IMPACT ANALYSIS FRAMEWORK FOR REPLICATOR CITIES

Project deliverable D8.4

Version number: Final
Date for release: 31/10/2023

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MOVE21 – Multimodal and interconnected hubs for freight and passenger transport contributing to a zero emission 21st century

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 953939

Deliverable administrative information

Deliverable Administration					
Grant Agreement	953939	**Project short name**	MOVE21		
Deliverable no.	D8.4	**Name**	Impact Analysis Framework for replicator cities		
Status	Final	**Due**	M30	**Date**	31/10/2023
Author **Contributor**	Edoardo Marcucci, Valerio Gatta Ila Maltese				
Related tasks	T8.1				
Dissemination level	Public				

Document history	Version	Date	Submitted	Reviewers	Comments
	V.01	20/09/2023	Valerio Gatta	All WP leaders	First draft
	V.02	14/10/2023	Valerio Gatta	Tiina Ruohonen, Paal Mork	First draft with response to WP Leaders
	V.03	24/10/2023	Valerio Gatta	Maria Mourfoulaki Kornilia-Maria Kotoula	First full draft with response to reviewers
	V.04	27/10/2023	Valerio Gatta	Tiina Ruohonen	Second draft with response to WP leaders
	V.05	30/10/2023	Valerio Gatta	Tariq van Rooijen	Second draft with response to WP leaders
	V.06	31/10/2023	Valerio Gatta	Tiina Ruohonen, Paal Mork	Final Draft
	V1.0	31/10/2023	Paal Mork		Submitted

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Project Executive Summary

The main objective of MOVE21 is to transform European cities and functional urban areas into climate neutral, connected multimodal urban nodes for smart and clean mobility and logistics. MOVE21 will do this through an integrated approach in which all urban systems are connected, and which addresses both goods and passenger transport together. As a result, MOVE21 will improve efficiency, capacity utilisation, accessibility and innovation capacity in urban nodes and functional urban areas.

The integrated approach in MOVE21 ensures that potential negative effects from applying zero emission solutions in one domain are not transferred to other domains but are instead mitigated. It also ensures that European transport systems will become more resilient. Central to the integrated approach of MOVE21 are three Living Labs in Oslo, Gothenburg, and Hamburg and three replicator cities Munich, Bologna and Rome. In these, different types of mobility hubs and associated innovations are tested and means to overcome barriers for clean and smart mobility are deployed. The Living Labs are based on an open innovation model with quadruple helix partners. The co creation processes are supported by coherent policy measures and by increasing innovation capacity in city governments and local ecosystems. The proposed solutions deliver new, close to market ready solutions that have been proven to work in different regulatory and governance settings. The Living Labs are designed to outlast MOVE21 by applying a self-sustaining partnership model.

MOVE21 partners

The MOVE21 consortium consists of 24 partners from seven different European countries, representing local city authorities, regional authorities, technology and service providers, public transport companies, SMEs, research institutions, universities and network organisations.

- **Norway**: City of Oslo, Viken County, Ruter, Urban Sharing, Mixmove, Institute of Transport Economics, IKT-Norge
- **Sweden**: City of Gothenburg, Rise Research Institutes of Sweden, Business Region Gothenburg, Volvo Technology, Renova, Parkering Göteborg
- **Germany**: City of Hamburg, City of Munich, Hafencity University Hamburg, Deutsche Bahn Station & Service
- **Italy**: Metropolitan City of Bologna, Roma Servizi per la Mobilità, Roma Tre University
- **Belgium**: Eurocities, Polis
- **The Netherlands**: TNO
- **Greece**: Hellas Centre for Technology and Research

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Deliverable executive summary

Key words

#1 Impact Analysis, #2 Key Performance Indicators, #3 Evaluation Framework #4 Innovative Mobility Solutions, #5 Zero-emissions

Executive Summary

This Deliverable describes the methodological approach to be followed within the project with respect to the impact Evaluation Framework for Replication Activities taking place in different cities. Specifically, it illustrates the theoretical approach for the identification and adoption of Key Performance Indicators, and sets out the systematic process to collect, manage, and analyse data linked to impact evaluation of the Replication Activities carried out by all the cities involved in the project (Living Labs - Oslo, Gothenburg, and Hamburg; - and Replicator Cities - Munich, Bologna, and Rome).

It was decided to adopt a technique that would involve the cities in defining the Key Performance Indicators and their level of difficulty, taking into account upstream other Key Performance Indicators to be used as alternatives. In this work, the Evaluation Framework for the Living Labs (D8.1) was used as starting point. The process entailed the following: an analysis of proposed indicators from official project documentation, harmonisation of them with indicators from other initiatives at the European Union level, an analysis of the available literature on related topics within other EU-funded projects, and finally a consultation with the six cities.

From an initial list of 15 indicators from the harmonised official project documentation, enriched by seven others from European projects, a survey was carried out in the six cities. The main findings from the survey suggests that six out of the 15 official Key Performance Indicators are too difficult, while only one indicator from the literature was considered to be feasible. As a result, a final list of 10 Key Performance Indicators is proposed in the Evaluation Framework for Cities Replicating Activities.

Finally, this Deliverable clarifies in detail how the Key Performance Indicators are to be defined and calculated according to a multi-level scheme and specific elements used for Living Lab Cities in D8.1 and D8.3.

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1 List of abbreviations and acronyms

Acronym	Meaning
DT	Digital Twin
EC	European Commission
EF	Evaluation Framework
EU	European Union
GA	Grant Agreement
GDP	Gross Domestic Product
GHG	Greenhouse Gas
KPI	Key Performance Indicator
LL	Living Lab
M	Month
QS	Questionnaire Survey
RA	Replication Activity
RC	Replicator City
SCAN – MED	Scandinavian–Mediterranean Corridor
SDGs	Sustainable Development Goals
SSMS	Sustainable and Smart Mobility Strategy
SUMI	Sustainable Urban Mobility Indicators
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
TEN-T	Trans-European Transport Network
WP	Work Package

2 Purpose of the deliverable

Deliverable D8.4 describes, in addition to D8.1 *Impact Analysis Framework for the Living Labs* the first outcomes of Task 8.1 in WP8 entitled *Develop an Impact Analysis Framework.*

Specifically, D8.4:

- Describes the creation, design, and development of the Evaluation Framework (EF) which involves all cities, both Living Lab (LL) and Replicator Cities (RC), participating in the project;
- Details the list of KPIs included in the EF, also mentioning the tools that will be used for their measurement;
- Explains the methodology used to exploit the survey results and combine a top-down and bottom-up approach in the creation of the EF. This was necessary to take into account the difficulties in measuring the required indicators, also considering budgetary and time constraints cities have to replicate the measures.

D8.4 follows the process adopted in D8.1 *Impact Analysis Framework for the Living Labs* and D8.3 *Ex-ante Implementation of the Impact Analysis Framework for the Living Labs*, while adapting it to the replication actions in the project which are detailed in both D7.1 *Capacity Building and Replication Master Plan* and D7.2 *Replication Action Plans for Oslo, Gothenburg, Hamburg, Munich, Bologna and Rome.*

An in-depth analysis of the theoretical approach that will be used for measuring and/or calculating the main result indicators for replication actions in MOVE21 as well as the approach to collect, manage, and analyse data is presented in the following sections.

2.1 Attainment of the objectives and explanations of deviations

D8.4 initially intended to present a “systematic structure to manage, analyse and identify data linked to impact evaluation tailored to the replicator cities”. This objective has been enriched and extended in two directions. Firstly, Living Labs (LLs) - and not only Replicator Cities (RCs) - have been included. Secondly, it has been decided that D8.4 also describes the whole process of creating the Evaluation Framework to be implemented for the impact evaluation of the Replication Activities (RAs) that are carried out in all the cities, enhancing the aspects of involving cities in the process of identifying Key Performance indicators (KPIs).

Altogether, the objective of the Deliverable – both in original and modified form – has been achieved to the fullest, while also the Deliverable was finalized according to the project’s time schedule.

2.2 Intended audience

Apart from the involved cities engaged in replication actions, the Project Coordinator and all the WP Leaders, as well as the MOVE21 Executive Board, who are the main internal audience for this Deliverable, D8.4 is a public document and aims to become a guide for any interested entity, as it describes a methodology that can be transferred to relevant EU initiatives or research activities.

2.3 Structure of the deliverable and links with other work packages/deliverables

The document is structured in 8 Sections. Section 1 presents the list of abbreviations and acronyms used in the document. Chapter 2 is about the purpose of the deliverable, Section 3 presents the sources for the evaluation framework design, i.e., apart from the MOVE21 project official documents and its

related CIVITAS Initiative, also an overview of various evaluation frameworks that have been adopted in other European projects related to both urban freight and passenger transport, focusing on the used indicators. Section 4 delves into the methodological approach adopted for the impact assessment of the RAs conducted by all six cities involved in the project. Section 5 describes the survey carried out among the six cities, illustrating not only the design of the questionnaire and its administration process, but also the results of the survey. After the final summary of the EF approach in Section 6, which also provides the final list of KPIs used for the impact assessment of the RAs, conclusions follow in Section 7, while Section 8 lists the references used in the Deliverable.

As for the links with other deliverables and work packages, D8.4 is linked to D8.1, D8.3 and to future deliverables D8.5, D8.6 and D8.7, keeping in mind that not only RCs are required to replicate three measures identified from those implemented by the remaining cities, but that LLs are also required to replicate at least one measure in an ambitious two-way replication process. D8.4 builds on D8.1 (WP8), which developed an original evaluation framework for the three LLs of Oslo, Gothenburg and Hamburg, and whose indicators link closely to the themes developed in WPs 3, 4, and 5 (Sustainability, Efficiency, Accessibility, Adequacy and effectiveness, Resilience of the transport network).

Further, D8.4 is linked with D7.1 (WP7), which provides a framework for capacity building and RAs in order to determine the correct replication approach and targets. D8.4 is also linked to D7.2 (WP7) which details the city specific plans for replication of selected measures.

Finally, D8.4 will feed the D8.5 where this mapping of indicators will be used for the *ex-ante* evaluation of RAs carried out by the cities.

3 Sources used for structuring the KPIs for replication

With more than 70% of the European population living in cities (EC, 2023), most journeys begin and end in cities, in which transport generated 33% of the total urban greenhouse gas (GHG) emissions in 2019 (OECD, 2020). Yet, in many urban areas, increasing demands for urban transport are not compatible with sustainable urban mobility (*ibidem*). In this context, the EU often works with cities and regions to develop projects and policies to improve “urban passenger transport” and “urban freight transport” without increasing their negative impact on urban liveability.

In order to measure their effectiveness (*ex-post*) and/or efficiency (not only *ex-post*, but also *ex-ante*), all these initiatives have been evaluated in their own way. In fact, evaluation is an essential tool in the policy cycle (Fratesi, 2024). Whenever resources are limited, it is necessary to ensure that they are allocated in the best possible way, especially when the source is public (Maltese *et al.,* 2023). On the other hand, there is no difficulty in understanding the correlation between the success of a policy and the remuneration of its promoters.

The evaluation process can often consist of a pre-designed evaluation framework, followed by an evaluation report on the results. As the framework is different from one project to another, it is difficult to understand whether different sub-projects or cities will be assessed one-sidedly. Therefore, despite the different measures adopted or replicated in the six MOVE21 cities, it is necessary to look for a common EF for projects related to urban transport, both passenger and freight.

First of all, it is a starting point for evaluating cities’ measures within the project to have a correlation between the main dimensions (impact domains), the KPIs (i.e., indicators that are used to evaluate the impact of the implemented measures), and the measures adopted.

As described in D8.1, there are three basic components of the impact assessment concept that 1) concern an overarching strategy delivering the project approach; 2) the harmonisation with other previous research projects and targeted studies of EU, and; 3) the definition of an analytical framework, which mainly results in a list of KPIs which will be used for estimating the impact of the project and its innovative solutions.

In MOVE21 the evaluation activities build upon the CIVITAS Impact and Process Evaluation Framework, also taking also into consideration relevant work in other Horizon 2020 projects. Since much can be learned from past evaluations and experiences, we took a look at other previous European projects. The most relevant indicators for evaluating these projects were identified, analysed, and selected in order to be added to the ones already included in the MOVE21 Grant Agreement and D8.1. The aim was to arrive at a concrete evaluation framework for the replication actions in MOVE21 that can also be of use for other European urban transport projects.

This section describes the different sources that were drawn on to build the list of indicators that makes up the evaluation framework for RAs.

3.1 The Impact Analysis Framework for the Living Labs

D8.1 *Impact Analysis Framework for the Living Labs* and D8.3 *Ex-Ante Implementation of the Impact Analysis Framework for the Living Labs* include some additional KPIs (compared to the Grant Agreement) that were selected for evaluating the impact that the measures in the three Living Labs

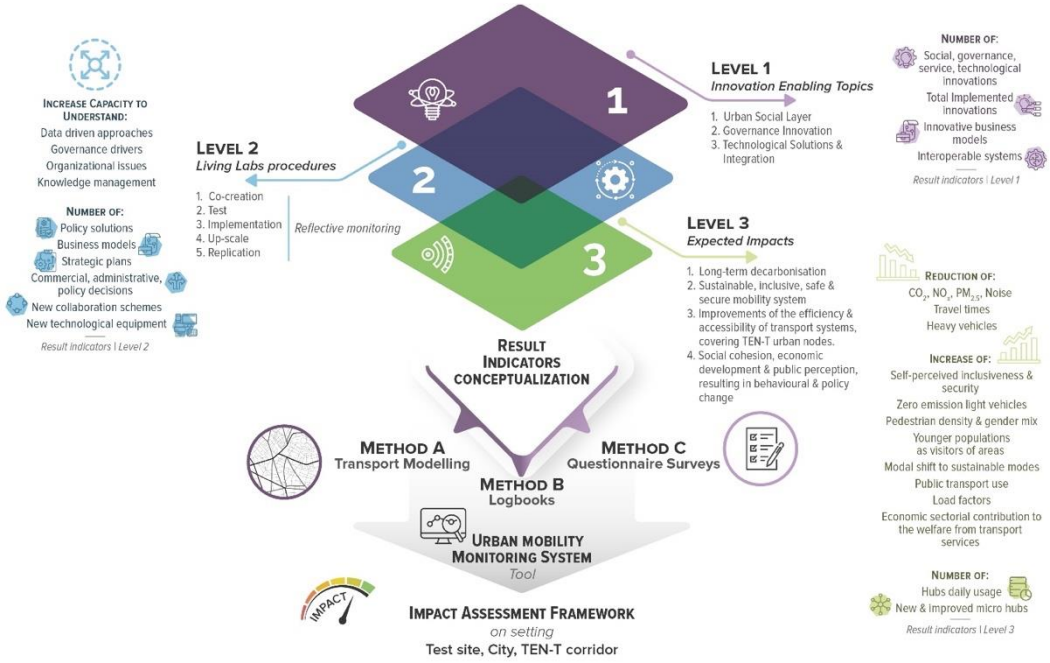
generate. The final list of KPIs is based on an analytical three-level framework (see figure 1), which is also taken as a reference, with the appropriate modifications, for the creation of the evaluation framework for RAs.

The three-levels of the evaluation framework for the Living Labs are described below and taken from D8.1:

1. The **innovation enabling topics** level, which includes the parallel performance evaluation of the measures at three thematic areas: the urban social layer, the governance, and the technical integration.
2. The **Living Labs procedures**, for monitoring LLs' processes for achieving policy coherence, increase of innovation capacity, and development of the innovation co-creation partnership,
3. The **impact oriented result indicators**, which measure the performance of the project to the specific impact areas mentioned in the Grant Agreement of MOVE21. Moreover, these indicators are categorized according to four expected impact areas that will be addressed in the MOVE21 project by the LLs:
   - Long-term decarbonization;
   - Sustainable, inclusive, safe, and secure mobility system;
   - Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes;
   - Social cohesion, economic development, and public perception, resulting in behavioral and policy change.

Figure 1 below presents a schematic representation of the above-mentioned approach.

Figure 1 - Impact Assessment Methodology Approach for LLs



Source: D8.1 Impact Analysis Framework for the Living Labs

As far as the third level is concerned, KPIs aim to measure results in terms of impact and demonstrate the progress made towards achieving the set impact values. They are interdisciplinary, as they integrate

different scientific aspects, and represent the strategic outcome of the overall processes of integrating mobility and freight transport solutions.

Table 1 below provides the complete list of KPIs as they were set for the LLs' activities in D8.1 and updated during the implementation of the ex-ante evaluation in D8.3.

Table 1 - KPIs complete list from D8.1 and D8.3

LEVEL 1: Innovation Enabling Topics
Thematic Area 1: Urban Social Level
• **No of MOVE21 social innovations implemented in the Living Labs**
Thematic Area 2: Governance Level
• **No of MOVE21 innovative business models implemented in the Living Labs** • **No of MOVE21 governance innovations implemented in the Living Labs**
Thematic Area 3: Technical Integration
• **No of MOVE21 technological innovations implemented in the Living Labs** • **No of MOVE21 service innovations implemented in the Living Labs** • **Number of interoperable systems of innovative solutions adopted in the Living Lab cities** • **No. of implemented MOVE21 innovations in the Living Labs**
Level 2: Living Lab procedures
Target Area 1: Uptake of new knowledge and skills
• **Increased capacity to incorporate data-driven approaches in mobility planning** • **Perceived improved understanding of governance drivers and barriers to implementation of measures** • **Living Labs' Increased innovation capacity regarding organizational issues for implementing innovative mobility solutions** • **Living Labs' Increased innovation capacity regarding knowledge management needed for implementing innovative mobility solutions** • **Perceived improved understanding of the potential for the upscaling of MOVE21 solutions per Living Lab**
Target Area 2: Modifications occurred within the Living Lab cities' administrative and legal framework as well as technological upgrade
• **Number of policy solutions proposed for ensuring the successful establishment of MOVE21 mobility hubs per Living Lab** • **Number of Commercial decisions proposed or implemented for ensuring the successful establishment of MOVE21 mobility innovations per Living Lab** • **Number of Administrative decisions proposed or implemented for ensuring the successful establishment of MOVE21 mobility hubs per Living Lab** • **Number of Governance decisions proposed or implemented for ensuring the successful establishment of MOVE21 mobility hubs per Living Lab** • **Number of new Technological Equipment developed/installed/purchased for ensuring the successful establishment of MOVE21 mobility hubs per Living Lab**
Target Area 3: Quantify the collaborations created and the business models developed
• **Number of MOVE21 business models developed** • **Number of strategic plans that will be reformulated based on the results of MOVE21 in the 3 Living Labs**

• **Number of New Collaboration Schemes proposed or implemented for ensuring the successful establishment of MOVE21 mobility hubs per Living Lab**
Level 3: Impact-oriented result indicators
Impact Area 1: Long-term decarbonization
• **CO2 reductions from passenger transport in Living Lab cities** • **CO2 reductions from freight transport in Living Lab cities** • **No. of MOVE21 innovations upscaled in the three Living Labs** • **Reduction in passenger transport related NOx air pollution as a result of deployed MOVE21 innovations** • **Reduction in freight transport related NOx air pollution as a result of deployed MOVE21 innovations** • **Reduction in passenger transport related PM2.5 air pollution as a result of deployed MOVE21 innovations** • **Reduction in freight transport related PM2.5 air pollution as a result of deployed MOVE21 innovations**
Impact Area 2: Sustainable, inclusive, safe, and secure mobility system
• **Increase of self-perceived inclusiveness from the implementation of transport solutions** • **Increase of perceived security (crime, COVID-19 etc.) in the city-transport system** • **Reduction in passenger transport related noise pollution** • **Reduction in freight transport related noise pollution** • **Decrease of average travel time loss per visitor of large (sports) events**
Impact Area 3: Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes.
• **No. of daily usages of new hubs** • **Load factors in urban freight as a result of MOVE21** • **No. of new (micro) hubs as a result of the Project** • **No. of improvements in existing hubs as a result of the Project** • **Reduced number of heavy (freight) vehicles in circulation as a result of the implementations** • **Increase in zero emission light duty electric vehicles** • **Increase in public transport use** • **Modal shift due to decrease of travel time (associated with MOVE21 hubs)**
Impact area 4: Social cohesion, economic development, and public perception, resulting in behavioral and policy change.
• **Increase of gender mix in pedestrian space usage per Living Lab city** • **Direct economic sectorial contribution to the welfare to the metropolitan area from city transport** • **Increase of pedestrian density/people walking by the areas surrounding the hubs** • **Increase of younger population as visitors**

Source: Authors' Elaboration on D8.1 and D8.3

D8.1 and the updates included in D8.3 present the general methodology for calculating these KPIs. They maintain the data collection from three fundamental data sources:

Questionnaire Survey: Questionnaire Surveys (QS) are organized covering several MOVE21 impact areas and result indicators. The QS will collect data and information from the relevant stakeholders in relation to the specific timelines of assessment (a) the baseline and (b) the *ex-ante* and *ex-post* evaluation.

Measures and Innovations Logbooks are designed for and used by the Living Lab cities in order to cover several MOVE21 impact areas and result indicators. The aim of the Measures and Innovations Logbooks are to collect relevant information related to the measures, solutions, and innovations that will be implemented and/or upscaled in the Living Labs.

Scenario Modelling**:** Two methods of scenario modelling applied from WPs (3&5) work close and overlap with the implementation of the impact analysis and the impact assessment. The methods are digital twinning and agent-based pedestrian modelling. Both of the monitoring tools will assist the MOVE21 impact assessment by providing data-driven results for the effects of the implementation of the measures, solutions and innovations on the mobility system, the environment, the urban context, and social dimensions of the impacts.

Section 4.4 of D8.1 provides 30 final tables in which each KPI is presented, based on the following details:

- Thematic area(s)
- Contribution to additional impacts
- Measurement Unit
- Target values
- Methodology approach & monitoring tools

In turn, D8.3 has calculated the ex-ante results through the relevant tools developed for this scope and as described above.

Moreover, D7.2, which covers 12 measures (three from each of the three RCs and one from each LL), also refers to a not exhaustive list of KPIs, defined in Table 2 below. Indicators 2.3, 3.12 and 5.2 are not included in table 1, but are from the Grant Agreement.

Table 2 - KPIs list from D7.2

Long-term decarbonization
1.2 CO2 reductions from local road transport in RCs cities: private cars, vans, heavy vehicles (incl. buses)
1.4 Number of MOVE21 innovations upscaled in all the cities
Sustainable, inclusive, safe, and secure mobility system
2.2 Increase of perceived security (crime, COVID-19 etc.) in the city-transport system
2.3 Increase in active modes of transport thanks to incentive models/reward scheme
2.4 Reduction in transport related noise pollution
Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes
3.2 Number of implemented MOVE21 innovations in the RCs
3.3 Number of new (micro) hubs as a result of the Project
3.4 Number of improvements in existing hubs as a result of the Project
3.6 Load factors in urban freight as a result of MOVE21
3.7 Reduced number of heavy (freight) vehicles in circulation as a result of the implementations
3.9 Increase in public transport use

3.12 Increased collaboration level between public-private entities and between transport domains in all collaboration cities / functional urban areas
Social cohesion, economic development, and public perception, resulting in behavioral and policy change
4.1 Perceived improved understanding of governance drivers and barriers to implementation of measures
4.3 Number of MOVE21 business models developed
4.4 Direct economic sectorial contribution to the welfare to the metropolitan area from city transport
4.9 Living Labs' Increased innovation capacity regarding organizational issues for implementing innovative mobility solutions
Contribution to the development of the existing European knowledge base on the effectiveness and impacts resulting from the implementation of innovative mobility solutions
5.2. Number of city representatives and experts that take part in capacity building, replication exchanges, study visits, workshops, webinars and Urban Nodes Forums.

Source: Authors' Elaboration on D7.2

Almost all the indicators in Table 2 are already present in the list of those foreseen for the LLs (Table 1), in the same formulation or possibly adapted to RAs (specifically: KPI1.2 from KPI1.1; KPI3.2 from KPI3.1). Two more indicators (KPI3.2 and KPI3.12) were included in order to focus on active modes and cooperation level, while, due to the specific nature of RAs, KPI5.2 has also been added.

The in-depth analysis of all these indicators as presented in tables 1 and 2 formed the basis for the first selection of replication indicators that was submitted to the cities in the form of a questionnaire survey. This is presented in Section 5.1.

3.2 CIVITAS and other EU approaches

As already explained in D8.1, the impact assessment approach is based also on contributions from several inititiatives already in force, which are briefly listed below.

The **EU Sustainable and Smart Mobility Strategy** (EU-SSMS) is aiming at reducing transport-related greenhouse gas emissions by 90% by 2050. Along these lines MOVE21 will:

- Encourage the shift towards sustainable alternatives for passengers and freight transport
- Increase efficiency and multimodality across the whole transport system
- Incentivise low-carbon practices and sustainable mobility across functional urban areas
- Boost the uptake of lower and zero emissions vehicles. MOVE21's hubs and associated measures for their uptake in their functional urban area and integration in the larger mobility system will support last-mile distribution using walking, cycling or use of light duty zero emission vehicles.

The **mission on 100 climate neutral and smart cities** aims to reach 100 climate neutral cities by 2030. MOVE21 will contribute to this goal by:

- Turning the involved cities into innovative and sustainable hubs for passenger and freight mobility and thus supporting them and other cities in a cascade effect, in their path towards climate neutrality
- Fostering a strong co-creation approach in the Living Labs and a multi-level cooperation both at functional urban area level and Scan-Med corridor level that sets the ground for the preparation of Climate City Contracts proposed by the mission.

The **UN Sustainable Development Goals** (SDGs) were set up in 2015 by the UN General Assembly to be achieved by the year 2030 for a better and sustainable future for all. Among the 17 SDGs, MOVE21 will assist the cities' efforts to reach these specific ones:

- Halve deaths and injuries from road traffic accidents and Reduce air pollution (SDG3- Good Health and Well-being)
- Quality, reliable, sustainable, and resilient infrastructure (SDG9- Industry, Innovation and Infrastructure)
- Access to safe, affordable, accessible, and sustainable transport systems for all, and Enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries (SDG11- Sustainable Cities and Communities)
- Policy coherence for sustainable development and Effective public, public-private, civil society partnerships and building on the experience and resourcing strategies of partnerships (SDG17- Partnerships for sustainable development).

The **Sustainable Urban Mobility Indicators,** developed by the European Commission can help cities evaluate their mobility system and to measure improvements that result from new mobility practices or policies, thus identifying the strengths and weaknesses of their mobility system and to focus on areas for improvement. MOVE21 is specifically in line with the indicators addressing Air pollutant emissions (3), noise hindrance (4), and Greenhouse gas emissions (GHG).

MOVE21 is part of the **CIVITAS Initiative**, and D8.1 also accurately explains that the CIVITAS Evaluation Framework has been used to align the MOVE21 evaluation framework. Therefore, the extensive documentation of the CIVITAS evaluation framework is a key tool in MOVE21. In CIVITAS projects, measures are being implemented in a real, complex, and functioning environments, and thus evaluation efforts need an optimal balance between scientific, precise analyses, and synthetic interpretation of the evolution of urban mobility in order to make the evaluation work feasible, efficient, and useful for policy conclusions. Based on this, MOVE21 adopted the following key elements of the CIVITAS 2020 evaluation framework:

1. Efficient combination of impact and process evaluation
2. Clear understanding of measures and their context
3. Structuring measures for evaluation
4. Further development of the assessment plans
5. Key measures with an in-depth evaluation
6. Consistency of approaches in all cities

All these criteria were also taken into account when choosing potential indicators for RAs in MOVE21.

Finally, the MOVE21 evaluation framework is aligned with the eight SUMP principles listed in Table 3.

Table 3 – MOVE21 alignment with SUMP principles

SUMP Principles	MOVE21 alignment
Plan for sustainable mobility in the functional urban area	The impact assessment framework covers the whole functional urban areas, and test cases are linked to the TEN-T. Accessibility to TEN-T and network performance is intended to be assessed, and the Scan-Med Observatory is intended to increase ecosystem collaboration across functional urban areas.
Cooperate across institutional boundaries	The impact assessment framework focuses on the aspect of policy coherence and sectoral integration, through horizontal and vertical collaboration across policy and transport domains, geographical areas and administrative levels.
Involve citizens and stakeholders	MOVE21 emphasises citizen engagement. The quadruple helix innovation model is used to engage researchers, businesses, governments and citizens and this engagement is exploited by the impact assessment framework.
Assess current and future performance	The impact assessment framework builds on *ex-ante*, *in itinere* and *ex-post* assessments where needs, challenges and pressure points will be evaluated against current and future performance.
Define a long-term vision and implementation plan	MOVE21 takes as timeline of assessment the 2030 policy goals of participating cities and functional urban areas. Strategies are developed to deliver long term impacts.
Develop all transport modes in an integrated way	MOVE21 integrates different transport modes, systems, infrastructures, needs and planning domains in order to innovate holistic win-win solutions and this will be reflected in the impact assessment framework and, more specifically, by the result indicators (sections 4.4 – 4.7).
Arrange for monitoring and evaluation	The impact assessment framework is building on the establishment of an Urban Mobility Monitoring System.
Quality assurance	Transport modelling approaches and simulations (e.g. DTs and agent – based modelling) ensure that the innovative mobility solutions are sound. Iterative, agile development with well defined review processes and a reflective monitoring guide (WP6) will ensure quality, as well.

Source: Authors' Elaboration on D8.1

The MOVE21 evaluation framework concept is thus adapting to the methodology for the above-mentioned (in Section 3.1) indicators' calculation, while also considering data availability and collection efforts, while being aligned with both the CIVITAS evaluation framework and the SUMP principles. This also applies to the KPIs for evaluating the replication activities.

3.3 Harmonisation with other EU projects

Ultimately, in order to obtain the information on the main dimensions (such as, Society-people, Society-governance, Transport system efficiency, Economy, Energy and Environment, Technology, Resilience) which are inspiring or selected in relation to the project objective, on the KPIs that are used in the project in relation with the main dimensions, and on the way to measure the KPIs, a Systematic Literature analysis was carried out by initially exploring a certain number of projects selected according to three criteria with which to identify them.

Specifically, the projects must meet the following requirements:

- The projects must have been implemented between January, 2018 and April 2023, in order to be studied in May 2023 (M25) and produce the list for submission in June 2023 (M26).
- The projects must include the topics of urban passenger transport and urban freight transport.
- The projects must be European projects where a comprehensive evaluation has been carried out.

The search was carried out within the CORDIS platform using the keywords: 'urban' AND 'passenger' AND 'freight' AND 'transport' in the search bar, while applying the following filters:

- Collection: project;
- Start date: from January 1, 2015;
- End date: until 28 April 2023;
- Language: English.

The search provided 30 projects, from which those not related to urban mobility or to the topics of MOVE21 were dropped off, providing the final list of 17 items, which is shown in the following Table 4.

Table 4 - Other EU projects related to MOVE21 topics (2015-2023)

Project number	Project acronym	Project Title	Project start date	Project end date
1	**Levitate**	Societal Level Impacts of Connected and Automated Vehicles	01/12/18	31/05/22
2	**DTEU**	Decarbonising Transport in Europe	01/11/18	31/01/22
3	**SETRIS**	Strengthening European Transport Research and Innovation Strategies	01/05/15	30/04/18
4	**HARMONY**	Title: Holistic Approach for Providing Spatial & Transport Planning Tools and Evidence to Metropolitan and Regional Authorities to Lead a Sustainable Transition to a New Mobility Era	01/06/19	28/02/23
5	**PORTIS**	PORT-Cities: Integrating Sustainability	01/09/16	30/11/20
6	**SUITS**	Supporting Urban Integrated Transport Systems: Transferable tools for authorities	01/12/16	28/02/21
7	**SUMP-PLUS**	Sustainable Urban Mobility Planning: Pathways and Links to Urban Systems	01/09/19	28/02/23
8	**FUTURE-RADAR**	Future Research, Advanced Development and Implementation Activities for Road Transport	01/01/17	31/12/20
9	**SPROUT**	Sustainable Policy RespOnse to Urban mobility Transition	01/09/19	28/02/23
10	**IMPACT-1**	Indicator Monitoring for a new railway PAradigm in seamlessly integrated Cross modal Transport chains – Phase 1	01/09/16	30/04/18
11	**MOBILITY4EU**	Action Plan for the future of Mobility in Europe	01/01/16	31/03/19
12	**RISEN**	Rail Infrastructure Systems Engineering Network	01/04/16	30/09/21
13	**NEAR2050**	NEAR2050 - future challenges for the rail sector	01/10/16	30/04/18
14	**CoEXist**	'AV-Ready' transport models and road infrastructure for the coexistence of automated and conventional vehicles	01/05/17	30/04/20
15	**SETA**	SETA: An open, sustainable, ubiquitous data and service ecosystem for efficient, effective, safe, resilient mobility in metropolitan areas	01/02/16	31/01/19
16	**CityChangerCargoBike**	CityChangerCargoBike	01/09/18	31/07/22
17	**SMARTER TOGETHER**	Smart and Inclusive Solutions for a Better Life in Urban Districts	01/02/16	31/07/21

Note: Projects in blue have been randomly chosen as "detectors". Source: Authors' Elaboration

A further in-depth analysis of the projects' impact assessment concepts allowed us to eliminate those in which the evaluation process was not clearly defined and/or identifying KPIs was a challenging task. Indicators used in these projects should follow the criteria proposed by CIVITAS (See Section 3.2), especially in terms of relevance to the selected measures (5), consistency across projects (6), and clarity in both the definition of the indicator and the way in which data is obtained (2). Projects 1, 2, 5, 6, 9, 10 were finally left, which provided some KPIs, among which to choose the indicators to be submitted to the cities.

For the selection of the indicators, a multi-step process was followed. First of all, three projects (in green in Table 4 above) were chosen quite randomly in order to select a set of less general keywords that could still apply to the MOVE21 project.

To gather all the data on the KPIs and measures, the Microsoft Excel program was utilised as a data collection tool. For each project, the relevant keywords were used to search for the corresponding KPIs within the collected documents. These identified KPIs were then consolidated into a single Excel document, organized in a table format. The resulting Excel table encompasses 120 indicators from the following projects:

Project 1: Levitate,
Project 2: DTEU,
Project 5: HARMONY,
Project 6: SUITS,
Project 9: SPROUT,
Project 10: Railway.

By compiling the KPIs from each project into this Excel table, a comprehensive overview of the data regarding the KPIs, their domain (Climate, Environment & Energy; Economy; Governance; Management; Society; Transport System) and measures across these projects was achieved. The remaining projects (3, 4, 7, 8, 11, 12,13, 14, 15, 16, and 17) were not included because no relevant information could be found about KPIs.

The following information was used from the documents and filled in the columns, whenever possible, for each KPI:

- Project name: the name of the project
- Main dimension (category or domain)
- Impact aspect (related to the impact areas identified in MOVE21- Section 3.1 – but more detailed),
- Indicator name
- Indicator Description/measurement
- Indicator Unit of measurement
- Similar KPI (if any)
- Methodology of collection/tool
- Description of methodology

Ultimately, a comparison between the KPIs from the GA and those from the literature review was carried out, in order to avoid any possible overlapping, even partial. The final list of selected indicators is presented in the description of the questionnaire (Section 5.1, Table 12).

4 Methodological Framework for MOVE21 Replication Impact Assessment

To assess whether the project will achieve its expected objectives related to RAs, an impact assessment concept, borrowed from the one prepared for the LLs activities and adapted to the specific notion and context of MOVE21 RAs, was structured. It consists of a general strategy developed for the formulation of the impact assessment framework (approach definition) and its alignment with similar and already used frameworks that have proven to be valid on the same topic (harmonisation process).

The first component of the framework refers to the adoption of the three-level methodology that is used for the LLs, and which includes the description of the relevant metrics and indicators that will be measured, calculated or estimated per level.

The second one refers mainly to the adoption of specific indicators per level in order to align with other relevant EU initiatives, research projects or targeted studies addressing the same topics.

The integration of the above two components leads to the evaluation framework for RAs. It consists of the final list of KPIs to be used to estimate the impact that the project and mobility solutions will bring to the cities where they are implemented.

4.1 Adaptation of the LLs' impact assessment methodology to Replication Activities

Following the MOVE21 impact assessment methodology that was used for the LLs evaluation, the RAs evaluation framework integrates also three fundamental conceptual levels:

- The innovation enabling topics level, which includes the parallel performance evaluation of the measures at three thematic areas: the urban social layer, the governance, and the technical integration (**level 1**).
- The procedures for the cities that are replicating solutions (**level 2**), under which the RAs for achieving policy coherence, increase of innovation capacity and development of the innovation co-creation partnerships will be monitored;
- The impact oriented MOVE21 result indicators **(level 3**), which measure the performance of the project as regards the improvement of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes.

The implementation of the evaluation framework is based on specific methods/tools (logbooks, transport models and questionnaire surveys) that will be used and will be configured within the project.

The KPIs per level are presented in the sub-sections below in order to give a comprehensive understanding of the step-by-step procedure that will be followed.

4.1.1 Level 1: Innovation Enabling Topics

This level refers to the performance assessment that is taking place for assessing the number of innovations intended to be implemented in the Replication Cities, in the view of the ***three thematic areas***: urban social layer, governance, and technical integration. The ***urban social layer*** considers the implemented innovations that provide close link between social and spatial components of the cities,

enhance social acceptance and maximizing the impacts on social cohesion. The ***governance level*** is related to the needed innovative actions that should be realized during the replication phase, in order to solve specific problems and barriers as regards governance structures/mechanisms and specific parameters The ***technical integration*** is related to the technological innovations of the final implemented solutions.

The KPIs included in this Level per thematic area are listed in the Table 5 below:

Table 5 - Level 1 selected KPIs

Level 1: Innovation enabling topics
Thematic Area 1: Urban Social Level
• **No of MOVE21 social innovations implemented in the Replication Cities**
Thematic Area 2: Governance Level
• **No of MOVE21 innovative business models implemented in the Replication Cities**
• **No of MOVE21 governance innovations implemented in the Replication Cities**
Thematic Area 3: Technical Integration
• **No of MOVE21 technological innovations implemented in the Replication Cities**
• **No of MOVE21 service innovations implemented in the Replication Cities**
• **Number of interoperable systems of innovative solutions adopted in the Replication Cities**

4.1.2 Level 2: Cities Replication Activities co-creation procedures

These procedures refer to the co-creation, implementation, and upscaling of innovative mobility solutions, the efforts to increase innovation capacity in the cities and the local ecosystems, and the self-sustaining partnership models which are undertaken by the cities involved in the RAs. Under this concept, there are three main targets that this Level serves:

- ✓ To evaluate the uptake of new knowledge and skills within the 6 cities, during the co-design and implementation procedures of the measures.
- ✓ To quantify any modifications occurred within the cities' administrative and legal framework for strengthening the local innovation ecosystems
- ✓ To quantify the collaborations created and the business models developed within the cities for achieving a successful implementation and operation of innovative measures.

A total of 6 KPIs are included in Level 2, addressing different target areas, as described in Table 6.

Table 6 - Level 2 selected KPIs

Level 2: Cities Replication Activities procedures
Target Area 1: Uptake of new knowledge and skills
• **Perceived improved understanding of governance drivers and barriers to implementation of measures**
• **Number of MOVE21 innovations replicated**
• **Number of implemented MOVE21 innovations in the Cities Replicating Activities**
Target Area 3: Quantify the collaborations created and the business models developed
• **Number of MOVE21 business models developed**
• **Increased collaboration level between public private entities and between transport domains**

4.1.3 Level 3: Impact-oriented result indicators

Under this level, the ***result indicators*** reveal the performance of the measures, solutions and innovations, administrative, commercial or policy decisions replicated by the six cities as regards the already mentioned MOVE21 impact areas.

A total of 16 KPIs are included in Level 3, addressing different Impact areas, as described in Table 7.

Table 7 - Level 3 selected KPIs

Level 3: Impact-oriented result indicators
Impact Area 1: Long-term decarbonization
• **CO2 reductions from local (passenger and freight) transport in Cities Replicating Activities**
Impact Area 2: Sustainable, inclusive, safe, and secure mobility system
• **Increase of perceived security (crime, COVID-19 etc.) in the city-transport system** • **Reduction in passenger and freight transport related noise pollution** • **Increase in active modes**
Impact Area 3: Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes.
• **Load factors in urban freight as a result of MOVE21** • **No. of new (micro) hubs as a result of the Project** • **No. of improvements in existing hubs as a result of the Project** • **Reduced number of heavy (freight) vehicles in circulation as a result of the implementations** **Increase in public transport use**
Impact area 4: Social cohesion, economic development, and public perception, resulting in behavioral and policy change.
• **Direct economic sectorial contribution to the welfare to the metropolitan area from city transport**

4.2 Introduction of additional KPIs per level used in other European Initiatives

After an in-depth analysis of the indicators that were used in previous European projects and according to the relevance of them to the scope and targets of the MOVE21 project, the following list of possible indicators to be included in the evaluation framework of the RAs was extracted (Table 8). These indicators were also assigned to the three levels of the evaluation framework as presented in Table 9.

Table 8 – List of possible KPIs from other EU projects

EU Initiative	KPI definition	KPI measurement
LEVITATE	**Increased shared mobility**	Percentage change in number of trips made sharing a vehicle with others.
LEVITATE	**Required parking space**	Required parking space in the project area per person, in m^2 (Levitate)
SUITS	**Modal integration**	Availability of intermodal (between different transport modes) connections and quality of the interchange facilities, number and frequency.

SUITS	**Accessibility perception**	The user's perception of the physical accessibility to the service. This concerns, for instance, the distance to the nearest PT stop and the convenience of getting there.
LEVITATE	**Availability opportunity**	The opportunity of taking a trip whenever and wherever wanted, 10 point Likert scale.
HARMONY	**Investments attracted for economic growth in RAs**	Investments attracted, in Euros.
CIVITAS	**Acceptance level**	The percentage of the population (general public or target groups) who favourably receives or approves a measure.

Table 9 – List of possible KPIs from other EU projects

Level 2: Cities Replicating Activities procedures
Target Area 3: Quantify the collaborations created and the business models developed
• **Modal integration (SUITS)**

Level 3: Impact-oriented result indicators
Impact Area 1: Long-term decarbonization
• -
Impact Area 2: Sustainable, inclusive, safe, and secure mobility system
• **(LEVITATE) Increased shared mobility** • **(LEVITATE) Availability opportunity**
Impact Area 3: Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes.
• **(LEVITATE) Required parking space** • **(SUITS) Accessibility perception**
Impact area 4: Social cohesion, economic development, and public perception, resulting in behavioral and policy change.
• **(HARMONY) Investments attracted for economic growth in RAs** • **(CIVITAS) Acceptance level**

4.2.1 Methods of Data Collection

For the calculation of the result indicators data acquirement from several data sources and regarding various thematic areas is necessary. The fundamental data source that will feed the impact assessment framework is based on the outcomes of the RAs procedures; i.e., the data collection is based on the overall processes that will take place in the six cities for the replication of mobility solutions.

Specifically, tor the data collection through replication procedures, the impact assessment framework will be deployed by using two main methods for collecting data.

Firstly, for the implementation of the MOVE21 impact assessment, **Questionnaire surveys** (short questionnaires or in-depth interviews) have been organized covering several MOVE21 impact areas and result indicators. The aim of the QS is to collect information from the relevant stakeholders.

For the implementation of the MOVE21 impact assessment, a ***Measures and Innovations Logbook*** has also been designed for the all the cities in order to cover several MOVE21 impact areas and result indicators. The aim of the Measures and Innovations Logbook is to collect all the relevant information related to the measures, solutions, and innovations intended to be implemented and/or upscaled by the six cities as part of their replication and implementation activities.

4.2.2 Area of Reference

As already stated in D8.1 (Section 4.2), the reference area is important for identifying the impact zone as well as for defining the reference point of the framework. Specifically, the geographical area of reference is categorized in the following levels:

- Test site level or Area of interest: refering to a defined spatial area in which the mobility solution will take place in the city within its RA.
- City/Functional Urban Area level: spatial units based on the city (core) and its commuting zone which is interconnected to it based on several possible different functions.
- EU-wide/TEN-T corridor level: refering to the most extensive setting of the framework, the European setting and TEN-T corridor.

As presented in the previous sections, the approach adopted for LLs presented in D8.1 and D8.3 was taken as a reference to establish the strategy with which to construct the analytical framework for the evaluation of the impact of the RAs. This allowed a choice to be made between the indicators identified from the analysis of project documentation as well as the related initiatives and European projects similar in topic, in order to create a proposal for effective replication. It was decided to involve all six cities in the selection process by interviewing them on the level of difficulty they expect to encounter in collecting data on the proposed indicators but also to let them provide some more KPIs that may interest them as result after their measures implementation.

The next section (Chapter 5) is dedicated to this phase of city involvement. Chapter 6 provides the reader with the final list of KPIs for the evaluation framework as well as the detailed methodology (tools, time period, sources) for their calculation.

5 Finalization of the KPIs for the evaluation framework

The choice of KPIs to be included in the MOVE21 evaluation framework for replication has been defined in close collaboration with the six cities involved in the project through a dedicated survey. The survey prompts the cities to reflect on the KPIs and aims to understand the level of difficulty in finding data associated with each indicator. It also intends to ascertain whether cities assume they should provide other important KPIs that may be neglected in the current framework.

This section illustrates the previous mentioned procedure. In particular it presents the preparatory activities (5.1) for understanding the cities' replication measures. It describes the structure of the questionnaire, detailing the three questions asked for each indicator (5.2), and it finally presents the results of the data analysis (5.3).

5.1 Understanding the replication measures of the six cities

To understand if the cities wish to gain specific knowledge of the RAs results through the evaluation procedure, gaining a full understanding of the measures to be replicated was a crucial first step.

As described in D7.2 *Replication action plans for Oslo, Gothenburg, Hamburg, Munich, Bologna and Rome*, the development of the replication actions plan followed a three-step process in order to meet requirements of transferability and feasibility. First, each city selected a measure among the ones listed in the Logbooks, which allow each city's representatives to collect and provide all the relevant information related to the measures, solutions, and innovative aspects to be implemented, and detailed the specific aspects they will replicate. Second, the cities ran a transferability assessment and identified the main challenges they could face when implementing the measure. Third, the cities completed an action plan for the selected measure(s) indicating the implementation steps, the actors involved, the timelines and the milestones for monitoring and evaluation.

The following Table 10 presents the information taken from the cited document with respect to the first step, i.e., the measure selected by each city (in the first column), among those listed in the Logbooks by the other cities (in the first row).

Table 10 - Replication Measures by city

Cities	Oslo	Gothenburg	Hamburg	Bologna
Oslo				Guidelines
Gothenburg				Guidelines
Hamburg	Mobility on Demand			
Munich	3.Integrated micro-mobility with PT	2.Park&Bike Node	1.Neighbourhub	
Bologna		1.Park&Bike Node 2.Cargo-waste co-freight	3.Mobility Hub	
Rome	2.Emission-Free Goods Transport	1.Park&Bike Node		3.Guidelines

Source: Elaborated from D7.2

As can be seen from the table above, the cities mainly converge on the measures presented by Bologna, concerning the drafting of Technical Guidelines for designing metropolitan Mobility Hubs, and by Gothenburg, concerning the implementation of Park and Bike Nodes.

The remaining measures concern both general objectives such as, for example, making urban freight distribution clean in the city centre (Rome from Oslo), as well as aspects of integration with public transport (Munich from Oslo), reverse logistics (Bologna from Gothenburg), and contemporary innovations such as demand-responsive transport (Hamburg from Oslo).

All cities except Rome and Munich were taken as examples of measures described in the Logbooks for at least one of their actions and therefore taken as examples of measures of which at least one innovative or otherwise relevant aspect for the replicating city would be replicated. Interestingly, Oslo provided cues to three cities on three different measures.

Based on this knowledge, a questionnaire of the survey was formulated as presented in the following section (5.2) and the cities were asked to answer it giving their feedback for the structure of the evaluation framework.

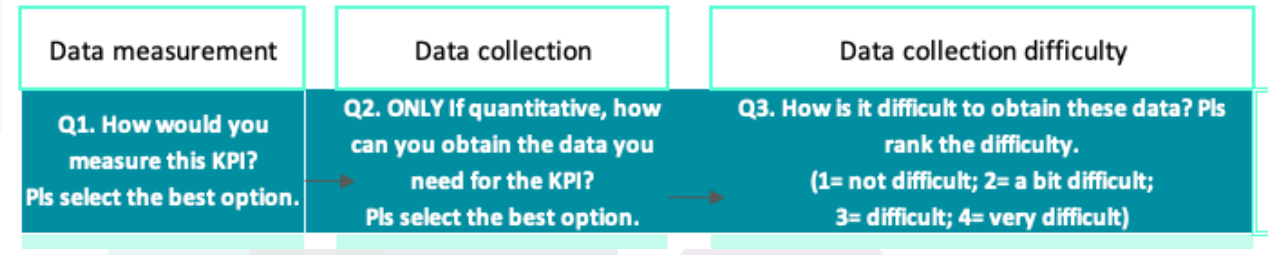
5.1 Structuring the questionnaire survey

The questionnaire that was used for collecting all the needed information from the cities was divided into two parts and asked the cities if 1) they had additional KPIs that they would like to include in the framework, but also about 2) their efficiency to collect the appropriate data for the calculation of the final list of KPIs.

The first part of the questionnaire presents indicators already known to the respondents. This list of 15 indicators is the result of the analysis conducted on the project documents described in section 3.1, in light of the need for harmonisation with specific initiatives revolving around CIVITAS, which are mentioned in section 3.2, taking into account the division into levels described in chapter 4. However, in presenting the set of indicators from which the city would have to choose within the questionnaire, it was considered necessary to simplify the proposal by not referring to levels or thematic, target or impact areas (see Chapter 4) but only to the distinction between indicators already familiar or not. For this purpose, as is known, specific reference was made to the source document of the indicator.

The second part proposes seven more indicators drawn from the literature review (detailed in Section 3.3) while the third part urge the cities to propose any additional indicators needed for evaluating their measures. For each of these indicators, cities are asked to answer to one up to three questions that are illustrated in Figure 2.

Figure 2 - Questions on the KPIs



For the first question (Q1), the options were: quantitative and qualitative.

- Answering “qualitative” did not need to specify anything else and the city was asked to go directly to question 3;
- Answering quantitative, instead, the cities had to answer another question (Q2) before moving on.

The second question (Q2) required the cities to specify which tools were useful in obtaining the data, among the following:

- use of sensors;
- individual interviews;
- focus groups;
- survey or questionnaire;
- estimates from calculations; or
- other (which had to be specified in a cell).

Finally, the third question (Q3) asks the cities to rank the difficulty of finding the data in a range from 1, that means there was no difficulty, to 4, where one means it could be very difficult. Questions 1 and 2 were not asked for KPIs 1 to 15, i.e., those already included in other MOVE21 documents.

It should be noted that all three questions were to be answered by cities thinking in general about the replication action of the project and not specifically about the project measures that directly concerned them either as primary actions to be carried out in the case of LLs or as actions replicated by other cities, which concerned both Living Lab and Replicator cities.

Going into the details of the indicators, they were presented to the respondents separated according to the sole criterion of source. In particular, the first group of 15 indicators from the project documentation (see section 3.1) is illustrated in Table 11.

Table 11 - KPIs from MOVE21 project

KPI no	KPI code	KPI definition	KPI measurement
1	CO_2	**CO2 reduction from local transport due to RAs**	CO2 reduction from local **road** transport: private cars, vans, heavy vehicles (incl. buses). In use of energy of kilometre driven, CO2-equivalent. (GA 1.2 & D8.1 - 1.1)
2	InnoR	**Number of MOVE21 innovations replicated**	No. of MOVE21 innovations just replicated, but not implemented yet, in the six cities/functional urban areas.(GA 1.4 & D8.1 - 1.3)
3	ATI	**Increase in active modes due to RAs**	Increase in active modes of transport thanks to incentives, in percentage. (GA 2.3)
4	InnoI	**Number of implemented MOVE21 innovations as a result of the Ras**	No. of implemented MOVE21 innovations as a result of the RAs. (GA 3.2 & D8.1 -3.1)
5	nMH	**Number of new (micro) hubs as a result of the Ras**	No. of new (micro) hubs as a result of the RAs of the project. (GA 3.3 & D8.1 -3.3)
6	MHI	**Number of improvements in existing hubs as a result of the Ras**	No. of improvements in existing hubs as a result of the RAs (GA 3.4 & D8.1 -3.4)
7	PTI	**Increase in public transport use due to RAs**	Increase in public transport use, in percentage. (GA 3.9 & D8.1 -3.9)
8	COO	**Increased collaboration level between public private entities**	Increased collaboration level between public private entities and between transport domains in all

		and between transport domains	collaborating cities/functional urban areas, 5 points Likert scale. (GA 3.12)
9	**GOV**	**Perceived improved understanding of governance drivers and barriers within Ras**	Perceived improved understanding of governance drivers and barriers to the implementation of measures, 5 point Likert scale. (GA 4.1 & D8.1 - 4.1)
10	**BIZ**	**Number of MOVE21 business models developed within the Ras**	No. of MOVE21 business models developed. (GA 4.3 & D8.1 -4.3)
11	**WEL**	**Direct sectorial contribution to the welfare of the metropolitan area from city transport due to Ras**	Share of GVA (gross value added) by transport sector and storage in total GDP. (GA 4.4 & D8.1 -4.4)
12	**LoF**	**Load factors**	Load factors in urban freight as a result of MOVE21 RAs, in numbers. (GA 3.6 & D8.1 -3.6)
13	**SEC**	**Increased security due to Ras**	Increase of perceived security (crime, COVID-19 etc.) in the city-transport system, 5 point Likert scale. (GA2.2 & D8.1 - 2.2)
14	**HFV**	**Reduced number of heavy (freight) vehicles due to Ras**	Reduced number of heavy (freight) vehicles in circulation as a result of the implementations, in percentage. (GA3.7 & D8.1 -3.7)
15	**NOR**	**Noise Reduction due to Ras**	Actual noise level is described as the outdoor sound level caused by human activities, including transport, in dB. (GA 2.4 & D8.1 -2.4)

In the first column one can see the number by which the indicator is identified, in the second the abbreviation code, in the third the definition and in the fourth the description accompanied, where possible, also by the code and the source (GA and D8.1), and unit of measurement. For these first 15 indicators only, an initial hypothesis of a data collection instrument is also indicated.

The second group of seven indicators from the literature review (16 to 22) is presented in Table 12 below.

Table 12 KPIs from other European projects

KPI no	KPI code	KPI definition	KPI measurement
16	**SHA**	**Increased shared mobility**	Percentage change in number of trips made sharing a vehicle with others. (Levitate)
17	**PAR**	**Required parking space**	Required parking space in the project area per person, in m^2(Levitate)
18	**TMM**	**Modal integration**	Availability of intermodal (between different transport modes) connections and quality of the interchange facilities, number and frequency. (SUITS)
19	**AXP**	**Accessibility perception**	The user's perception of the physical accessibility to the service. This concerns, for instance, the distance to the nearest PT stop and the convenience of getting there. (SUITS)
20	**AVA**	**Availability opportunity**	The opportunity of taking a trip whenever and wherever wanted, 10 point Likert scale. (Levitate)
21	**INV**	**Investments attracted for economic growth in RAs**	Investments attracted, in Euros. (HARMONY)
22	**ACC**	**Acceptance level**	The percentage of the population (general public or target groups) who favourably receives or approves a measure. (CIVITAS)

Again, in the first column one can see the number by which the indicator is identified, in the second the abbreviation code, in the third the definition and in the fourth the description accompanied by the possible unit of measurement and the source.

Note that a final indicator from the CIVITAS Scoreboard has been included in this table, in order to also monitor the level of acceptance of the replicated measures in the project.

5.2 Collecting and analysing the data

After a focus group conducted by Roma Tre University with the cities of Rome and Bologna on 1 June 2023 to test the comprehensibility, length, and ease of completion, the questionnaire was finally administered on 23 June 2023. Roma Tre University, who is responsible for the dataset analysis, sent an excel file to six representatives of the six cities involved in the project, asking for responses within a week.

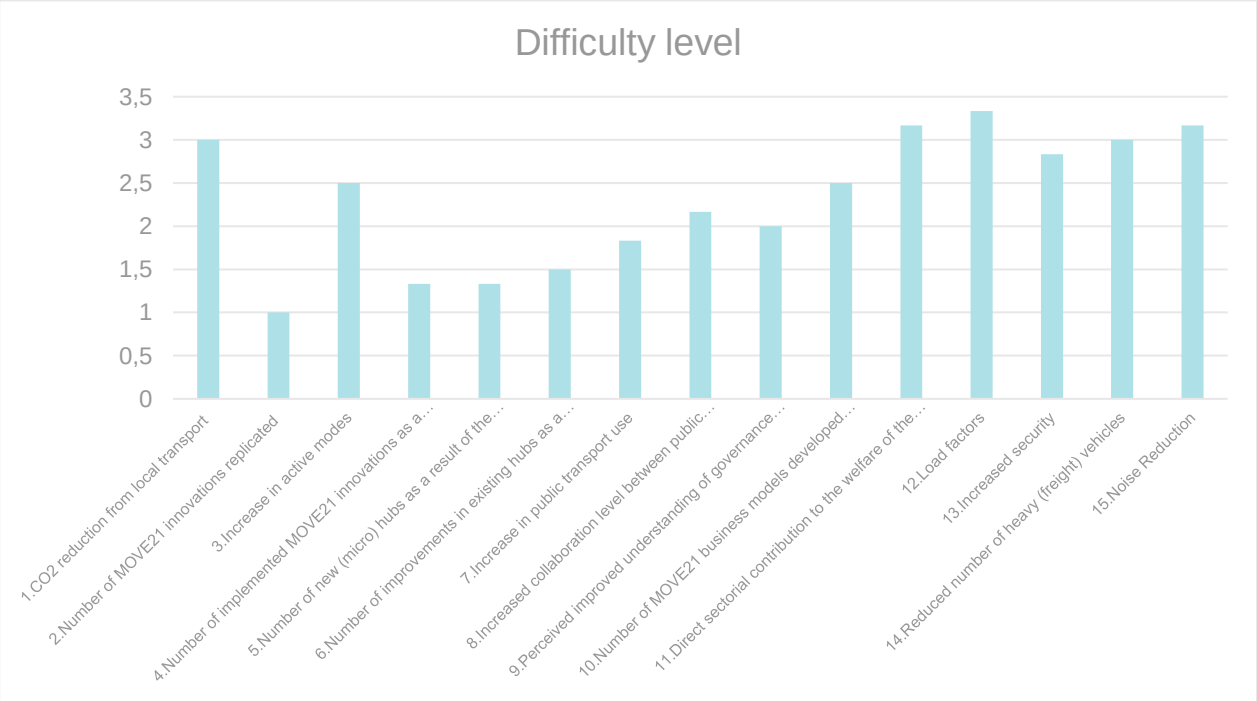
In some cases, an additional meeting with the cities was necessary for clarification of some points in the questionnaire. Doubts that arose from the responses or the consequent analysis (e.g., data missing, perspective adopted, notes clarification) were clarified through e-mail exchanges during the summer period. After this, a detailed analysis took place in order to evaluate the efficiency of the KPIs presented in the previous section to be used for the evaluation framework.

The results of the data analysis are presented in the next sections.

5.2.1 Evaluation of KPIs originating from the MOVE21 Documentation

For the first set of indicators, those derived from the project documentation, cities were just asked to answer only Q3, thus associating a level of difficulty from one (not difficult) to four (very difficult) to the KPI data collection.

Figure 3 - Difficulty level of MOVE21 KPIs data collection



The overview of the first group of indicators in Figure 3 shows that the greatest difficulties, i.e., with an average difficulty value of more than three, could be encountered in collecting data on KPI12, the load factor (3.3), KPI11, the direct contribution to the welfare, and KPI15, noise reduction (3.2).

KPI1 concerning CO2 reduction and KPI14 related to the Reduced number of heavy (freight) vehicles due to RAs are also considered difficult, with an average value of 3.

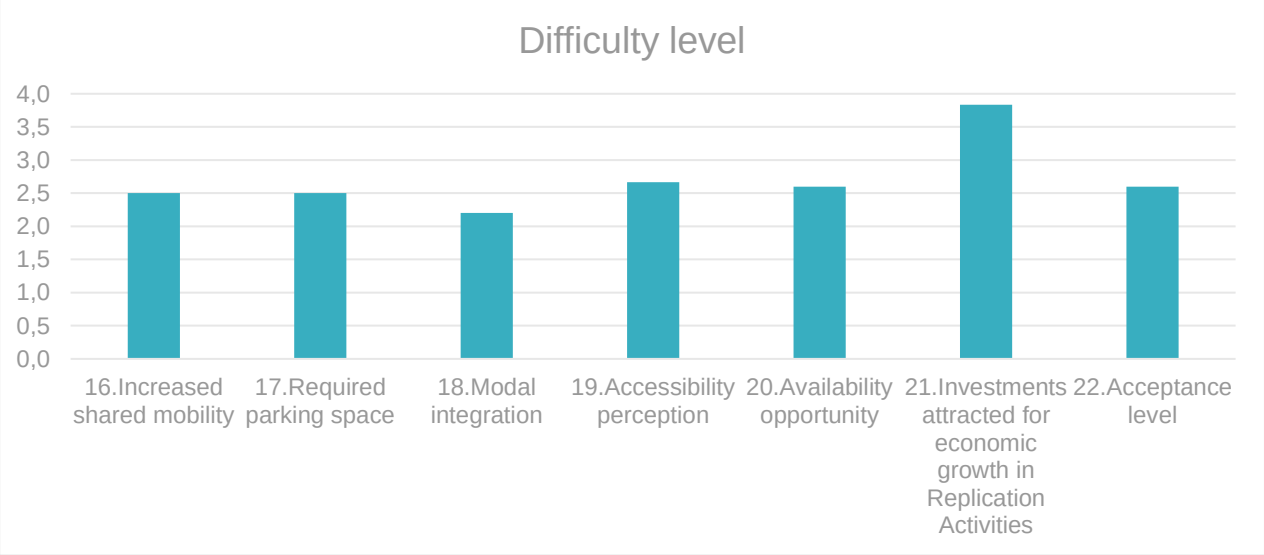
Much less challenging, however, are the indicators on the number of replicated innovations (KPI2), new micro-hubs (KPI5), and implemented innovations (KPI4), with an average difficulty level of less than 1.5.

5.2.2 Evaluation of KPIs originating from other European projects

On the second group of indicators, five out of six cities gave their opinion. In this case, respondents were also asked to express themselves on the type of approach to be used to collect data, quantitative or qualitative and, in case of a preference for the quantitative approach, to also specify which tools would be used, among the different options available (already detailed in section 4.2).

Figure 4 actually, describes the survey results concerning the level of difficulty attached to the KPIs identified in the literature by the cities.

Figure 4 - Difficulty level of other EU projects KPIs data collection



The greatest concern of the cities converges on the economic indicator; the average value attributed to indicator 21. concerning investments attracted through RAs is almost 4 (3.8).

In contrast, indicator 18. modal integration is considered to be the easiest to assess. Apart from indicator 16 and indicator 21, about the increase in sharing mobility and the Investment Attractiveness, cities seem to prefer a qualitative approach.

On the other hand, with regard to the data collection methods, the cities present a high level of heterogeneity that does not allow the identification of any useful convergence.

3.2.1 Additional KPIs proposed by the Cities

The following Table 13 presents all the indicators that have been proposed by the two cities of Bologna (green) and Munich (purple).

Table 13 - KPIs from the Cities

KPI no	KPI definition	KPI description
23	Less polluting routes	distance covered by less pollutant means of transport, instead of more pollutant ones (number of kms)
24	Less polluting trips	usage/trips made by less pollutant means of transport, instead of more pollutant ones (number of trips)
25	Knowledge increased	learning from the measures (number of paper/document/tool produced)
26	Stakeholder future interest	assessment of potential stakeholder continuation of the measures (5 point Likert scale)
27	Bike hubs level of use	number of accesses/ reservations to use the bike park services
28	Involvement commercial activities and associations	number of commercial activities and associations involved within the measure
29	Increase the use of sharing services	Number of loans / trips
30	Ensure intermodality	Number of apps that offer bookable intermodal route chains, number of intermodal routes that include shared mobility, number of mobility points and mobility concepts with sharing offers
31	Tariff and price integration	Number of providers offering discounts for holders of public transport tickets / subscriptions
32	Reduction of private cars	Change in registration figures due to shared mobility
33	Prioritisation of areas	Ratio of shared mobility parking spaces to parking spaces for private cars
34	Area-wide network of mobility points and parking spaces for shared mobility	Proportion of population with access to shared mobility within 5 minutes walking distance
35	Journeys and CO2 saved through shared mobility use	Number of passenger kilometres and tonnes of CO2 or greenhouse gases
36	Reduction of travel time compared to (pure) public transport	Ratio of travel time of classic public transport in relation to travel time in combination with Shared Mobility

To a small extent, the indicators are related to others proposed by the cities in one or more aspects, identifying partial overlap, for example:

- KPI32 (Reduction of private cars) is analogous to KPI14 (Reduced number of heavy (freight) vehicles due to Ras);
- KPI35 (Journeys and CO2 saved through shared mobility use) is a specific part of KPI1 (CO2 reduction from local transport due to RAs) as well as KPI27 (bike hubs level of use) is strictly related to KPI3 (Increase in active modes due to RAas);
- KPI36 (Reduction of travel time compared to (pure) public transport) relates to KPI7 (Required parking space);
- KPI23 (Less polluting routes) and KPI24 (Less polluting trips) partially overlaps in terms of themes with KPI1 (CO2 reduction from local transport due to RAs);
- KPI28 (Involvement commercial activities and associations) overlaps with KPI8 (Increased collaboration level between public private entities and between transport domains);
- KPI29 (Increase the use of sharing services) and KPI30 (Ensure intermodality) almost completely overlap with KPI16 (Increased shared mobility) and KPI18 (Modal integration), respectively.

In any case, there is no overlap with the indicators proposed to the cities. Moreover, they are heterogeneous in terms of the nature of the category they belong to, capturing the different dimensions of economy (KPI31), transport efficiency (KPIs 27, 29, 30), governance (KPIs25, 26, 28), multi-modality, environment (KPIs23, 24, 35) and urban liveability (KPIs32, 33, 34). It is very interesting that cities have also provided clear guidance on how to collect the data.

Taking into account the above presented results, an enriched evaluation framework, compared to the original idea, was prepared, consisting of two sets of indicators as it is presented in the next Chapter.

6 The Replication Activities Evaluation Framework

The Evaluation Framework for RAs includes two sets of Indicators detailed below.

6.1 Core KPIs included in the evaluation framework

The first set of the so-called CORE indicators, was identified on the basis of the KPIs suggested in the questionnaire, i.e., from 1 to 22. In particular, in selecting the indicators to be included in the EF, several criteria were taken into account, also distinguished on the basis of the group of indicators, i.e., whether they belonged to the group of indicators mentioned in the documentation (1-15) or were found from the analysis of other projects (16-22).

For the first group, indicators were initially selected whose average difficulty in finding data according to the evaluation provided by the cities was ≤2.5. Thus, indicators from 2 to 10 were selected. Whereas for the second group, which presented a very high heterogeneous results in terms of answers about both the approach (qualitative or quantitative) and the tools for gathering the data (see 5.2), a more restrictive approach was adopted, considering a difficulty level <2.5. This allowed only indicator 18. Modal integration, borrowed from the SUITS project, to be considered.

Moreover, after carefully analysing also the notes provided by the cities (some of them, although it was not necessary, tried to answer also the first two questions for the first group) and discussing the way of data retrieval with the WP leader, it was decided to also explain or modify some indicators to make them easier for the cities within the evaluation procedure.

For example, since some cities are only going to replicate one aspect of a measure or solution and not of a whole, it was decided to adopt the same subdivision into several indicators used for the evaluation framework for the Living Labs, as the more general indicator 1.4. Therefore indicator 1.4 submitted to the city was split into six sub-indicators also in the case of CRAs. Again, referring to indicator 1.4, thanks to the requests for clarification made by almost all cities, both during the focus group but also during the response creation phase, it was decided to better specify the difference between indicators 1.4 and 3.2. In detail, the difference between replicated and implemented is that replicated (or developed) means that it is not implemented yet.

This also applies when discussing other aspects such as in indicators 4.3 and new 1.4b referring to business models. Based on these different steps in the selection process, the first set of indicators is illustrated in the following Table 14.

Table 14 - Core KPIS in the EF

KPI no	KPI code	KPI definition	Unit of measure	KPI measurement
1	**InnoR**	Number of MOVE21 innovations replicated (1.4) *Splitted into:* •1.4a No. of MOVE21 social innovations implemented in the CRAs •1.4b No. of MOVE21 innovative business models implemented in the CRAs •1.4c No. of MOVE21 technological innovations implemented in the CRAs •1.4d No. of MOVE21 service innovations implemented in the CRAs	Number	WP8 RCs Logbooks

		•1.4e No. of MOVE21 governance innovations implemented in the CRAs •1.4f Number of interoperable systems of innovative solutions adopted in CRAs		
2	**ATI**	Increase in active modes due to RAs (2.3)	Percentage	WP8 Questionnaire Survey
3	**InnoI**	Number of implemented MOVE21 innovations as a result of the RAs (3.2)	Number	WP8 RCs Logbooks
4	**nMH**	Number of new (micro) hubs as a result of the RAs (3.3)	Number	WP8 RCs Logbooks
5	**MHI**	Number of improvements in existing hubs as a result of the RAs (3.4)	Number	WP8 RCs Logbooks
6	**PTI**	Increase in public transport use due to RAs (3.9)	Percentage	WP8 Questionnaire Survey
7	**COO**	Increased collaboration level between public private entities and between transport domains (3.12)	Likert scale	WP8 Questionnaire Survey
8	**GOV**	Perceived improved understanding of governance drivers and barriers within RAs (4.1)	Likert scale	WP4 Questionnaire Survey
9	**BIZ**	Number of MOVE21 business models developed within the RAs (4.3)	Number	WP8 RCs Logbooks
10	**TMM**	Modal integration (SUITS)/Multimodality Level	Number	Estimation of expert group

The process of data retrieval has been further clarified, making it as simplified as possible, whether in terms of source or unit of measurement.

It should be noted that having to take into account the principles of relevance with respect to the RAs, it is possible to distinguish these indicators into two categories. The first one is that of the cross-cutting indicators that will be compulsorily requested from the cities, due to the need of consistency alongside the project EF (KPIs 2, 4, 5, 6, 8, 9, 10). The second one, which takes into account the heterogeneity of the measures to be replicated, is that of the so-called specific indicators (3, 7, 18) will not be compulsory for all. Those cities that ascertain that these indicators are not significant or relevant with respect to the measures they're going to replicate, will be allowed to declare the non-applicability of the indicator when compiling their RAs evaluation framework.

6.1 Optional KPIs included in the Replication Activities EF

The second set of indicators, on the other hand, is entirely optional and consists of all indicators that have been proposed in the questionnaire by the cities and to the cities, the latter excluding the CORE ones. It therefore includes not only the indicators that have been variously defined as more difficult on average for cities to survey (i.e., KPIs 1,11 to 17 and from 19 to 22), but also all those which, having been independently proposed by the individual cities (namely, Bologna and Munich) have not been endorsed by the others and for which there is therefore no response from all the other cities.

It should be noted that for the latter, a skimming operation was also carried out to eliminate those indicators that partly or totally overlapped with the others, especially those that have been already proposed to the cities, namely 23, 24, 27, 28, 29, 30.

This led to a scheme of several indicators that are presented in the Table 15 below.

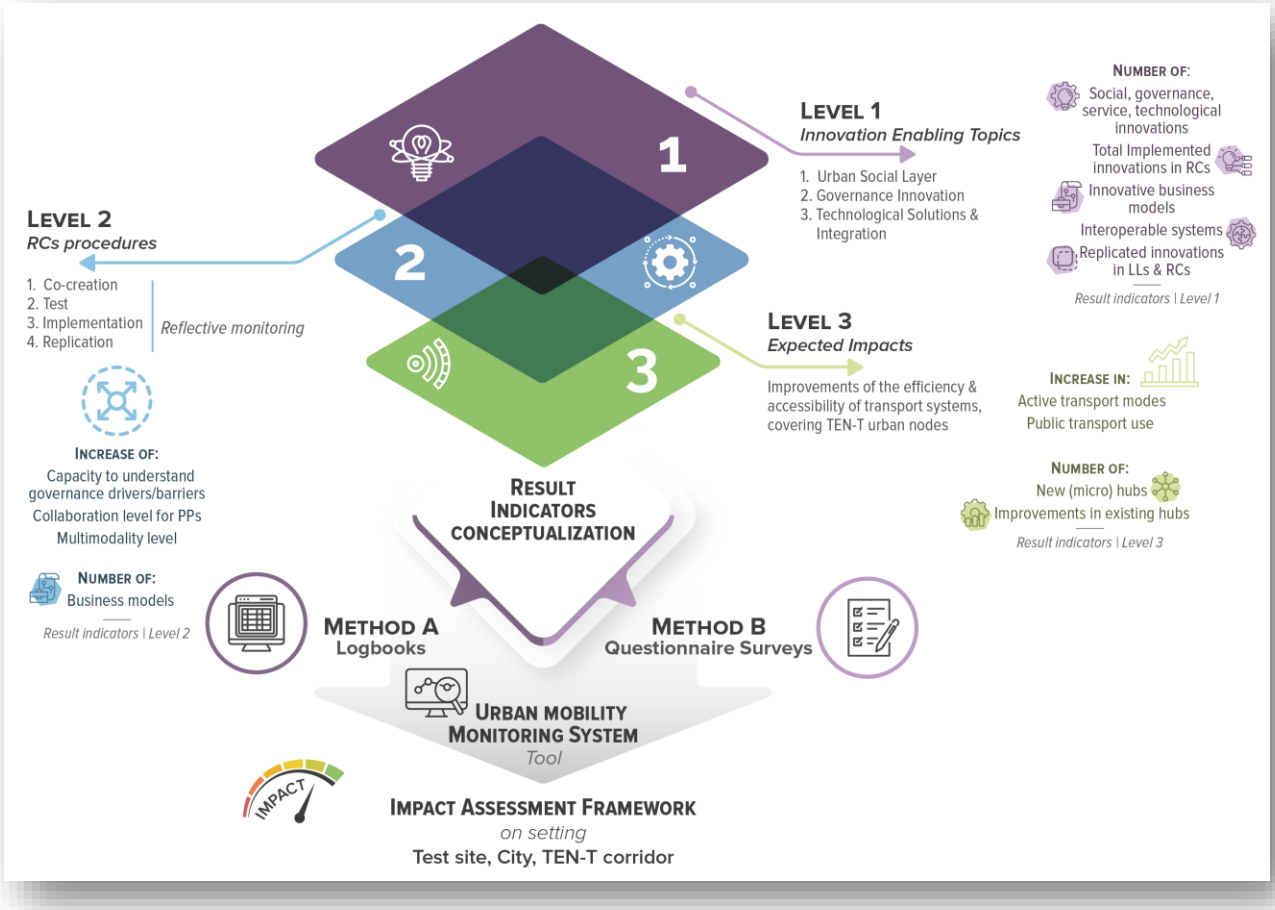
Table 15 - Optional KPIs in the EF

KPI no	KPI definition	KPI description
1	**CO2 reduction from local transport due to RAs**	CO2 reduction from local **road** transport: private cars, vans, heavy vehicles (incl. buses). In use of energy of kilometre driven, CO2-equivalent. (GA 1.2 & D8.1 - 1.1)
11	**Direct sectorial contribution to the welfare of the metropolitan area from city transport due to Ras**	Share of GVA (gross value added) by transport sector and storage in total GDP. (GA 4.4 & D8.1 -4.4)
12	**Load factors**	Load factors in urban freight as a result of MOVE21 RAs, in numbers. (GA 3.6 & Del 3.6)
13	**Increased perceived security**	Increase of perceived security (crime, COVID-19 etc.) in the city-transport system, 5 point Likert scale. (GA2.2 & Del2.2)
14	**Reduced number of heavy (freight) vehicles**	Reduced number of heavy (freight) vehicles in circulation as a result of the implementations, in percentage. (GA3.7 & DEL 3.7)
15	**Noise Reduction**	Actual noise level is described as the outdoor sound level caused by human activities, including transport, in dB. (GA 2.4 & Del 2.4)
16	**Increased shared mobility**	Percentage change in number of trips made sharing a vehicle with others. (LEVITATE)
17	**Required parking space**	Required parking space in the project area per person, in m^2 (LEVITATE)
19	**Accessibility perception**	The user's perception of the physical accessibility to the service. This concerns, for instance, the distance to the nearest PT stop and the convenience of getting there. (SUITS)
20	**Availability opportunity**	The opportunity of taking a trip whenever and wherever wanted, 10 point Likert scale. (LEVITATE)
21	**Investments attracted for economic growth in RAs**	Investments attracted, in Euros. (HARMONY)
22	Acceptance level	The percentage of the population (general public or target groups) who favourably receives or approves a measure. (CIVITAS)
25	knowledge increased	learning from the measures (number of paper/document/tool produced)
26	stakeholder future interest	assessment of potential stakeholder continuation of the measures (5 point Likert scale)
31	Tariff and price integration	Number of providers offering discounts for holders of public transport tickets / subscriptions
32	Reduction of private cars	Change in registration figures due to shared mobility
33	Prioritisation of areas	Ratio of shared mobility parking spaces to parking spaces for private cars
34	Area-wide network of mobility points and parking spaces for shared mobility	Proportion of population with access to shared mobility within 5 minutes walking distance

6.2 Finalizing the Evaluation Framework for the Cities Replicating Activities

The Evaluation Framework used for the CRAs will be based on the final list of the Core Result Indicators per level as well as on the methodology and tools that were also used for the LLs *ex-ante* implementation. The Assessment process is presented in the Figure 5 - Impact Assessment Methodology Approach for CRAsFigure 5 below. The respective information is presented in the following sub-sections.

Figure 5 - Impact Assessment Methodology Approach for CRAs



6.2.1 Result indicators used for the RAs Evaluation Framework

The result indicators that will form the basis of the evaluation framework are the core 10 KPIs and are presented below (Tables 16-18) according to their impact level.

Table 16 - KPIs in Level 1 by Thematict Area

Level 1: Cities Replicating Activities procedures
Thematic Area 1: Urban Social Level
• 1.4a - No of MOVE21 social innovations implemented/replicated in the Cities Replicating Activities (2a)
Thematic Area 2: Governance Level
• 1.4b - No of MOVE21 innovative business models implemented/replicated in the Cities Replicating Activities (2b)
• 1.4e - No of MOVE21 governance innovations implemented/replicated in the Cities Replicating Activities (2e)
Thematic Area 3: Technical Integration
• 1.4c - No of MOVE21 technological innovations implemented/replicated in the Cities Replicating Activities (2c)
• 1..4d - No of MOVE21 service innovations implemented/replicated in the Cities Replicating Activities (2d)
• 1.4f - Number of interoperable systems of innovative solutions adopted/replicated in the Cities Replicating Activities (2f)
• 3.2 No. of implemented MOVE21 innovations in the Cities Replicating Activities (4)

Table 17 - KPIs in Level 2 by Target Area

Level 2: Cities Replicating Activities procedures
Target Area 1: Uptake of new knowledge and skills
• 4.1 Perceived improved understanding of governance drivers and barriers to implementation of measures (9)
Target Area 3: Quantify the collaborations created and the business models developed
• 4.3 Number of MOVE21 business models developed (10)
• 3.12 Increased collaboration level between public private entities and between transport domains (8)
• (SUITS) Modal integration (18)

Table 18 - KPIs in Level 3 by Impact Area

Level 2: Impact-oriented result indicators
Impact Area 2: Sustainable, inclusive, safe, and secure mobility system
• 2.3 Increase in active modes due to Ras (3)
Impact Area 3: Improvements of the efficiency and accessibility of the transport networks/systems covering the TEN-T urban nodes.
• 3.3 No. of new (micro) hubs as a result of the Project (5)
• 3.4 No. of improvements in existing hubs as a result of the Project (6)
• 3.9 Increase in public transport use (7)

In the following sub-section all the information for the KPIs calculation is analytically provided.

6.2.2 Methodological Framework for Assessing the Impact of the Replication Activities Measures

In the following tables the data that is needed for calculating and monitoring the 10 core KPIs of the replication cities activities / measures is presented, composing the Move21 Replication Cities' Evaluation Framework. More specifically for each core indicator a table is structured presenting:

- **Result indicator name and encoding:** a unique code number representing the indicator along with the full name of the indicator
- **Level of Evaluation:** the result indicators correspondence with the three levels of the impact assessment framework for the RCs
- **Contribution to additional impacts:** correlation to one or more additional impacts, in relation to the way they are reported at sub-Chapter 3.2.
- **Measurement Unit:** a quantity used as a standard of measurement. The measurement unit is defined for the qualitative and quantitative indicators of the current research.
- **Target values:** values intended to be achieved *(if necessary).*
- **Methodology approach & monitoring tools:** the overarching strategy and methodological rationale behind each indicator, providing, at the same time the tools/ methods to be used for the measurement of the indicator.

Result indicator 1.4	**Number of MOVE21 innovations replicated in the six cities/functional urban areas**
Level of evaluation	1
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 12 (innovations)
Methodology approach **Monitoring tools to be used**	RCAs procedures Measures/Solutions/Innovations Logbook

Result indicator 3.2	**Number of MOVE21 implemented innovations in the replicators**
Level of evaluation	1
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 9 (innovations)
Methodology approach **Monitoring tools to be used**	RCAs procedures Measures/Solutions/Innovations Logbook

Result indicator 4.3	Number of MOVE21 business models developed within the replication
Level of evaluation	2
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 6 (business models)
Methodology approach Monitoring tools to be used	RCAs procedures Measures/Solutions/Innovations Logbook

Result indicator 4.1	Perceived improved understanding of governance drivers and barriers to implementation of measures
Level of evaluation	2
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 4.5 (from scale)
Methodology approach Monitoring tools to be used	RCAs procedures Questionnaire Survey to city's administrations

Result indicator 3.12	Increased collaboration level between public private entities and between transport domains in all collaborating cities/functional urban areas
Level of evaluation	2
Contribution to additional impacts	Sustainable and Smart Mobility Strategy Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 5 (from scale)
Methodology approach Monitoring tools to be used	RCAs procedures Questionnaire Survey to city's administrations

Result indicator SUITS	Modal Integration/Increased level of multimodality
Level of evaluation	2
Contribution to additional impacts	Sustainable and Smart Mobility Strategy Sustainable Development Goals / Goals 9 / Target 9.1-11.1
Measurement unit	Number
Target value according to GA	2025: 4 (from scale)
Methodology approach Monitoring tools to be used	RCAs procedures Questionnaire Survey to city's administrations

Result indicator 2.3	Increase in active modes
Level of evaluation	3
Contribution to additional impacts	Sustainable and Smart Mobility Strategy Sustainable Development Goals / Goals 11 / Target 11.1
Measurement unit	Percentage
Target value according to GA	2025: +10%
Methodology approach Monitoring tools to be used	RCAs procedures Questionnaire Survey (data collection at local level)

Result indicator 3.3	No. of new (micro) hubs as a result of the Project
Level of evaluation	3
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 15 (micro-hubs)
Methodology approach Monitoring tools to be used	RCAs procedures Measures/Solutions/Innovations Logbook

Result indicator 3.4	No. of improvements in existing hubs as a result of the Project
Level of evaluation	3
Contribution to additional impacts	Mission board climate neutral and smart cities objectives Sustainable Development Goals / Goals 9 / Target 9.1
Measurement unit	Number
Target value according to GA	2025: 33 (improvements)
Methodology approach Monitoring tools to be used	RCAs procedures Measures/Solutions/Innovations Logbook

Result indicator 3.9	Increase in Public transport
Level of evaluation	3
Contribution to additional impacts	Sustainable and Smart Mobility Strategy Sustainable Development Goals / Goals 11 / Target 11.1
Measurement unit	Percentage
Target value according to GA	2025: +15%
Methodology approach Monitoring tools to be used	RCAs procedures Questionnaire Survey (data collection from public transport operators)

7 Conclusions

MOVE21 identifies smart and clean mobility solutions for achieving medium and long-term objectives such as, among the others: decarbonization, sustainability, inclusiveness, security, economic development, social cohesion and accessibility improvements. It applies a holistic and integrated approach to transport planning, policies and implementation in six European cities: Oslo, Gothenburg and Hamburg (Living Labs) and Munich, Rome and Bologna (replicator cities).

MOVE21 will also aim to secure impact through strong stakeholder and citizen engagement required for the deployment of innovative and sustainable solutions, such as the multimodal and interconnected hubs for freight and passenger transport, that will also serve the needs of final users, passengers, freight transport operators, local authorities, and private companies.

In order to assess the impacts, a three-level impact assessment methodology has been adopted, according to which: level one refers to the three innovation-enabling topics: society, governance, and technology; level two refers to the Living Labs co-creation procedures; level three refers to the impact-oriented MOVE21 result indicators.

To assess the specific impact of the ambitious two-way RAs taking place in MOVE21, a replication evaluation framework was set up, which involved all six participating cities. It is based on:

- The twin-scheme for the LLs actions (i.e., it was borrowed and adapted from that used for LLs activities in D8.1 and D8.3) and
- on other European projects, tailored upon the RAs,

This work has resulted in a set of KPIs for RAs. The final list of KPIs contain their description, their source and units of measurement, and data collection tools.

To establish a realistic Evaluation Framework for the Replicator Cities who have limited budget for data collection, it was crucial take into account information and knowledge exchange on data availability. For this reason, the replicator cities participated in an open dialogue using also a dedicated questionnaire survey in order to gain valuable insights into the essential components of the measures that they will implement as well as their efficiency to find the data required for evaluating these measures.

Once all the information for the cities was gathered, the final KPIs of the EF was structured, which could serve as a basic framework to be used for the *ex-ante* evaluation but also for the final *ex-post* evaluation of the project. What should be highlighted here, is that most of the KPIs that will be used are not based on quantified data that will be provided by the cities, as it became clear that most of the cities have no such updated data. This is something that should be taken into account when similar evaluation frameworks will be proposed.

The proposed framework is harmonised with the KPIs and the tools proposed by CIVITAS and can be used for other relevant EU projects as the core indicators can be transferred to any measure or solution that is tested as transfer of knowledge. Additionally, the tools that MOVE21 use for the implementation of the specific framework but also for the LLs evaluation, namely the Logbooks, the Questionnaires and the Replication Action plans, also go in the same direction. They are a precious source of information for evaluation activities and can easily serve the purpose of other initiatives.

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