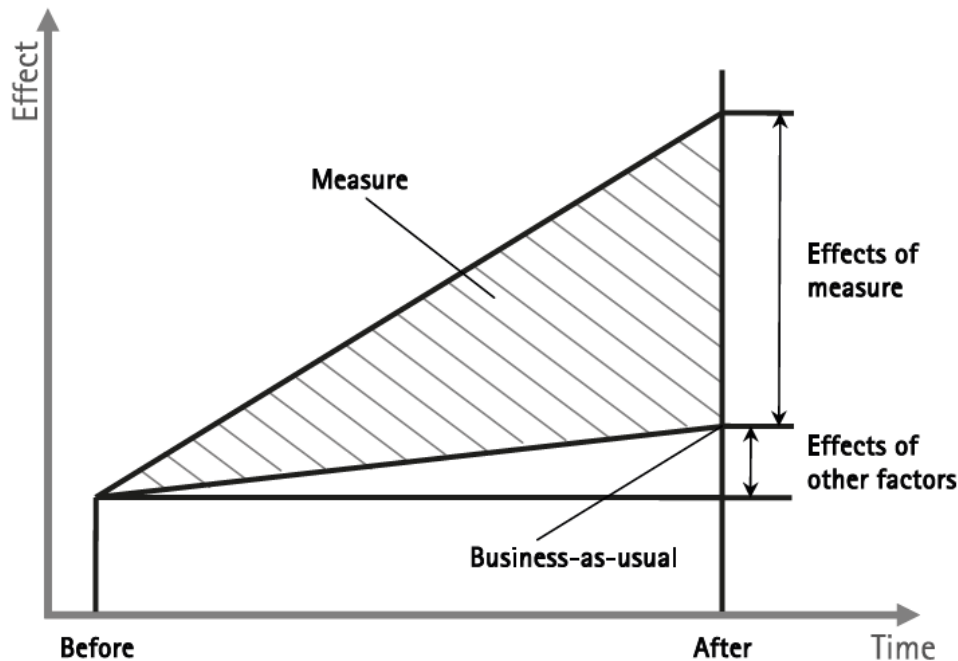


Figure 3: Impact evaluation (Dziekan, et al., 2013)

Process evaluation focuses on the means and procedures by which a measure is implemented. It begins during project development and continues throughout the life of the project. Its intent is to assess all project activities, negative and positive factors which influence the measure implementation process and thus provide information to monitor and improve the project.

2.2 Objectives of the evaluation in the framework of INDIMO

INDIMO aims to incorporate the concept of universal design in digital mobility solutions, more specifically to introduce the concept of universal design into the development of personalised on-demand digital mobility solutions i.e. taking into account the seven principles of universal design. Based on these principles the main output of the project will be an Inclusive Digital Mobility Toolbox comprising of a Universal Design Manual (UDM) for digital transport services, Universal Language Interface Icons for transport services, Guidelines for cybersecurity and personal data protection and the INDIMO Policy Evaluation Tool. Five pilots in the project will act as the testbeds for this toolbox that will be developed in WP2. A comprehensive evaluation of the pilots will help us to evaluate if the proposed tools in the INDIMO Inclusive Digital Mobility Toolbox can have the expected impact under various cultural, spatial and policy contexts; with diverse user groups; and for all potential future users of the tools (developers, policy makers, operators). This evaluation will also provide feedback to improve the developed tools. In this regard, the evaluation framework that will guide the project's pilot assessment activities will be structured around the five main pillars described below:

- 1 User acceptance (how do users perceive and use the improved services and applications?);
- 2 Inclusivity and accessibility (how inclusive and accessible are the new or improved digital mobility or logistics services and applications to the users?);

- 3 Cybersecurity and personal data aspects (to what extent the cybersecurity and personal data aspects have improved in the improved services and applications?);
- 4 Process evaluation of the INDIMO Inclusive Digital Mobility Toolbox (how can the tools be used in practice to improve the current way of working?);
- 5 Applicability and transferability assessment (How feasible is it to apply INDIMO tools in different local settings and how likely is it that those tools can achieve the same outcomes?)

The process evaluation pillar can be further subdivided into two parts:

- a. Decision making process assessment
- b. Usability assessment

The evaluation framework shown below in figure 4 will provide, for each pillar, answers to the questions mentioned in section 1.1.

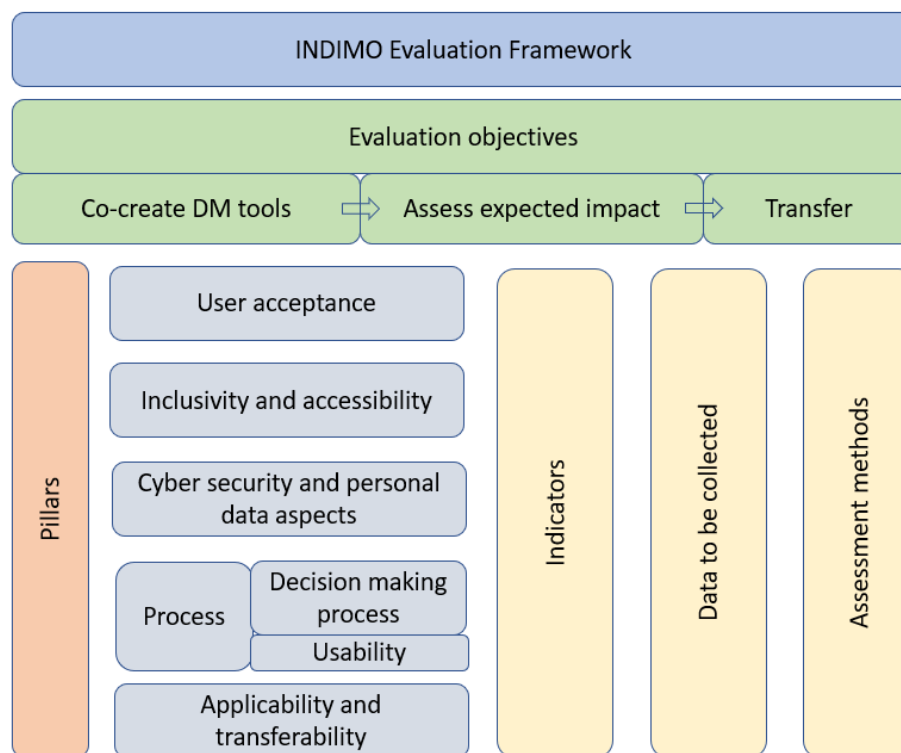


Figure 4: INDIMO evaluation framework

The evaluation framework will function in co-ordination with the pilot handbook (D3.1). In pilot phase 1 (task 3.3) the baseline measurements will be taken and in pilot phase 3 (task 3.5) post implementation data will be collected on the indicators from the evaluation framework to investigate if the pilots have achieved improvements over the original setup through the use of INDIMO digital mobility tools developed in WP2. The evaluation results will feed into the second iteration of these tools in WP2 to improve and optimize the tools in terms of applicability by

developers and policy makers, addressing all needs of the target groups. It must be noted that the indicators, attributes and factors that are identified in this deliverable are although comprehensive, but preliminary in nature. Therefore, the list of the final set of indicators, attributes and factors corresponding to each evaluation framework pillar for pilot locations will be developed by suitably adapting and updating these lists of indicators, factors and attributes in co-ordination with the relevant tasks (T4.2, 4.3, 4.4 and 4.5), pilots and work packages such as WP3 if and when necessary as the project advances. Nevertheless, this evaluation framework will always serve as a foundation of the evaluation activities throughout the INDIMO project.

2.3 Indicators and data collection

Once the objective and interventions have been identified, it is necessary to identify a set of indicators that can help determine what data needs to be collected in order to assess if the project has achieved its targeted its goals and objectives or at least on track to achieving the same. As per the Food and Agricultural organization of the United Nations an indicator represents the concrete expression of the target quality/impact at a specific time, based on a concrete measurement scale (Food and Agricultural Organization UN, 2020). The following aspects must be established in order to construct an indicator:

1. The impact to be measured.
2. The objectives of the project.
3. The way in which this impact will be measured.
4. The possible levels/values that can be reached, the maximum and minimum and their qualitative significance.
5. Capability of the indicator to reliably assess the impact using the chosen experimental tools and measurement methods.

Indicators must also comply with some basic requirements (Castillo & Pitfield, 2010), i.e.

- (i) **Measurability:** An indicator should be capable of being measured in a theoretically sound, dependable and easily understood manner.
- (ii) **Ease of availability:** Reliable data on the indicator needs to be available for collection easily and at a reasonable cost or it should be possible to calculate/forecast the value of the indicator using accepted models.
- (iii) **Speed of availability:** Data from which the indicator is derived or calculated should be regularly updatable so that shortest time lag between the state of affairs being measured and the indicator becoming available can be ensured.
- (iv) **Interpretability:** All stakeholders should be able to easily, clearly and unambiguously understand the indicators and the information derived from it.
- (v) **Mobility's impact isolatable:** It is important that mobility's share of the impact that the indicator is purporting to measure can be isolated.

Once indicators have been identified, the next important step is data collection. This can involve two types of data:

- (a) **Primary data:** Data that is collected as a part of the project.
- (b) **Secondary data:** Data that is already available.

In INDIMO, we will be mainly depending on the primary data collection. Some of the qualitative and quantitative methods for data collection that have been identified in the INDIMO DoA are:

1. Semi-structured interviews
2. Questionnaire surveys
3. Focus groups

Additionally, in DoA it has been proposed that these data collection methods will be supported by activities such as analysis of case studies, communities of practice and quantitative data analytics of backend data.

3. User acceptance

Under this pillar the user acceptance of the new or improved pilot digital mobility services (DMS)/digital delivery services (DDS) will be evaluated, i.e. how do users perceive and use the improved services and applications? To understand to what extent the tools developed in WP 2 as part of the INDIMO Digital Mobility Toolbox have an impact on user acceptance of digital mobility services/digital delivery services in the pilot projects, data mentioned in sub section 3.2 of this deliverable will be collected by the pilot partners based on the detailed data collection plans in the Pilot handbook (D3.1) from users parallel to Tasks 3.3 & 3.5 to compare the baseline (before using the tools) and the situation after implementation (after applying the tools). The collected data will be related to the indicators mentioned in sub section 3.1 of this deliverable.

3.1 Assessment indicators

The following indicators will be used for measuring the end user experience with the improved digital mobility services/digital delivery services in each of the pilots. The concrete and final selection of indicators as well as the concrete questions covering the indicator and its description will be elaborated in consultation with the pilots as part of task 4.2 (Evaluation of inclusion and accessibility including a gender perspective). In the current table, a first assessment is based on the applicability of each indicator to one, more or all pilots.

Table 1: List of assessment indicators for user acceptance¹

Category	Indicator	Description	Pilot
<i>User capabilities</i>	Perceived usefulness (Davis, 1985; Venkatesh & Davis, 2000)	The degree to which a user believes that using INDIMO's improved digital mobility service/digital delivery service can have more utility for them or can empower them more working as a capacity building tool.	All pilots
	Perceived ease of use (Davis, 1985; Venkatesh & Davis, 2000)	The degree to which a user believes that using INDIMO's improved digital mobility service/digital delivery service is not physically or mentally demanding.	All pilots
	Experience (Venkatesh & Davis, 2000)	The degree to which a user has previous experience in using similar digital technologies as the one provided by INDIMO.	Berlin, Madrid
	Self-efficacy (Davis, 1985; Venkatesh & Davis, 2000)	The belief of the user that they are capable of using the INDIMO digitally improved mobility service successfully.	All pilots
	Digital anxiety (Venkatesh & Davis, 2000)	A user's apprehension, or even fear, when faced with a digital application.	Madrid, Berlin, Galilee
<i>Facilitating conditions of usage</i>	End user support (Venkatesh & Davis, 2000)	A user's access to specialised instructions and support for using an INDIMO improved digital mobility service.	All pilots
	Physical accessibility (Venkatesh & Davis, 2000)	The physical accessibility of an INDIMO improved digital mobility service/digital delivery service.	All pilots

¹ Table 1 and table 2 (Assessment of accessibility and inclusion) contain some indicators which have similarities. During data collection attention will be given so that duplication of data collection can be avoided.

Category	Indicator	Description	Pilot
	<i>Time availability</i> (Venkatesh & Davis, 2000)	Time needed to be invested in learning to use INDIMO improved digital mobility service/digital delivery service.	All pilots
	<i>Cost</i> (Venkatesh & Davis, 2000; Tornatzky & Klein, 1982)	The monetary cost incurred by a user for using the INDIMO improved digital mobility service.	Berlin, Madrid, Emilia Romagna, Galilee
<i>Task features</i>	<i>Task relevance</i> (Davis, 1985)	user's perception that the INDIMO improved digital mobility service/digital delivery service is relevant for the task they want to complete.	All pilots
	<i>Compatibility</i> (Lee, Kozar, & Larsen, 2003; Mallat, Rossi, Tuunainen, & Öörni, 2009; Moore & Benbasat, 1991)	The degree to which an INDIMO improved digital mobility service/digital delivery service is perceived, by the user, as compatible with their existing needs, values, and past experiences.	All pilots
<i>Output features</i>	<i>Output quality</i> (Venkatesh & Davis, 2000)	The perceived quality of the outcome produced by the INDIMO improved digital mobility service.	All pilots
	<i>Result demonstrability</i> (Davis, 1985)	The tangibility of the outcomes obtained by the use of an INDIMO improved digital mobility service/digital delivery service (i.e. able to demonstrate to others the positive results obtained by the use of the component).	All pilots
<i>Social factors</i>	<i>Subjective norm/social approval</i> (Davis, 1985)	a user's perception that their significant others may approve (or not) of using an INDIMO improved digital mobility service.	All pilots

Category	Indicator	Description	Pilot
	<i>Social influence</i> (Maness, Cirillo, & Dugundji, 2015; Paez & Scott, 2007; Carrasco & Miller, 2006; Deutsch & Goulas, 2013; Venkatesh & Davis, 2000)	A user's decision to use an INDIMO improved digital mobility service/digital delivery service as a result of social influence (e.g. community influence).	All pilots
	<i>Perceived connectedness/communication</i> (Fetscherin & Lattemann, 2008; Park, Baek, Ohm, & Chang, 2014)	A user's perception of being connected with and collaborating with the other users of an INDIMO improved digital mobility service, while using it.	All pilots
	<i>Image</i> (Davis, 1985)	The degree to which a user perceives the usage of an INDIMO improved digital mobility service/digital delivery service as able to enhance their status in their community.	All pilots
<i>User innovativeness</i>	<i>User innovativeness</i> (Venkatesh & Davis, 2000)	A user's willingness to try out an INDIMO improved digital mobility service/digital delivery service due to its innovative features.	All pilots
	<i>Cognitive playfulness</i> (Venkatesh & Davis, 2000)	A user's cognitive spontaneity when using an INDIMO improved digital mobility service.	All pilots
<i>Hedonistic motivation</i>	<i>Expressiveness</i> (Nysveen, Pedersen, &	User's perception that the use of an INDIMO improved digital mobility service/digital delivery service allows	All pilots

Category	Indicator	Description	Pilot
	Thorbjørnsen, 2005)	them to express their social or personal identity and emotions.	
	Perceived enjoyment (Venkatesh & Davis, 2000)	A user's perception that an INDIMO improved digital mobility service/digital delivery service is expected to be enjoyable when using it, aside from any performance results	All pilots
	Flow of experience (Hsu & Lu, 2004)	A user's experience as being absorbed by the activity of using an INDIMO improved digital mobility service. Characteristics of flow, applicable to this case, are: concentration, enjoyment, being in control, and seamless sequence of response, amongst others.	All pilots
	Integration (Shin, 2010)	A user's perception that that an INDIMO improved digital mobility service/digital delivery service is well integrated in their lives, without interfering with other activities.	All pilots
Ethics (in relation with evaluation of cybersecurity assessment)	Trust (Shin, 2010)	A user's trust that an INDIMO improved digital mobility service/digital delivery service will act as expected (Shin, 2010).	All pilots
	Perceived security (Shin, 2010)	A user's perception of security while using an INDIMO improved digital mobility service.	All pilots
	Privacy (Shin, 2010)	A user's perception that any personal data collected by an INDIMO improved digital mobility service/digital delivery service about themselves or others remain confidential.	All pilots

3.2 Data collection

In addition to the user experience indicators related data, in order to understand the concrete use by end users and in order to place the self-reported statements about the end user experience in the right context, the following data in each pilot from the improved digital mobility service/digital delivery service will be collected:

1. **Number of total end users:** number of total end users for each target group that used the improved digital mobility service/digital delivery service during the trial period of the project.
2. **Number of new engaged end users:** number of end users from each of the target groups registered to the digital mobility service/digital delivery service in the pilot and not using the service before the INDIMO-trial:
 - a. Number of new end users discovering the digital mobility service: number of new users in each target group discovering the tool without necessarily using the service connected to it;
 - b. Number of active new end users: number of new users in each target group actually using the service at least one time during the INDIMO trial.
3. **Number of existing users also using the improved INDIMO service.**
4. **Number of users using the improved INDIMO service only once during the INDIMO trial period.**
5. **Number of returning end users:** number of end users used the digital improved INDIMO mobility service more than once during the INDIMO trial period.
6. **Number of requests for help:** number of requests by end users for information about how to use the digital improved mobility service during the trial period.

If necessary and depending on the pilots, numbers referring to specific components of the service offering might be added. This will be decided upon by pilots.

In summary, the data to be collected are twofold:

- Quantitative for the user experience indicators. Each indicator will be split down in (a) particular statement(s) adapted to the pilot and has a 5-point qualitative Likert scale on which users indicate their opinion. (from 1 to 5 with 1 = strongly disagree/2 disagree/3 neither agree/nor disagree/4 agree/5 strongly agree)
- Quantitative data for the usage indicators of the service: 'hard' numbers (analytics of system)
- Qualitative testimonies by means of interviews with end users

The data about the end-users will come from three methods (survey, interview, usage data):

- **Survey** with end users of the (improved) digital mobility service. The data will be provided in each pilot by end users and collected at level of the pilot at the beginning and end of the trial.
- **Semi-structured interviews** with a selection of end users (min 3 per pilot) of the improved digital mobility service/digital delivery service in order to dive deeper into the survey results at the end of the pilot trial.

- **Quantitative backend data:** Usage data collected from the system of the improved digital mobility service. This data will be provided by the owner of the system at the end of the pilot trial. If possible, an overview of the numbers for each month is given in order to identify increase or decrease or particular points of usage.

3.3 Assessment methods

In order to evaluate the impact of the services on user acceptance, a before and after evaluation by end users will be performed by means of a survey. In particular, the response of users at initial stages before the implementation of the INDIMO tools (baseline survey) will be organised and again at end after the implementation of INDIMO tools. Depending on practicalities, baseline survey participants who will give their consent to be contacted again and leave their contact information will be contacted for the survey to be done at the end after the implementation of INDIMO tools. In addition, there will be a trial phase in between for prototype testing and tool improvement. This beginning and end measurement allows to chart an increase or decrease of user experiences on the indicators and allows to check which indicator(s) play a more determinant role on user acceptance of the improved services. In order to understand the reactions, user profile/characteristics questions and self-reported usage questions (number of use, assistance or not, periods of use, ...) will be added to the survey

If feasible and depending on resources available (budget, time, research staff, other tasks), a comparison between users and non-users can be made via a control group. The non-users are the control group that allows us to check if the increase on one of the indicators is actually due to the improvements done during the project or can be attributed to an external factor. In this scenario, both the non-users and the users groups are recruited before each iteration and take a survey at the start and at the end.

In case such a control group scenario is not feasible, questions on particular conditions that could have influenced the usage of the services by the end user will be added to the end user survey. These context factors will be elaborated together with the pilots in order to find these conditions for each pilot.

Another scenario to compensate for the absence of a control group is to look for involvement of members of the Community of Practice in each pilot as these participants are not end users of the service but will nonetheless follow up on the development of service. As they are experts on the matter, they might identify conditions that influence usage independent of INDIMO and thus support to better assess the real impact of the INDIMO tools on the services and the resulting user experience and acceptance.

3.4 Possible risks and limitations

The following limitations that may be faced regarding the data to be collected and the results of the assessment are outlined below:



- Size of the user sample in the pilot: It is not the aim to have a statistically representative panel size, nevertheless a certain broad base of participation is necessary to have meaningful results. The same counts for the control group members. This depends on the success of the user recruitment strategy in the pilots. The size of the sample depends also on the objectives of each pilot.
- Diversity of the profiles and engagement towards evaluation methods: To what extent are the end user profiles in the pilots easy to reach out to with respect to participation in the evaluation? To what extent should we adapt the survey (e.g. number of questions) in order not to ‘harm’ the recruitment but on the other hand also not to have “thumbs up/down” style surveys.
- Surveys should be accessible (online/paper). Besides the design of the survey, also attention should be paid to its distribution.
- Control-group/users recruitment and engagement: feasibility within the resources at hand in the pilots. Alternative strategy via CoP or extra questions on external conditions and their impact in survey to end users.
- Backend usage data may not be retrievable and accessible.
- Anonymisation of personal data: while the pilots will have to make sure that they can follow up on participants, it should be made sure that the collected survey data are anonymised when sent for analysis.

4. Inclusivity and accessibility

Under this pillar the inclusivity and accessibility of the new or improved digital mobility or logistics services will be evaluated, i.e. to what extent the tools developed in WP 2 as part of the INDIMO Digital Mobility Toolbox have an impact on inclusion, accessibility and gender equality of digital mobility services/digital delivery services in the pilot projects (implemented in Task 4.2). Data mentioned in sub section 4.2 of this deliverable will be collected by the pilot partners based on the detailed data collection plans in the Pilot handbook (D3.1) from users parallel to Tasks 3.3 & 3.5 to compare the baseline (before using the tools) and the situation after implementation (after applying the tools). The collected data will be related to the indicators mentioned in sub section 4.1 of this deliverable. Task 4.3 will synthesize and translate these collected data to identify the level and direction of change in inclusivity and accessibility of the tested services and applications.

Inclusivity and accessibility have rarely been looked at together when it comes to digital mobility solutions. From one side, inclusivity is intended as the ability to provide equal access to digital mobility solutions for people who might otherwise be excluded or marginalized, such as those having physical or mental disabilities or belonging to minority groups in terms of socioeconomic, language and spatial barriers. From the other side, accessibility is intended as the physical and cognitive ability to get access of digital interfaces of transport services. INDIMO considers universal access from both of these viewpoints therefore investigating barriers and opportunities

for users from the usability perspective (how easy is it to use a digital interface or service), the equity perspective (why can certain groups of society not access a service due to spatial issues, i.e. service not available), the economic perspective (service too expensive or requires credit card payments) or limitations to access to technology (internet coverage, device availability). A comprehensive understanding of these interlinked aspects of inclusivity and accessibility to digital services is hence needed.

4.1 Assessment indicators

When considered separately, inclusivity and accessibility have previously been assessed through the use of several sets of indicators. The aim of INDIMO is to develop a comprehensive framework that could enhance the assessment of both dimensions. In order to be fully inclusive and accessible, new digital transport solutions need to show their adaptability to several aspects or scales of inclusivity and accessibility. These scales include:

- **Spatial:** they should be adaptable to rural, remote and deprived areas.
- **Functional:** they should be potentially integrated with the current regular public transport, including door-to-door trip attributes (i.e. comfort, reliability, safety, security, and time) in comparison to current options.
- **Socio-economic:** they should be socially inclusive, and oriented towards the mobility needs of specific population groups such as children, older people, low-income groups and those with cultural constraints, to name but a few. The complete list of vulnerable to exclusion target groups covered in INDIMO is included in D1.1.

The distinction between the three scales is vital, because in many cases, digital mobility solutions replace more traditional forms of public transport provision. As such, if these digital mobility solutions are not fully inclusive, they will serve to further marginalise already vulnerable population groups and undermine already fragile transport services in remote areas.

The conceptualisation of inclusivity should go beyond the regular understanding of a fair mobility system. Mobility systems can be said to be inclusive if they: not only serve the widest possible range of persons, including young people, older people, people experiencing travel-related impairments, immigrants and low-income households, but also meet the specific travel needs of these groups. The latter implies transport services that:

1. are inclusive and accessible for all in a technical sense, minimizing or extinguishing the **physical, cognitive and cultural barriers and efforts** for whom might otherwise be excluded or marginalized (e.g. wheelchair accessible).;
2. **take the gender perspective** into account;
3. are affordable in relation to people's **resource budgets** (e.g. guaranteeing reasonable travel times and costs);
4. are based on a thorough understanding of the **activity needs** of various vulnerable-to-exclusion groups;

5. and adequately serve people's **key travel needs** (i.e. not only serving peak hour commuting patterns but also supporting people's social activities and networks, such as the trips for care-giving activities-buying food, medicament or accompanying a dependent person).

When digitalising mobility, attention shall be given to the accessibility of information and the devices used for people with a wide range of impairments, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities and socio-economic and ethical factors. There are already several international and European guidelines and legislation on how to make information accessible for a wide range of users, including people with different types of disabilities (e.g. United Nations Convention on the Rights of Persons with Disabilities, UN CRPD; Web Content Accessibility Guidelines, WCAG 2.0/2.1, ISO/IEC 40500:2012 standard; Standard EN 301549 on accessibility requirements of ICT products and services, EU Directive on the accessibility of public sector bodies' websites adopted in 2016).

Digital mobility services/digital delivery services, however, combine several physical (vehicles, stations, devices) and non-physical elements (interfaces, service offer) that fall under different legislations or guidelines making it complicated to design a system or service where every element is accessible. In addition, the travel process consists of different stages (pre-travel planning, booking and ticketing, en-route information, post-travel evaluation, billing, etc.) which each require the use of a different combination of these physical and non-physical elements by travellers. Therefore, the assessment indicators to be identified in INDIMO evaluation framework must be chosen with the aim of building a comprehensive design manual that considers each of these elements of the digital mobility services/systems (software interfaces, ticketing systems, devices, on and off-vehicle information systems etc.) in a comprehensive manner from the point of view of the users. At the same time, the needs of the developers, providers and financiers or regulators of such systems (i.e. the software and hardware developers, transport service operators and transport authorities) will also be taken into account in order to produce guidelines that are applicable in practice.

In line with the literature, potential mobility refers to the ease with which a person can move through space (Sager, 2006), while accessibility represents a person's ability to reach a range of destinations (Koenig, 1980). Accessibility can also be interpreted as the ability for someone to have access to any kind of service. In the INDIMO-project both forms of accessibility are used since both have an influence on the user's ability to use various forms of mobility.

The concept of inclusion means we strive to be able to offer the same benefits to all layers of society. In recent years, several indicators for capturing inclusion issues in transportation have been defined. Among them, and probably most widely used, are those dealing with accessibility (Geurs & Van Wee, 2004; Farber, Morang, & Widener, 2014; Paez, Scott, & Morency, 2012; Wang, Monzon, & Di Ciommo, 2015; Lucas, 2019). By doing so, they can provide a comprehensive assessment of the accessibility 'service' received by the users (Martens, 2015). Therefore, they have long been introduced in the transportation planning literature as indicators of the quality of services (Ben-Akiva & Lerman, 1979).

Table 2: List of assessment indicators for inclusivity and accessibility

Category	Indicator2	Additional note on the indicator	Data availability from INDIMO data collection and pilot
Inclusivity & accessibility	Number of downloads of the proposed INDIMO app by people with disabilities or older people	Making technology and electronic services accessible and usable by people with disabilities or the elderly	All pilots, specially P1, P2 and P4.
	Number of people having broadband internet access.	Giving people broadband internet access.	All pilots, specially P1, P4 and P5 (lower income people)
	People that have access to e-commerce and public services that save time and money.	Preventing economic exclusion from e-commerce and public services that save time and money.	All pilots, specially P1, P3 and P4
	Number of persons involved in digitally connected communities.	Preventing social exclusion from digitally connected communities.	All pilots, specially P1 and P4 (i.e. migrants and socially isolated people)
	Number of accesses to any digital technology in communities to tackle area-based deprivation.	Using any digital technology in communities to tackle area-based deprivation.	All pilots, specially P3 and P5

² Most of the indicators here are largely inspired by articles written by Saha (2014), Arora (2019) and INDIMO D1.1. Indicators that are expressed in terms of numbers will be collected in the term/format (such as absolute numbers, percentages with respect to the population etc.) that represents the case in the most suitable or appropriate way.



Category	Indicator2	Additional note on the indicator	Data availability from INDIMO data collection and pilot
	Number of uses of any digital technology to tackle social exclusion.	Using of digital technology to tackle social exclusion	All pilots, specially P3 and P5
Affordability	Proportion of additional household income gained thanks to the introduction of DMS/DDS for the lowest income population ³	Increased household income thanks to the accessibility to jobs by ethnic and migrant groups.	All pilots, specially P1 and P3
Attention to needs	Level of the accessibility to key life activities before and after the use of the app and the associated transport service.	An accessibility index has been defined and adopted to this goal in the Pilots' handbook.	All Pilots
	Waiting time between booking transport services and receiving them. This is adequate for personal mobility and goods delivery DMS/DDS assessment.	Digital waiting time.	All pilots, specially P3, P4 and P5.
Gender perspective⁴	Use of DMS/DDS for care-giving trips purpose and other essential activities.	Adoption of DMS/DDS for care-giving trips	All pilots, specially P1, P2 and P4

³ If it is not feasible to collect this data, self-declared perception of the same can be considered

⁴ Specifically women related data are being collected here as it has been seen by comparing world transport and travel-use data men are caregivers in the 18-22% of cases, and women for the rest (Mitra-Sarkar & Di Ciommo, 2019)

Category	Indicator2	Additional note on the indicator	Data availability from INDIMO data collection and pilot
	Number of people empowered to download the INDIMO DMS/DDS apps, specially by low skilled persons and women	Closing the gap between those enabled and empowered to download the INDIMO DMS/DDS apps and those who are not.	All pilots, specially P3 and P5
	Number of women who can take advantage of DMS/DDS in respect to the mobility of care - giving (e.g. purposes related to food and medicaments shopping, accompanying dependent persons and visit family and friends).	Adoption of DMS/DDS for women who mostly carry out care-giving trips.	All pilots, specially P3 and P5
Transport poverty	DMS/DDS contribution to complement the capacity, frequencies and network of public transport (PT).	Increasing of PT capacity and services and extending traditional PT networks.	All pilots, specially P3 and P5
Security issues	DMS/DDS information about service status for reducing sexual harassments in public transport, disease contagion, etc.	Providing appropriate information on service status for avoiding sexual harassment situations and disease contagion.	All pilots, specially P3, P5
Comfort	Leisure is a key driver of the popularisation of digital mobility solutions. A leisure barometer will be implemented for understanding how much comfortable the use of DMS/DDS is.	The importance to understand social contexts, needs, and aspirations behind DMS/DDS.	All pilots, specially P1 and P4

4.2 Data collection

There are few literature references for indicating key data to collect for evaluating inclusivity, accessibility and gender aspects of DMS/DDS. INDIMO project participants (e.g. developers, social scientists, human-centred specialists in inclusiveness, accessibility and gender specialists) have elaborated a first list of data to be collected for analysing inclusiveness and accessibility also considering the gender perspective. All inclusivity and accessibility data will be available through the analysis of backend data of pilots apps, while affordability indicator estimation needs additional data collected through the users of the application before and after the use of this application. Categories of indicators concerning gender perspective, transport poverty, security issues and comfort need additional data collection for each INDIMO DMS/DDS.

The identified data collection methods for estimating the abovementioned indicators include the following:

1. Short survey on user experience proposed through the Digital mobility service (DMS)/digital delivery service (DDS) INDIMO apps for checking the apps use
2. Accessibility index (Di Ciommo, 2018) described in D3.1.
3. DMS/DDS INDIMO apps backend data analysis. This data will be downloaded directly from DMS/DDS app.
4. Social digital networks data related to INDIMO DMS/DDS apps. (Kim, Rasouli, & Timmermans, 2018)
5. Exploitation of content analysis of data collected through semi-structured interviews and quantitative survey developed for users and non-users of INDIMO apps.

4.3 Assessment methods

Traditionally, transport assessment adopted Cost-benefit Analysis (CBA) or Multicriteria tools. However, literature has widely showed that CBA is insufficient for assessing accessibility and inclusiveness (Martens & Di Ciommo, 2017) of more vulnerable to exclusion people even when CBA assessment model explicitly considers characteristics of these vulnerable groups (e.g. low-income) (Guzmán, Di Ciommo, & de la Hoz, 2013). More recently, the consideration of needs-based approach and capabilities identification for evaluating mobility services has shown how a wider consideration of needs, capabilities and challenges of vulnerable end-users can offer a performant assessment tool where vulnerable people are able to clearly say what are their needs to cover in terms of mobility services. Building on the information from D1.1, for the above-mentioned assessment indicators, DMS/DDS can start from the needs-based approach for defining an appropriate assessment of inclusivity, accessibility and gender balance tool to be assessed. The Universal design manual with the data management and privacy plan will provide assessment tools for evaluating the degree of inclusiveness, accessibility and gender balance aspects. Similar to the user acceptance pillar, for this pillar too assessment will be done on data collected in 3 phases: baseline data (before the implementation), trial phase data, after implementation data.

4.4 Probable limitations

Probable limitations are related to the specific above-mentioned data collection that is related to the use of the DMS/DDS and the specific information that the DMS/DDS applications can provide for assessing the process. Therefore, during pilot implementation phase it must be kept in mind that DMS/DDS apps need a critical mass for producing the assessment indicators shown in section 4.1 section.

5. Cybersecurity and personal data aspects

In this section, two important security aspects to be incorporated into digital mobility tools are considered: 1) cybersecurity and 2) personal data privacy. Cybersecurity is a very broad topic, including any practices aiming to secure electronic equipment from antagonist threats, e.g. computers, servers, mobile devices, networks, data etc. (Kaspersky, 2020). The motivations behind cyber-attacks can be several. Organized criminal groups could attack the information system layer of companies, e.g. manipulating data, copying data, sabotaging security devices etc., to facilitate theft of money or valued objects. People indulged in cyber-criminal activities such as cyber hackers could steal and gather sensitive information from countries or use media and communication channels to drive propaganda with the scope to weaken existing regimes, i.e. geopolitical reasons. Finally, an attack could aim to cause fear or panic in a country, i.e. terrorism, attacks driven by ideological reasons e.g. religion (Kaspersky, 2020).

In transport services, personal data of users of public transport systems can be collected, stored and exchanged at various stages. For instance, when users visit public transport websites, when road users or public transport passengers are recorded with cameras, when vehicle registration numbers are collected, when subscriptions to transport services are created, when tickets are purchased etc. This information can reside in central servers of the transport agency, or it can be intercepted during communication when it is exchanged between users and transport IT systems, or between the transport agency and other services providers, e.g. media, banks etc. Likewise, the same information could be stored in electronic tickets based on RFID tags (Radio Frequency Identification tags). Personal information of the owners includes paid subscription fees, location, and transactions. The information in the e-tickets can be stolen (using readers), the cards can be skimmed or manipulated creating illegal subscriptions to the transport services (Sadeghi, Visconti, & Wachsmann, 2008). Protecting personal data is important, for instance to prevent fraud and identify theft. From a geopolitical perspective privacy ensures trust in a society, respect, freedom of thought and most of all to limit political power, “the more someone knows about us, the more power they can have over us” (Solove, 2014).

Countries in Europe are working intensively by preparing legislative frameworks that can ensure the protection of personal data (Council of Europe, 2020). Internet websites or other applications typically collect personal data, e.g. shopping on e-commerce websites, e-learning, and specifically websites or apps that are necessary to access and use transportation services. Important aspects of personal data protection are contained in the General Data Protection Regulation (GDPR), which according to Regulation (EU) 2016/679, regulates “the processing by an individual, a company or an organisation of personal data relating to individuals in the EU”



(EU, 2020). According to GDPR, personal data refer to information or pieces of information that could be collected together in order to lead to the identification of a particular person (EU, 2020). Nevertheless, existing policies and regulations are not drafted to specifically govern operations of Intelligent Public Transport (IPT) (Lévy-Bencheton & Darra, 2015). Therefore, advances in new regulatory frameworks are expected in the coming years.

5.1 Assessment indicators

To assess the implementation of solutions aiming to prevent, detect and mitigate cyberthreats, diverse standards exist. In the context of the INDIMO project, we have reviewed the standards proposed by ISO27001 and those from the National Institute of Standards and Technology, NIST 800-55 from the U.S Department of Commerce (Chew, et al., 2008). These indicators constitute the most used standards that are available to assess cybersecurity. The scope of this section is to expound KPIs found in literature and thereafter, elaborate on measurement areas and KPIs to identify in all INDIMO pilots, as explained in section 5.2.

The NIST 800-55 is of special interest for this report, since it proposes a robust methodology to identify and measure the impacts of security controls. The NIST is a document providing information for measuring the impacts of security controls through three categories: *implementation, efficiency and effectiveness* and organizational *impact measures*. The guidelines support the decision making concerning where to invest in additional information security but also whether to dismiss non-productive security policies, controls and procedures (Chew, et al., 2008). Next, they point out the importance of top management commitment, which is critical for the implementation of the program. Next, the guidelines encourage the development and implementation of security policies and procedures to be backed up by the authority in charge of enforcing compliance. These policies and procedures lay the foundations to successively measure progress and compliance. The final step is about measuring organizational performance using quantitative indicators. These KPIs should be easy to obtain, feasible to measure, and repeatable and subject to periodic reviews (Chew, et al., 2008).

5.1.1 Implementation

Standards include KPIs to measure implementation of protective measures. Measuring the implementation of information security measures aims to determine the progress in implementing programs or specific security controls, associated policies, and procedures. These measures come after periodic security risk assessment carried out by companies and leading to the implementation of appropriate security controls, policies and procedures. Chew et al. (2008) give examples of indicators that can be used to measure the degree of implementation of information security measures in a company. Hence, the scope of this set of indicators is to assess the maturity level reached by companies in the task of implementing processes, procedures, and security controls (Table 3).

Table 3: Possible indicators to measure implementation progress.

Indicator	Definition
Security Plans approved	% of information systems with approved system security plans.
Password policies	% of information systems with password policies configured as required.
Standard configured servers	% of servers within a system with a standard configuration.
Trained personnel	% of information system security personnel that have received security training.
Approved configuration changes	% of approved and implemented configuration changes identified in the latest automated baseline configuration.
Signed acknowledge statement	% of users with authorized access granted to information systems after signing acknowledgement.
Personnel screening	% of personnel screened before granting access to information systems.
Secure contracting	% of system and service acquisition contracts with security requirements / specifications.
Enable cryptographic operations	% of computers and mobile devices that can perform cryptographic operations
Installed patches	% of operating systems for which patches have been installed/applied.

The percentage indicates the % of completion of the specific task. These data should be obtainable from information security reports, quarterly and annual FISMA reports (Federal Information Security Modernization Acts), plans of action and milestones (POA&M) and other documents that are used to track and monitor information security programs activities.

5.1.2 Efficiency and effectiveness

The scope of these KPIs is to measure how the implemented security measures are operating. Effectiveness measures the robustness of the security control implemented, while efficiency the timeliness of results obtained. Also, for this category, Chew et al. (2008) propose examples of measures. These are elaborated in Table 4.

Table 4: Possible indicators to measure efficiency / effectiveness.

Indicator	Definition
Vulnerability mitigation	% of vulnerabilities mitigated within a certain time frame t established by the organization.
Remote unauthorized access	% of remote access points used to gain unauthorized access.
Audit review	Average frequency of audit records review.
Certification & accreditation	% of new systems that have completed certification and accreditation (C&A).
Tested contingency plans	% of information systems that have committed annual contingency plan testing.
Shared accounts access	% of users with access to shared accounts.
Reported incidents	% of incidents reported within the required time frame for each incident category
Systems in maintenance	% of systems that undergo maintenance according to pre-established maintenance schedules.
Enacted sanitization	% of media devices passing sanitization procedures.
Physical security accidents	% of physical security accidents concerning unauthorized access to facilities containing information systems.

Indicator	Definition
Vulnerabilities remediated	% of vulnerabilities fully remediated after a specified time t.

5.1.3 Impact Measures

The scope of these measures is to determine the potential impacts of the security measures on the organization. These could be derived by the specific strategies and goals of organizations. Examples of measures are the following:

Table 5: Possible indicators for impacts of the security measures

Indicator	Definition
Security budget allocated	% of company budget dedicated to information security.
Cost-savings	Cost savings produced by the information security system.
Trust	Degree of public trust gained.

5.2 Data to be collected

The following steps are suggested to proceed with the collection of data in all the pilots to 1) provide a case context description, as recommended in risk management processes (e.g. ISO 27001) and thereby 2) measure the three areas suggested in NIST, i.e., implementation, efficiency / effectiveness and impact measures:

- Establish a case context analysis
- Identify and measure implementation KPIs.
- Identify and measure efficiency / effectiveness KPIs
- Identify and measure Impacts measures

5.2.1 Establish case context analysis

Document the overall background of the case company in relation to the following pillars as indicated in ISO 27001 (Kenyon, 2019):

- Management improvement cycle, Plan-Do-Check-Act
- Document current legislation.
- Data structure / exchange /stakeholders involved
- Risk perception measurement per stakeholder

5.2.2 Implementation/efficiency/effectiveness

Review risk management documentation and highlight main risk criteria identified. Example of risks that could be spotted in the cases can be but not limited to the following ones:

- Risk of human resources employed, e.g., background screening
- Corruption / malware mobile devices at work/home
- Malware / virus in media devices, e.g., physical media transfer devices
- Unauthorized access to network and network services.
- Adoption of cryptography in information storing / exchange.
- Risk for physical access, damage and interference to the organization's information and information processing facilities.
- Sabotage of equipment/devices used for the storing / exchange of information.
- Backup system failure.
- Lack of redundant systems.
- Access to login information of information system users.
- Risk for eavesdropping, intrusion via wireless networks and information theft.
- Lack of security requirements in purchasing/procuring of new information systems or updates of existing ones.
- Unauthorized access to information shared with suppliers.
- Lack of response practices in case of cybersecurity / breach into the system.

In the risk management documentation, identify the security controls determined by the case company. Some examples could be:

- Proceeding with firewall updates to detect and prevent malwares.
- Establish a new procedure for monitoring / reviewing and auditing service delivered by suppliers.
- Create a procedure to test security systems, e.g. red teams.
- Controls or processes to ensure restriction of access to main system functions and compliance to access control policy of company.

Diversify what solutions are “being implemented” versus what solutions are “going to be implemented”. Solutions being implemented will be assessed according to guidelines specified under “implementation”, those that have been implemented during a minimum of 1 year will be measured in terms of their “efficiency/effectiveness”.

5.2.3 Impact measures

In view of the measures identified in the previous section; the following data will be needed:

- Corporate allocation of budget to information / physical security in %.
- Costs vs benefits of operating security solutions. To perform this assessment data about spending budget and risk mitigation as a benefit will be needed.

To measure the degree of public trust gained, data could be collected from end-users with qualitative techniques.

5.3 Data collection methods

Data should be collected by using a case study methodology where the unit of analysis should be centered on the access and usage of transport services by persons with disabilities within the systems established in the pilots of INDIMO.

- **Secondary data collection.** Data from transportation management centre consists of the following:
 - description of IT architecture and systems,
 - data management plan,
 - stakeholders and third-party service providers exchanging data with the transportation management centre,
 - risk management plan/documentation,
 - corporate spending documentation to retrieve information about spending budget on security (information and physical security),
 - annual financial statements to identify and measure operational performance indicators.
- **Semi-structured interviews.** It aims to develop an understanding of the case/context of analysis. Interviews could initially be performed with the Chief Security Officer, Chief Information Officer, Chief Operating Officer, and employees of their departments. They will provide further insights about:
 - perception of risks,
 - current threats of information / physical access,
 - existing security solutions to protect access / theft / sabotage of information / physical access,
 - operations in order to determine the impacts of the security controls.
- **Surveys.** The surveys will be developed following the specifications given in the previous paragraph and aiming to measure the levels of the security controls in the

organization: i) implementation, ii) efficiency / effectiveness and iii) impact measures.

5.4 Assessment methods

Assessment will be made on quantitative and qualitative measures leading to comparable results as well as threshold to evaluate vulnerability / risk levels of an organization. Specifically, text coding will be used for the qualitative data collected from secondary data and semi-structured interviews. Surveys will be analysed using basic statistical techniques.

5.5 Probable limitations

The possible limitations are the following:

- The proposed indicators and assessment methods will need to be adapted to the cases/demos established in the INDIMO project. It is expected that, due to confidentiality, some of these indicators or the related data cannot be disclosed or published.
- The identification of security solutions has to come after a review of vulnerabilities /threats/risks. Risks are based on historical data and past events, implying that vulnerability indicators are not able to capture unexpected risks/threats. A resilient approach is typically necessary in order to deal with the unknowns.
- Some measures, especially those based on qualitative or collected with interviews, may be biased by subjectivity.
- Data confidentiality could limit an in-depth collection and analysis of cyber-related vulnerabilities.

6. Process evaluation

In addition to the impact evaluation of the tools developed in WP2 as part of the INDIMO Digital Mobility Toolbox, it is necessary to conduct a process evaluation of the same to get real evidence of success or failure of the tools developed. Process evaluation focuses on the internal dynamics and actual operations of a measure in an attempt to understand its strengths and weaknesses (Dziekan, et al., 2013). This objective is achieved by evaluating experiences and perceptions of the stakeholders who are closely related to the measure. In case of INDIMO, these stakeholders are the users of the INDIMO digital mobility toolbox, i.e. the developers, operators and policy makers of different digital mobility services/digital delivery services. Unlike the impact evaluation, in process evaluation, effort will be made to understand how INDIMO can impact stakeholders' current way of working, rather than quantitatively measuring the impact of the INDIMO tools. Emphasis will be placed on the evaluation of the decision-making process of the practitioners and how the toolbox developed in INDIMO can be used by these stakeholders for their benefit. This will help to get insight into the 'stories behind the figures' and to learn from them. Since the process evaluation will be conducted not only at the end of the toolbox

development, but also before and during the development phase, it will provide useful information for initial input and continuous improvement of the toolbox during its development phase through co-creation. Due to this involvement of the practitioners in the development process, the efficacy of the toolbox to address the desired aspects and to be successfully applied universally in other settings is expected to increase. Based on its aspects, the process evaluation pillar in this project can be further subdivided into two parts:

- a. Decision making process assessment;
- b. Usability assessment.

6.1 Decision making process assessment

One of the main objectives of the process evaluation is to understand the explanations behind the successes, failures, delays, challenges and changes of any measure or implementation. In order to understand these issues related to any measure, it is extremely important to understand the way of working of the stakeholders. Throughout the lifetime of any project, several decisions made by the stakeholders depending on the situation and objectives determine the success and failure of a project. Therefore, assessment of the processes how decisions were made holds the key to more successful future projects by learning from the experiences and perceptions of the past. It helps to avoid making the same mistakes again. One crucial part of this decision-making process assessment is to first search for the barriers and drivers/potentials of a measure and then to look for the activities which can alleviate these barriers and make the best use of the drivers present. Since one of the main outputs of INDIMO is the INDIMO digital mobility toolbox, in the context of INDIMO, this assessment can be interpreted as assessing how these tools co-created in INDIMO can improve the current way of working of practitioners or stakeholders such as developers, operators and policy makers in the domain of digital mobility. The framework of doing the same will consist of first collecting the information about the drivers and barriers of digital mobility services/digital delivery services' planning, designing and deployment, steps taken and challenges faced from stakeholders and then assessing if, how and to what extent, the tools created in INDIMO can address these issues and improve the way of working by alleviating the barriers and utilizing the drivers. However, before explaining the assessment procedure further, it is necessary to define drivers and barriers of a process.

6.1.1 Process drivers and barriers

The deployment of digital mobility services/digital delivery services successfully meeting all the objectives of the service is often not straightforward due to real life conditions and unforeseen circumstances faced by stakeholders while taking decisions. The set of events or conditions that shape the decision-making process while planning, designing and deploying can be called the drivers and barriers of a process. To explain in more detail, process barriers are the events or the overlapping conditions that get in the way of the process of reaching a service's objectives (Dziekan, et al., 2013). At the same time, there are often conditions of events that have positive effects on the process. Those are called process drivers. In other words, process drivers are events or overlapping conditions that stimulate the process to obtain the objectives of a service

(Dziekán, et al., 2013). The identification of these process drivers and barriers along with steps taken and other challenges faced by the stakeholders of the digital mobility services/digital delivery services can reveal the way of working and then give insights into the decision making processes behind the designing, planning and deployment of the digital mobility services/digital delivery services and the perception of the people close to the digital mobility domain who are responsible for successful implementation of those services.

6.1.2 Data to be collected

As part of the decision-making process assessment, data related to the process drivers and barriers will be collected from the developers, operators and policy makers associated with the five pilots of INDIMO. However, it is important to collect these data category wise (such as social, financial, planning etc.) for better understanding and ease of assessment. Additionally, stakeholders will be asked to rank the most important drivers and barriers. Key information that will be collected for each driver and barrier are:

- What exactly happened in case of this driver/barrier?
- How did it take place?
- How did it impact the process of the design, planning and deployment of the service?

The table below shows some examples of the category and description of drivers and barriers for which data will be collected.

Table 6: Decision making process drivers and barriers

Category	Drivers	Barriers	Question
Collaboration - Development of the application/services - Implementation of the application/service	Active collaboration by all stakeholders during the development/implementation of the service/application.	Absence of active collaboration (or only passive)	- Which stakeholders were reluctant in participating? - What were the ‘symptoms’ of non-collaboration? - How were the symptoms discovered? - How were the symptoms treated?
Planning	- Planning was structured/achievable - The application was developed according the pre-determined timeline	- Planning was not structured/achievable - Measure was implemented later as planned	- Which were the reasons for delay? - What effects did the delay have on the development/implementation?
Political	- Local political landscape promoted	- Any of the political landscapes did not	- What is the local/regional/national vision/policy on

Category	Drivers	Barriers	Question
	implementation of digital mobility service	promote the implementation	the theme of the service in general and the service in particular?
Organizational	Trust among the partners in the organization was very high	- Lack of trust among organizational partners	- Why did the trust issue develop? - Were the trust issues there from the beginning of the service development?
Financial	- Funds were easily available and multiple sources.	- Lack of interest in funding was noted. - It was not easy to arrange funding	- Who funded the development? - Funding was continuously available throughout the implementation or running of the service? - Is the service profitable? - Why funding was easily available/not available?
Communication	- Fluent communications among stakeholders (operators, developers, policy makers) - Fluent communication to citizens/users	- Lack of communications among stakeholders - Lack of/limited communication to citizens/users	- Are/Were there open communication channels to reach developer and the other way around - Which channels could be used to report problems? - Which channels were used to communicate with citizens/users?
Technological	- High end technology was available for the development/implementation service - Use of new technology attracted new/more users - Employees with high technical skills were available in the organization	- Adequate technology was not available for the development/implementation service - Employees lacked in necessary technical skills	- Technical issues were not noticed from the beginning or even prior to the development? - Why did the new technology attract new users? - Were financial issues related to the technical issues?

Category	Drivers	Barriers	Question
Cultural	<ul style="list-style-type: none"> - Cultural circumstances promoted implementation and run of the service 	<ul style="list-style-type: none"> - Cultural circumstances impeded the promotion/implementation of the services 	<ul style="list-style-type: none"> - How did cultural circumstances effect the service?
Dissemination to key audiences	<ul style="list-style-type: none"> - Key audiences were reached - Dissemination was clear for all participants 	<ul style="list-style-type: none"> - Key audiences were not reached - Dissemination was not clear for all participants 	<ul style="list-style-type: none"> - Why there was an issue with dissemination? - Which channels or avenues were used for dissemination? - How did good dissemination help the service?
Inclusion	Including all groups of people, especially vulnerable to exclusion people made the service more popular and profitable	It was difficult to reach vulnerable to exclusion groups due to internet penetration, technological or payment related issues	<p>Which inclusion aspects were considered and why?</p> <p>Which were not considered and why not?</p> <p>How did an inclusive service have a positive outcome on the success of the service?</p> <p>How was the service made more inclusive?</p>
Gender related aspects	Making the service equally accessible and inclusive for all genders made the service more popular and profitable	Usage of the service by a certain gender is so low that there is no incentive to make an extra effort to consider the needs of that gender	<p>What are the gender related aspects that were considered and why?</p> <p>What are the gender related aspects that were not considered and why not?</p>

Along with these, more data will be collected also about the crucial challenges faced and steps that were taken while deploying the service. Once digital mobility services/digital delivery services are re/designed using the INDIMO tools and deployed, data will collected from the stakeholders about their experiences and perceptions of how these tools have impacted their way of working and decision-making process. This will help to identify how well INDIMO tools were able to make use of the existing drivers and address the issue of the present barriers. Almost all data collected is expected to be qualitative in nature.

6.1.3 Data collection methods

Standardised forms, a type of survey form will be used to collect the data. Due to the standardised nature of the forms, participants can fill it largely by themselves, require less assistance and it is



easier to compare the responses as well. Thus, this method has been proven as practicable (Dziekan, et al., 2013). For decision making process assessment in INDIMO these forms will have a set of questions/fields which stakeholders will be asked to fill in using their own words to write the drivers and barriers they faced and steps they have taken. However, to provide them with some directions, category names and a few examples of possible drivers and barriers will be mentioned in the form. If stakeholders feel some of the categories or examples of barriers and drivers mentioned are not relevant for their pilot, they will have the option to indicate the same in the form.

6.1.4 Timing of data collection

Data will be collected twice from the stakeholders. Once during pilot phase 1 before the INDIMO tools have been developed. This time data related to identification of process barriers and drivers will be collected from the stakeholders associated with the five INDIMO pilots. Then once digital mobility services/digital delivery services are re/designed using the INDIMO tools and deployed, again data will be collected from these same stakeholders during pilot phase 3. This time data about their experiences and perceptions of how these tools have impacted their way of working and decision-making process will be collected. Communities of practice sessions planned in INDIMO can be utilized for data collection activities. Finally, these two sets of data will be collected and will be presented in a workshop that will be organized for the second round of testing of INDIMO policy evaluation tools. Since this workshop will consist of many stakeholders from a wider network of stakeholders outside INDIMO pilots, this will give us an opportunity of disseminating the findings and to collectively learn from each other's experiences.

6.1.5 Assessment methods

Stakeholders' responses in the survey forms will be qualitatively analysed to identify the impact INDIMO tools brought in the way of working of the stakeholders for each INDIMO pilots. In case the information from the survey is unclear or insufficient, stakeholders will be approached through interviews.

6.1.6 Probable limitations

Not enough knowledge among the stakeholders about the definition or the concept of drivers and barriers could be a probable limitation. To mitigate this limitation, a short training and briefing session will be arranged before the start of the data collection process. Since this task is dependent on the active participation of the stakeholders of INDIMO pilots, all modes and channels will be used to reach widest possible range stakeholders associated with INDIMO pilots.

6.2 Usability assessment

Under this sub pillar the usability of the INDIMO Digital Mobility Toolbox will be evaluated. ISO (the International Organization for Standardization) defines usability as 'the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency

and satisfaction in a specified context of use' (Technical Committee ISO/TC 159 Ergonomics, 2018). In the context of INDIMO the usability can be interpreted as the extent to which the tools in the INDIMO Digital Mobility Toolbox can be used in practice by their respective target groups (developers, operators and policy makers) to achieve the specified goals with effectiveness, efficiency and satisfaction. Therefore, the assessment of the usability of these tools can also reveal if and how these tools can improve the current way of working will be investigated. Feedback will be collected through the methods (mentioned in the sub section 6.1.3 of this deliverable) linked to the testing of the Universal Design Manual and Universal interface icons for transport services in Tasks 3.4-3.5 and the policy tool testing in Task 3.6 and will feed back to the refinement of the tools (WP2).

6.2.1 Assessment indicators

According to the widely accepted and cited definition of Nielsen, the term usability is a quality attribute and it has five quality components (Nielsen, 2012): learnability, efficiency, memorability, errors and satisfaction. These quality components can serve as the assessment indicators for usability assessment. However, the INDIMO Digital Mobility Toolbox is comprised of diverse elements. Therefore, keeping in view the objective of the INDIMO project and the need for appropriate adaption and expansion of these quality components in the context of INDIMO, the following assessment indicators can be identified:

- a. **Learnability:** How easy is it for stakeholders to apply the tools to accomplish their tasks the first time they encounter the toolbox?
- b. **Time efficiency:** Once stakeholders are familiar with the toolbox, how quickly can they perform plan, design and assess using this toolbox?
- c. **Memorability:** When stakeholders return to the toolbox after a period of not using it, how easily can they re-establish proficiency?
- d. **Satisfaction:** How pleasant or satisfying is the experience of using the toolbox?
- e. **Coverage of essential topics:** Are seven principles of universal design, security and the protection of private data, accessibility (physical and cognitive) and inclusivity (from sociodemographic, spatial and economic point of view), possible steps that needs to be taken while deploying a digital mobility service/digital delivery service have been covered in the toolbox? If yes, how well these topics have been covered in the toolbox?
- f. **Coherence:** Are the items mentioned in a coherent manner in the toolbox?
- g. **Efficacy:** How well the tools can assess accessibility, inclusion, cybersecurity and personal data protection aspects in the digital mobility service? How well the tools are able to identify/highlight the barriers to use the services and give recommendations to overcome the identified barriers utilizing the potentials/drivers?
- h. **Ambiguity:** Are the tools or at least some parts of it ambiguous, i.e. open to more than one interpretation?
- i. **Universality:** How universal are the tools developed in this project?
- j. **Ease of use:** How easy is it to use the tools?

6.2.2 Data to be collected

Data corresponding to each of the assessment indicators needs to be collected. However, it should be kept in mind that although components of the INDIMO Digital Mobility Toolbox are related to each other, at the same time they are diverse in their objectives, features and contents. Therefore, not all the assessment indicators identified above will be applicable to each and every component. The following list shows the assessment indicators (shown as number codes defined in section 6.2.1) for which data needs to be collected for different components of the INDIMO toolbox:

- i. Universal Design Manual (UDM) for digital mobility services/digital delivery services – a, b, c, d, e, f, h, i, j
- ii. Universal Language Interface Icons for digital mobility services/digital delivery services – a, b, c, d, e, f, h, i, j
- iii. Guidelines for cybersecurity and personal data protection – a, b, c, d, e (only security and the protection of private data part), f, h, i, j
- iv. INDIMO Policy Evaluation Tool – a, b, c, d, e, f, g, h, i, j

6.2.3 Data collection methods

Data will be collected using questionnaires with Likert scale and space will be left for explanation to indicate if and where there is a scope for improvement. Data will be collected once during pilot phase 2 and then again during pilot phase 3 by the pilots. Pilot phase 2 data collection will be limited in nature as the objective of this data collection is to know the things that can be improved in the INDIMO tools before it gets implemented in pilot phase 3.

6.2.4 Assessment methods

Assessment of the Likert scale ratings and stakeholders' feedback will be able to identify the degree of usability of the tools developed in INDIMO among the stakeholders.

6.2.5 Probable limitations

Following limitations may arise:

- a. Questionnaire questions are not clearly understood.
- b. Difficulty in using Likert scale while expressing the opinion.

To mitigate these limitations, a short training and briefing session will be arranged before the start of the data collection process. Since this task is dependent on the active participation of the stakeholders of INDIMO pilots, all modes and channels will be used to reach widest possible range stakeholders associated with INDIMO pilots. It is also highly recommended that stakeholders' interests are kept alive with periodic updates of the project, news related to the project objectives that increase their awareness of their valuable contribution towards more inclusive and enhanced new digital mobility services/digital delivery services.

7. Applicability and transferability assessment

The assessment of applicability and transferability of the INDIMO toolbox developed in Work Package 2, is the final pillar of the INDIMO evaluation framework. The main output of this assessment exercise will be a description of the context under which, we expect, the INDIMO digital toolbox can be introduced and applied most efficiently in European cities and beyond.

7.1 Definition of applicability and transferability

Before entering into the description of how the process will be developed and followed within INDIMO, the concepts of both transferability, as well as applicability, should be defined and agreed upon.

In the context of the INDIMO project, ***applicability*** is defined **as the feasibility of implementing the toolbox in a local setting regardless of the outcome**. The focus, in this case, is strictly on the process of using the tools, rather than on its outcome. On the contrary, **the concept of *transferability*** has to be viewed as **the likelihood that the tools tested in one setting have the same or similar effectiveness in another setting**. In other words, the transferability of the INDIMO tools reflects the potential **generalisability** of the results of their application across different settings (Wang, Moss, & Hiller, 2005).

It is important to point out that the two concepts are closely related and, for this reason, they will be analysed jointly in the framework of the different pilots.

7.2 Methodology

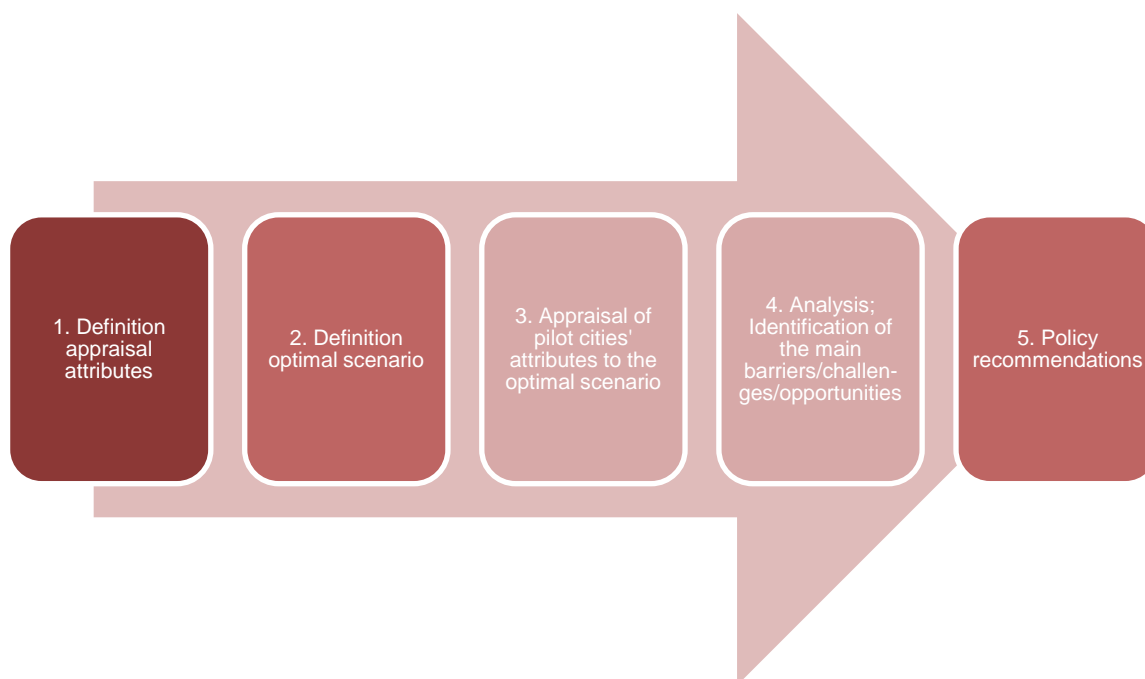


Figure 5: Schematic presentation of the methodology

Figure 5 presents schematically the main steps we plan to undertake to correctly and duly fulfill the evaluation of the transferability and applicability of the INDIMO Digital toolbox. While the main steps are included here, some intermediary steps are foreseen, mainly concerning the validation of the definition of the appraisal attributes as well as the validation of the optimal scenario. The sections below will shed light on each of the steps and the corresponding in-between steps.

7.3 Definition of the appraisal attributes and definition of the optimal scenario

The introduction of the INDIMO tools and their implementation in a local context demands that a **set of conditions are fulfilled**. To assess the applicability of the INDIMO tools, a list of attributes of applicability must be developed based on an enhanced understanding of the characteristics of the tools. These attributes reflect the preconditions that must be met by the intervention context, to enable the tools to be effective.

These lists of attributes will be developed within the consortium in following the next steps:

1. T4.4 partners will define the preliminary list of the appraisal attributes at the initial stages.
2. This list will be evaluated and validated by the relevant partners within the consortium, including pilot cities and regions, as per their expertise

At this stage, we have defined a preliminary list of appraisal attributes, presented in the tables at the end of this section. It will be further refined after consultation with relevant project partners and pilot cities, as described above. We might also consider prioritising the factors one above the other.

Table 7: Applicability appraisal attributes based on the work of (Wang, Moss, & Hiller, 2005)⁵

Factors	Appraisal attributes for applicability	Guiding questions
Political and social environment	Political and social environment of the local society	<i>Does the political and social environment of the local society allow methodology and tools to be implemented? Is there any political/legislative barrier to be</i>

⁵ Table 6 and table 7 (also table 1 for user acceptance) contain some factors which have similarities. During data collection attention will be given so that duplication of data collection can be avoided.

Factors	Appraisal attributes for applicability	Guiding questions
	Specific political and social actors required Legislative framework Language framework	<i>considered? What is missing for a successful implementation?</i> <i>Can or should the contents be tailored to suit the local culture?</i> <i>Language considerations</i>
User-acceptance	Necessary means to understand the tools	<i>Would and how will the targeted (sub)population accept/welcome tools and methodology?</i> <i>Does the target population in the local setting have a sufficient means to understand how to use the tools?</i>
Required resources	Human resources Economic resources	<i>Are the essential resources for the implementation available in the local setting?</i>
Organisational/structural barriers	Required organisational structure	<i>Is there any possible barrier to implementing the methods and tools that local organisation might face?</i>
Need for specific skills and training	Required organisational skills	<i>Does the local organisation have the needed skills?</i>

'Need for specific skills and training' is a factor that is also included in the Evaluation framework, described in the section above. The responsible partners VUB and Polis will join the efforts and align their activities in collecting the data related to needed skills.

Table 8: Transferability appraisal attributes

Transferability appraisal attributes	Guiding questions
Characteristics of the target population	<i>Are the characteristics of the target population comparable between pilots and replication cities?</i>
Magnitude of the issue	<i>Is the issue of exclusion comparable?</i>

Transferability appraisal attributes	Guiding questions
Magnitude of the reach and cost-effectiveness	<i>Is the capacity to implement the use of the INDIMO tools comparable in the political environment, social acceptability, economic resources, organisational structure, and skills of the local actor involved in the implementation of the tools?</i>

The definition of a set of attributes which, if fulfilled, would result in a positive outcome of the applicability and transferability appraisal of the local setting, leads to the need to address a related and fundamental issue: **the definition of an ideal performance by local settings under the attributes identified**, which would represent the baseline of the appraisal exercise. In other words, an optimal scenario corresponding to the idea of a “measure-enabling context” (Macário & Marques, 2008) must be identified.

The proposed method takes into account that the INDIMO toolbox is composed of several distinct elements and it also acknowledges the diversity of the characteristics and objectives across the INDIMO pilots. In light of these considerations, the first action to identify an optimal “measure-enabling scenario” is a consultation with INDIMO partners that are responsible for the creation of the tools; for each tool, certain conditions that would lead local settings to obtain a positive evaluation under the attributes of applicability and transferability will be identified and consolidated, with the aim of creating an optimal scenario. This scenario would then need to be validated by the cities involved.

Given the different nature of the pilots involved in INDIMO, it is not yet possible to foresee whether only one optimal performance can be defined. However, in order to facilitate the evaluation of the applicability and transferability of pilots, the ideal outcome of the exercise is the definition of one optimal “measure-enabling context”, which would facilitate the evaluation of the pilots.

In particular, previous research on policy transfer of urban mobility measures (Macário & Marques, 2008) has underlined **the utmost importance of aspects of political and social acceptability for the replicability of successful interventions in other contexts**. This finding has to be kept in high consideration when it comes to analysing the potential transferability of the INDIMO tools, as the most significant potential barriers or drivers to transfer the INDIMO tools are identified in their political and social acceptability.

The WP4 aims at performing a comprehensive appraisal of the applicability and the transferability of the INDIMO toolbox within pilot cities and to a broader network of cities beyond the pilots. For this reason, the exercise of evaluating the attributes proposed for the two concepts will be applied to the toolbox in its entirety, taking into account all four elements that compose it.

7.4 Appraisal of pilot cities' attributes to the optimal scenario

The information and data that will be collected in local settings, in order to assess applicability and transferability of the INDIMO toolbox, reflect the set of attributes outlined in the previous subchapter, which investigate the preconditions needed by the local context to assure a satisfactory level of uptake of the INDIMO tools in pilot cities and, at a second stage, in replication cities.

Once the attributes have been permanently defined, we will collect the detailed information on each of the appraisal attributes.

The necessary data for the assessment of the aforementioned attributes can be both quantitative and qualitative nature. They will be collected through a mixed method that combines a literature review with the consultation of local public and private stakeholders that are involved in the implementation, written questionnaires, in-person interviews, focus groups, and dedicated workshops.

The data to be collected aim to detect the different measure-enabling characteristics of local settings involved in the testing of the INDIMO toolbox:

- *Political and Social environment:*
 - Compatibility of the implementation of the INDIMO tools with the local political agenda
 - Legislative and administrative processes needed in order to implement the tools.
 - Presence of local organisations representing the interests of vulnerable-to-exclusions categories
 - Demographic composition of the local setting
- *User-acceptance:*
 - Communication and dissemination activities aimed at the promotion of the tools towards the target groups
 - Value number for each target group reached by promotion activities for the tools
 - Value number for each target group testing the tools
- *Required resources:*
 - Budget reserved for the implementation of the tools
 - Number of staff members dedicated to the task
- *Organisational/structural barriers:*
 - Level of cooperation between city departments and between public and private actors in the implementation of the INDIMO tools
 - *Need for specific skills and training:* Level of expertise of the staff within the public and private actors involved dedicated to the implementation of the tools;

- Level of previous experience of the staff in engaging with tools and measures for the improvement of accessibility and inclusivity aspects in mobility and other fields

The methods to be adopted in order to assess applicability and transferability of the INDIMO tools are influenced by the implications of the characteristics of the INDIMO toolbox, and especially by the necessity of investigating in depth their political acceptability, as well as the extent of their user acceptance.

For this reason, the methods adopted to collect information on the fulfillment of preconditions for the implementation of the INDIMO tools in both pilots cannot rely solely on the review of “descriptive, observational, or qualitative studies” (Macário & Marques, 2008) focused on the context of the intervention. While a systematic literature review on the political, social, and economical context of the intervention is part and parcel of data collection methods to assess applicability and transferability, this exercise must be complemented by elements of structured consultation of relevant local stakeholders, who have the necessary expertise to rate the aforementioned attributes of applicability and transferability with relation to the deployment of the INDIMO tools in their local contexts.

Drawing from the experience of previous EU-funded projects that have engaged with the transfer of mobility measures across European cities and the evaluation of the potential of these measures in terms of their applicability and transferability (TIDE Project, 2015; CITYLAB Deliverable 5.6, 2017)(TIDE Project, 2014 ; CITYLAB Project, 2017), a basic structure for the collection of evidence from the pilot cities can be proposed:

- Structured interviews/focus groups, as part of the activities of the Communities of Practice, with relevant local stakeholders, in particular those actors involved in the implementation of the INDIMO tools, as well as representative samples of the target groups involved;
- Online surveys customised according to the different types of actors involved in the consultation

7.5 Analysis; Identification of the main barriers/challenges/opportunities

Once the applicability of the INDIMO toolbox has been appraised through the analysis conducted in the pilot cities, dedicated project activities involving external cities and stakeholders interested in trying out the INDIMO tools will be organised with the aim of ensuring the conditions of their successful uptake beyond project pilots. In particular, the last two INDIMO Co-creation workshops will focus on the assessment of the transferability of the INDIMO toolbox tested in the context of pilot cities, according to the aforementioned framework. In addition to the INDIMO co-creation workshop, external cities will be involved in the validation of the transferability assessment of the INDIMO toolbox, through targeted consultations with Polis members. Once a satisfactory amount of information regarding the defined attributes of

applicability and transferability is collected through the aforementioned methods, it will be possible to conduct a thorough assessment of the applicability and the transferability of the INDIMO tools.

Following the example outlined by (Wang, Moss, & Hiller, 2005), the proposed method of applicability and transferability **appraisal** consists of building a matrix that would link the attributes assigned to the concept of applicability and transferability to the INDIMO toolbox. The INDIMO toolbox will be appraised comprehensively, taking into account all the elements that compose it, and rated with respect to all the attributes defined, by using a Likert scale.

Table 9: Example of applicability and transferability assessment table based on the one of (Wang, Moss, & Hiller, 2005)

Attributes		INDIMO toolbox applicability and transferability assessment
Applicability	Political and Social environment	++
	User acceptance	+
	Required resources	±
	Organisational and structural barriers	-
	Need for specific skills and training	--
Transferability	Comparability of target groups	
	Comparability of social context	

7.6 Policy recommendations

Once the consortium defines the ideal conditions to be met in order for cities to be able to implement the INDIMO toolbox, the evaluation of the elements of applicability and transferability related to each of the INDIMO tools in local context will be conducted. It is expected to result in a complete assessment of risks and benefits related to the transfer of such tools from INDIMO pilots to other local contexts.

The outcome of the INDIMO process evaluation concerning applicability and transferability will translate into a set of practical recommendations (contributing to T2.5). These recommendations will have several objectives:

- Providing guidance for the main INDIMO target groups – in particular, local policymakers, operators of digital mobility services/digital delivery services, and developers of digital mobility solutions – on how to successfully apply and adapt tools to different local contexts.

- Contributing to a possible redesign of (some of) the tools, for example, the Policy Evaluation Tool, during phase 3 of the co-creation process outlined in WP2;

Informing and supporting the first round of testing of the Policy Evaluation Tool by external local policymakers, as in T3.6. The recommendations following the applicability and transferability assessment of the INDIMO tools are expected to influence the final design of the INDIMO toolbox. The results of applicability and transferability appraisals will influence particularly the third phase of the development of the toolbox, when a redesigned version of the web-based policy tool will be tested with the policymakers linked to the pilots' projects building on the local connection with pilot partners, as well as by external local authorities involved in the Co-creation Community. As a consequence of this round of testing, the INDIMO Policy Evaluation Tool will be refined in accordance with the feedback provided and validated in the last INDIMO co-creation workshop.

In order to summarise the process of assessing the applicability and transferability of the INDIMO toolbox, the following section outlines the several steps that will make part of the process, the project partners involved and the data collection methods and timings.

7.7 Data collection methods and timings

The first phase of the applicability and transferability assessment consists in identifying, with respect to these two concepts, a preliminary list of attributes of the INDIMO Toolbox. The definition of attributes has been carried out by Task Leader Polis in the context of the development of the INDIMO Evaluation framework and will be validated through a structured consultation with the relevant partners responsible of the creation of the tools (VUB, DeepBlue, MBE, ZLC). The identification of conditions that would lead local settings to obtain a positive evaluation under the attributes of applicability and transferability, with the aim of creating an optimal scenario, would then need to be validated, through a collection of written feedback (and possible follow-up calls) from project partners in the pilot cities (Door2Door, VIC, CoopCycle, CambiaMO, ITL, Poste Italiane). The preliminary consultation with INDIMO technical partners on the validity of the list of attributes for applicability and transferability of the INDIMO toolbox and the collection of feedback from local partners in pilot cities will take place in the first months of the Pilot phase 1 (M6-M16).

Once the definition of appraisal attributes is completed, the applicability assessment of the INDIMO toolbox will take place in pilot cities, through the collection of relevant data with respect to the attributes defined. The collection of data will follow a mix of methods, that combines literature review and consultation with public and private stakeholders at local level. The stakeholders involved will be mostly drawn from the pools of experts involved in the Local Communities of Practice. As the political and social acceptability of the INDIMO toolbox were recognized as the most important aspects, priority in the consultation will be given to the interaction with policy-makers, as well as with transport users' and vulnerable groups, through the outreach to local associations representing them. However, the consultation of stakeholders will guarantee a balanced representation of all INDIMO target groups, including software and hardware developers, engineers, and any other group that is locally involved with the testing of the tools. Data collection through consultation will be carried out by the means of written

questionnaires tailored to the different target groups; in-person or online interviews; and, possible focus groups and workshops in the context of the activities of the Communities of Practice. A more detailed planning of the actions aimed at the collection of data at local level will vary depending on the activities of the different pilots and will be defined in the first months of Pilot phase 1. Once the applicability of the INDIMO toolbox has been appraised through the analysis conducted in the pilot cities, the assessment of transferability of the INDIMO toolbox will be undertaken involving external cities and stakeholders interested in trying out the INDIMO tools, with the aim of ensuring the conditions of their successful uptake beyond project pilots. External policymakers representing local and regional authorities, as well as other external stakeholders, will be involved the last two INDIMO Co-creation workshops: one on *Finalising the INDIMO Policy Evaluation Tool* (Q4 2021), and one specifically on the *Assessment of the transferability of the Policy Evaluation Tool* (Q1 2022). In addition to the INDIMO co-creation workshops, external cities will be involved in the validation of the transferability assessment of the INDIMO toolbox, through targeted consultations with Polis members: the collection of feedback from local and regional authorities that make part of the network of Polis will be carried out through written questionnaires, in-person (or online) interviews, and possible focus groups in the context of the Polis Working Group Access and Traffic Efficiency.

7.8 Probable limitations

A series of limitations might arise in the exercise of assessment of applicability and transferability. A list of possible obstacles to an accurate evaluation of the concepts with regards to the INDIMO tools is hereby identified:

- Issues in the definition of optimal performance of a local setting with regards to the potential of enabling the deployment of the INDIMO toolbox.

Possible mitigation: an in-depth consultation with the relevant partners within the consortium, aiming at consulting the most suitable partner for each of the factors.

- Issues in the alignment of the timeline between the pilot testing phase and the exercise of applicability and transferability assessment.

Possible mitigation: The anticipation of the beginning of the work on the Task 4.4 Applicability and transferability assessment, now planned for M20.

- Difficulties in the quantification and measurement on a Likert scale of some of the attributes identified for the concepts of applicability and transferability.

Possible solution: to be identified together with the involved partners

8. Evaluation synthesis and feedback loop to tool development

The INDIMO methodology is based on a five-stage co-creation process (figure 1). This co-creation process will consist of an evaluation feedback synthesis loop so that the tools developed within the project can be improved through multistage process fully utilizing the 3 pilot phases. The first stage of tool development will have inputs from pilot phase 1 and WP1, i.e. analysis of barriers and opportunities for tapping the full potential of the digital interconnected transport system (WP1). It must be recalled that pilot phase 1 represents the baseline condition, i.e. condition before implementation of the INDIMO tools. Once the first stage of tool development is over, developed tools will be put into test for trial in pilot phase 2 and data will be collected corresponding to tasks 4.2-4.5 for the aforementioned pillars in the evaluation framework. Then collected data will be evaluated following the framework set out in the evaluation framework and once the evaluation is complete under task 4.6 the evaluation results will be synthesized for tasks 4.2-4.5 and provide a concise and structured feedback to WP 2 where the INDIMO tools are adjusted or redesigned based on the feedback received from the pilots (figure 6). Then these redesigned tools will be finally implemented in pilot phase 3 and again data will be collected corresponding to tasks 4.2-4.5 for the aforementioned pillars in the evaluation framework. Finally collected data will be evaluated following the framework set out in the evaluation framework to assess the impact the project has achieved.

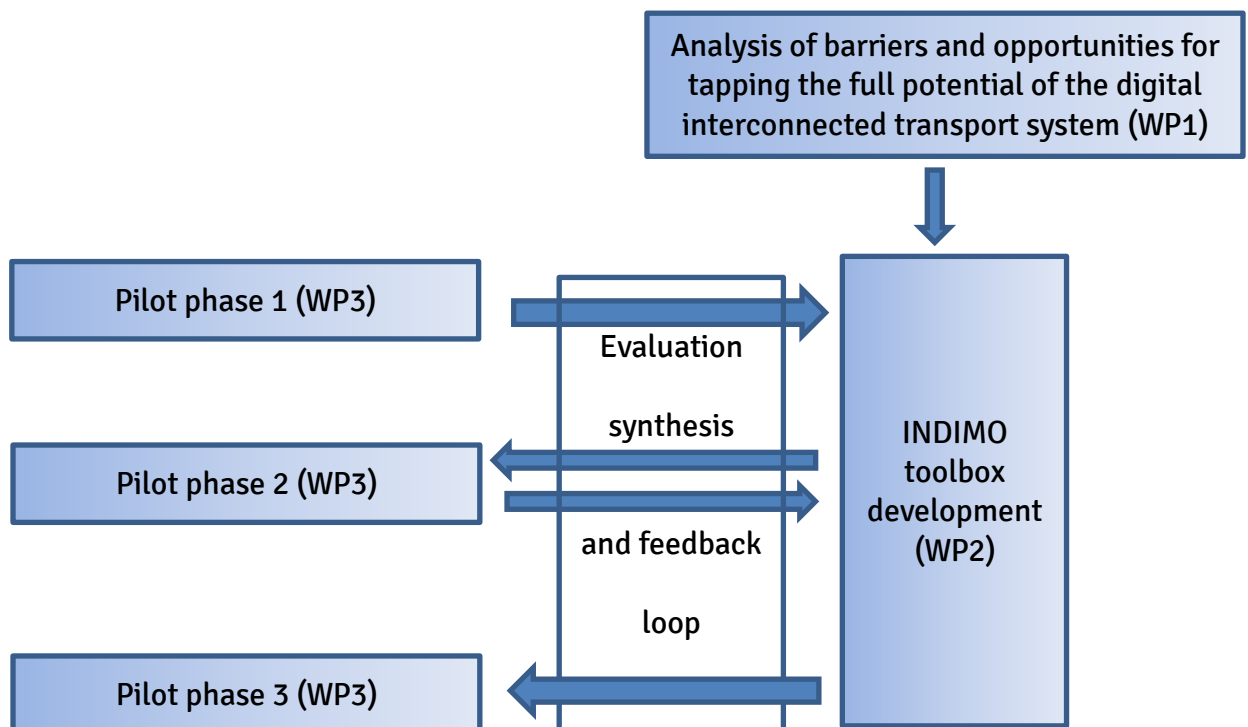


Figure 6: Evaluation and interdependencies of the work packages

9.Planning of evaluation

The planning of evaluation is dependent on the implementation of tools developed as a part of the INDIMO co-creation process and then the collection of related data in all INDIMO pilot cities. Therefore, this section of the evaluation framework is strongly linked with the protocol and phases laid out in D3.1 INDIMO pilots’ handbook in general and section 3 of D3.1 in particular. Figure 7 shows the scheme of pilots’ stakeholders’ involvement throughout different phases of the project along with the dependencies among WPs. The same is explained in detail in D3.1. Evaluation and transferability assessment appears in this plan as WP4, where the impacts generated as a result of the project interventions will be investigated and evaluated based on the evaluation framework in this deliverable.

Stakeholders involvement time-line

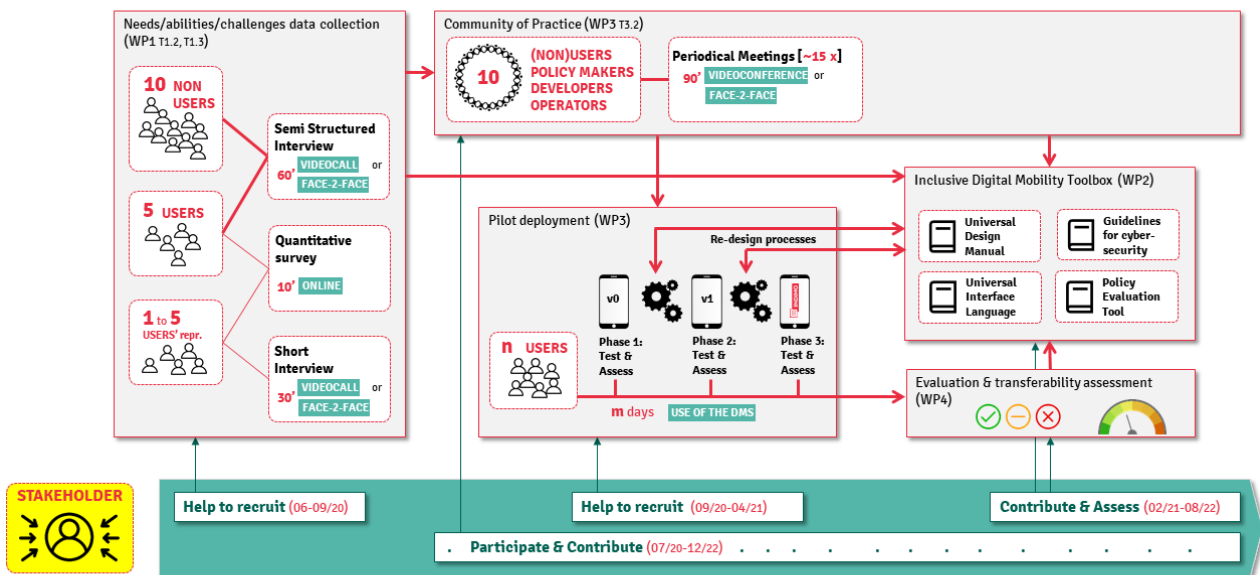


Figure 7: Stakeholders’ involvement plan (Source: D3.1 INDIMO Pilots handbook)

9.1 Pilot evaluation plan

Explain here the template & guidance for the preparation of the pilot evaluation plans (how, when and by whom the information will be collected). In order to collect data and evaluate them to co-create INDIMO tools and assess their impact pilot activities have divided in different phases as show in the Gantt chart (figure 8). These are as follows:

a) Pilot phase 0: Pilots setup(M1-M6)

This phase comprises different activities for pilots to further detail the living lab real ecosystem. It includes creation of timeline, the role of the partners involved, the identification and

involvement of an additional stakeholders, and the strategies to engage participants throughout all the co-implementation phases.

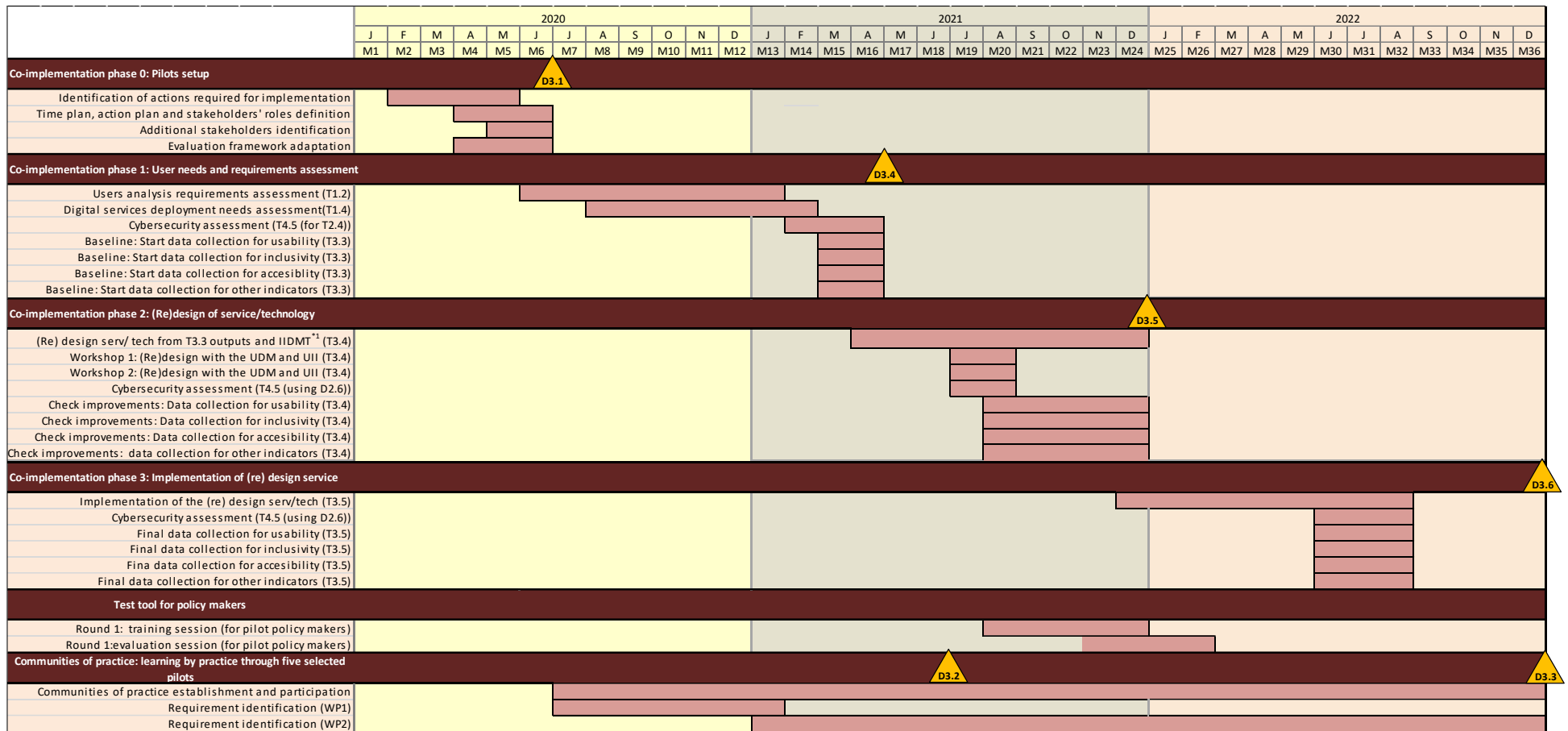


Figure 8: INDIMO Pilots generic Gantt Chart (Source: D3.1 INDIMO Pilots handbook)

b) Pilot phase 1: User needs and requirements assessment (M6-M16)

Objective of this phase is to investigate the user acceptance, user need and user requirements within the pilots. During the first period of this phase, pilots will participate in the WP1 activities, assess cybersecurity aspects and collect baseline measurements for different evaluation pillars.

c) Pilot phase 2: (Re)design of service/technology (M16-M24)

In this phase services/technologies in pilot locations will be (re-)design using the tools co-created in INDIMO based on the results of pilot phase 1 assessment and WP1 inputs. Another important objective of this phase is to conduct a mid-term short-scale assessment/trial of the prototype and collect data to identify shortcomings and additional requirements and improve INDIMO tools before the final implementation of (re-)designed services.

d) Pilot phase 3: Implementation of (re-)design service (M24-M32) and Test of tool for policymakers (M20-M32)

This is the final pilot phase in which implementation of (re-)designed services/technologies based on the revisions made according to co-created INDIMO tools. Pilots will collect data to investigate the impacts achieved in terms of pillars defined in this evaluation framework.

e) Communities of Practice: learning by practice through five selected pilots (M6- M36)

This point is an essential cross-activity in the true spirit of co-creation and corresponds to “T3.2: Communities of practice: learning by practice through five selected pilots”. The establishment of local “Communities of Practice” will contribute to gain insights into the needs of the target groups of INDIMO during the last three pilot phases explained above.

More details on these pilot phases, potential risks/limitation and adaptation/mitigation strategies for data collection activities in each pilot locations can be found in section 3.2 of D3.1 pilots’ handbook. Table 10 below provides a consolidated view of the pilot data collection timings for different evaluation framework pillars.

Table 10: Pilot data collection timings

Evaluation framework pillars	Pilot Phase 1	Pilot Phase 2	Pilot Phase 3
User acceptance assessment	Baseline data collection	Mid-term data collection for tool improvement	Data collection after final implementation
Inclusivity and accessibility assessment	Baseline data collection	Mid-term data collection for tool improvement	Data collection after final implementation



Evaluation framework pillars		Pilot Phase 1	Pilot Phase 2	Pilot Phase 3
(including gender perspective)				
Cybersecurity assessment		Baseline data collection	Mid-term data collection for tool improvement	Data collection after final implementation
Process evaluation	Decision making process assessment	Potentials/drivers and barriers data collection + current way of working		Data collection after final implementation to identify change in the way of working (presentation of the same in round 2 of policy evaluation tool test (wider test))
	Usability assessment		Data collection after limited/trial implementation for tool improvement	Data collection after final implementation
Applicability and transferability assessment			Applicability assessment in pilot sites	Transferability assessment through Co-creation workshops

10. Overall project evaluation

The success of INDIMO will depend on how well the project will be able to contribute to the impacts expected in the work programme. Following are the lists of preliminary target levels that have been identified. However, this list can be suitably adapted and updated if and when necessary in co-ordination with pilots and responsible relevant task/deliverable leaders as the project advances and evaluation related tasks (especially T4.2, 4.3, 4.4 and 4.5) begins. These impacts are:

i. Impact 1

INDIMO will “help policy-makers design appropriate regulatory frameworks and social and educational strategies in order to create the best possible conditions for an inclusive, user friendly digital transport system, taking into account the needs and characteristics of all parts of society, with particular attention to vulnerable to exclusion citizens”.



Following are the preliminary list of some of the impact assessment indicators through which this impact will be assessed:

Table 11: Expected target levels of impact 1 indicators

Indicator	Target	Impact assessment mechanism
Number of local or regional authorities that co-create the INDIMO toolkit	15	Membership and participation statistics from the INDIMO Cocreation Community
Number of local or regional authorities that trial the policy evaluation tool	20	D 4.3 Synthesized evaluation report for pilots
Number of vulnerable-to exclusion groups whose needs are considered in the Universal Design Manual	10	D 2.2 Universal Design Manual
Change in the accessibility of digital services in the pilots	Positive change of at least 1 point on a five-point qualitative scale	Survey of users from pilots D 4.3 Synthesized evaluation report for pilots
Change in the inclusiveness of digital services in the pilots	Positive change of at least 1 point on a five-point qualitative scale	Survey of users & policy makers from pilots D 4.3 Synthesized evaluation report for pilots
Change in the integration of gender perspective in the pilots	Consideration of the gender perspective in 5 pilots and in the Universal Design Manual	Development of the Inclusive Digital Mobility Toolbox D4.3 Synthesized evaluation report for pilots

ii. Impact 2



“Moreover, research will also help regional authorities and businesses in designing digital transport solutions that are better tailored to citizens' individual needs.”

As explained earlier in this deliverable among the four target groups addressed in INDIMO (users, policy makers, developers and operators), Regional authorities are covered by the category ‘policy makers’ also including local policy makers. Businesses are included in the target groups developers (software, hardware and service developers, engineers) and operators (of digital platforms or digitally enabled transport services).

Following are the preliminary list of some of the impact assessment indicators through which this impact will be assessed:

Table 12: Expected target levels of impact 2 indicators

Indicator	Target	Impact mechanism assessment
Number of businesses that cocreate the INDIMO toolkit	15	Membership and participation statistics from the INDIMO Cocreation Community
Number of businesses that trial the INDIMO toolkit	20	Membership and participation statistics from the INDIMO
Number of local or regional authorities that co-create the INDIMO toolkit	15	Membership and participation statistics from the INDIMO Cocreation Community
Number of local or regional authorities that trial the policy evaluation tool	20	Deliverable on process evaluation
Number of user groups identified whose individual needs will be considered through tailor-made recommendations or services or interface elements	At least 5	Results of the user needs assessment in Deliverable D1.3 User capabilities and requirements of a digital transport system on users
Change in the users' satisfaction with services (re)-designed with the help of the INDIMO toolkit	Positive change of at least 1 point on a five-point qualitative scale	Survey of users from pilots D 4.3 Synthesized evaluation report for pilots

Indicator	Target	Impact mechanism assessment
Number of practical tools developed to help regional authorities and businesses	4	Deliverables on Universal Design Manual, Universal Language Interface Icons for transport services, INDIMO Policy Evaluation Tool and Guidelines for cybersecurity
Satisfaction of policy makers with the policy evaluation tool	At least 4 on a qualitative scale of 5	Survey of policy makers as part of the process evaluation D 4.3 Synthesized evaluation report for pilots
Satisfaction of businesses with the Universal Design Manual and Guidelines for cybersecurity and personal data protection.	At least 4 on a qualitative scale of 5	Survey of businesses as part of the process evaluation D 4.3 Synthesized evaluation report for pilots

iii. Further substantial impacts

INDIMO pilot activities will focus on different aspects of digital transport, such as on-demand and shared mobility, multimodal route planning, on-demand logistics. These activities are expected to deliver on all dimensions of equitable transport, i.e. access (with special attention to vulnerable groups), inclusivity but also on sustainability dimensions i.e. climate change mitigation, air quality, congestion reduction and other socioeconomic benefits. These beneficial impacts will be multiplied through the further roll out of policies through the INDIMO Co-creation Community, as well as through the dissemination and exploitation activities. The table below shows the preliminary list of indicators (along with the corresponding target values) and assessment methods that have been identified to be used at the level of the individual pilot cities.

Table 13: Expected target levels of further substantial impact indicators

Indicator	Target	Impact mechanism assessment
Improvement of access to ecommerce solutions for peri urban residents (Emilia Romagna).	Increase in the use of smart ecommerce deliveries in the pilot rural region by 25%.	Evaluation of before and after survey of users of the

Indicator	Target	Impact mechanism assessment
Improvement of access to healthy food (Madrid)	Increase by 20% the access to healthy food for low-income and aged people with reduced mobility	Evaluation of before and after survey of users of the Coopcycle logistics platform for deliveries
Number of locations in Europe where access to bicycle deliveries has improved	15 locations in Europe	Number of participating couriers services in the Coopcycle platform where the updated software is deployed
Improvement of traffic safety for pedestrians through the smart traffic lights (Antwerp) - Perception of safety of pedestrians	Improvement of 1 point on a five point qualitative scale	Evaluation of before and after survey of test users
Reduction of travel time by using on-demand ride sharing (Berlin)	15 %	Evaluation of before and after survey of users of the on-demand ride sharing service
Time needed to find the best possible route in a multimodal setting (Berlin)	Less than 5 seconds	Evaluation of before and after survey of users of
Increase in the accessibility of essential services for female citizens (Galilee)	Increase by 20%	Evaluation of before and after survey of users of the ride sharing service
Change in trust and perception of safety of ridesharing service (Galilee)	Improvement of 1 point on a five point qualitative scale	Evaluation of before and after survey of test users
Increased accessibility due to the availability of ridesharing when public transport is not operational (Galilee)	Availability of shared or public transport 7 days a week	Evaluation of before and after survey of test users

11. Conclusion

Impact assessment of any project is one of the most important parts of the project as this helps to identify if and to what extent the project has been successful in achieving its goals and objectives. The evaluation framework explained in this deliverable serves as the foundation of that impact assessment of the tools that will be co-created and implement in pilot location of INDIMO. This framework has been developed around five main pillars: (i) user acceptance; (ii) inclusivity and accessibility; (iii) cybersecurity and personal data aspects; (iv) process evaluation; and (v) applicability and transferability. Evaluation carried out around these diverse set of pillars will help identify and assess the impact of the tools developed in WP2 under various cultural, spatial and policy contexts; with diverse user groups; and for all potential future users of the tools (developers, policy makers, operators). This framework along with pilot handbook (D3.1) will be used by the pilot coordinators to design the data collection and evaluation plans for monitoring and evaluation activities at INDIMO pilot locations. However, it must be noted that this framework is general in nature and therefore the list of final set of indicators and data to be collected and data collection timing durations during different pilot phases can be suitably adapted and updated in co-ordination with other tasks (especially tasks 4.2, 4.3, 4.4 and 4.5) deliverables (especially D3.1) and work packages if and when necessary as the project advances.

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