Deliverable 5.2

User interface and implementation

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Project Executive Summary

The EU-funded 'Predictive Approaches for Safer Urban Environment' (PHOEBE) project aims to develop an integrated, dynamic human-centred predictive safety assessment framework in urban areas. This will be achieved by bringing together the interdisciplinary power of traffic simulation, road safety assessment, human behaviour, mode shift and induced demand modelling and new and emerging mobility data.

Focused on vulnerable road users' safety, the 3.5-year-long PHOEBE project will draw inspiration from real-world scenarios in the three pilot cities of Athens (GR), Valencia (ES) and West Midlands (UK). Testing activities will be performed across the use cases to simulate and forecast the impact of changes on safety in different scenarios of disruptions or transitions across urban transport networks.

Predicting and visualising the safety and socioeconomic outcomes of new forms of transport, new technologies, or regulatory and behavioural changes from the individual (micro) level up to the network-wide (macro) level will also be a significant game-changer for urban stakeholders. The results of PHOEBE can be used as a blueprint by other European cities to develop their knowledge products, such as socioeconomic analysis model, urban road safety assessment, human behaviour and choice modelling.

PHOEBE pilot cities

List of participating cities:

- Athens (Greece)
- Valencia (Spain)
- West Midlands (United Kingdom)

Social Links:

https://twitter.com/Project_PHOEBE

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Project Partners

Organisation	Country	Abbreviation
EVROPSKI INSTITUT ZA OCENJEVANJE CEST - EURORAP	SI	**EIRA**
ETHNICON METSOVION POLYTECHNION	EL	**NTUA**
TECHNISCHE UNIVERSITEIT DELFT	NL	**TUD**
TECHNISCHE UNIVERSITAET MUENCHEN	DE	**TUM**
AIMSUN SLU	ES	**AIM**
POLIS AISBL	BE	**POLIS**
FACTUAL CONSULTING SL	ES	**FC**
UNIVERSITAT POLITECNICA DE VALENCIA	ES	**UPV**
OSEVEN SINGLE MEMBER PRIVATE COMPANY	EL	**O7**
THE FLOOW LIMITED	UK	**FLOOW**
INTERNATIONAL ROAD ASSESSMENT PROGRAMME	UK	**iRAP**

List of abbreviations and acronyms

Acronym	Meaning
CoP	CoP
ES	Spain
EU	European Union
FSIs	Fatalities and serious injuries
GR	Greece
IMF	Impact Modification Factor
KPI	Key Performance Indicator
SUMP	Sustainable Urban Mobility Plan
TfWM	Transport for the West Midlands
UK	United Kingdom
UN	United Nations
VRU	Vulnerable Road User
WMCA	West Midlands Combined Authority
WP	Work Package

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Deliverable executive summary

This deliverable report (D5.2) is a product of the PHOEBE project, T5.5 - User Interface and Implementation (Lead: POLIS; Partners: NTUA, iRAP, AIM, TUM, O7; Duration: M33-M44).

This task involves designing and implementing the PHOEBE user interface. It will identify user requirements and functional needs through stakeholder engagement and focus groups and translate them into a practical, interactive platform. The interface will support the visualisation, interpretation, and application of PHOEBE results, improving the accessibility of the predictive framework. Refinements and user testing will ensure usability and readiness for deployment.

This deliverable is organised into seven chapters:

1. Introduction: Overview of WP5 objectives and its role within the PHOEBE framework.
2. The PHOEBE User Interface: Description of what is the interface and the process behind it
3. Examples from PHOEBE Use cases: Summary of the pilots deployment
4. Transferability, Scalability and Replication Framework: Explanation of the process for transferability, scalability and replication
5. Practical Guidelines for Local Authorities and Decision Makers: Overview of how to implement the framework and how to use the PHOEBE Dashboard
6. Limitations and Future Developments: Overview of the identified limitations and possible developments for the framework
7. Conclusions

A central component of this deliverable is the detailed breakdown of the experimental design settings, interventions, and future scenarios specific to each of the three use case locations:

- Athens interventions focus on pedestrian-friendly transformations, such as the pedestrianisation of Vasilisis Olgas Avenue, traffic lane reductions in Panepistimiou Street and the promotion of public transport. Additionally, there is a city-wide initiative to implement a 30 km/h speed limit and establish an extensive network of bicycle routes, reflecting Athens' commitment to enhancing urban mobility and safety.
- Valencia focuses on scenario testing and simulations to gain valuable insights into the impact of proposed interventions on road user behaviour, mode selection, induced demand, and safety outcomes. With its challenges of 400-500 crashes involving cyclists annually, the city aims to test the effectiveness of different policies and interventions in promoting road safety through the PHOEBE framework.
- West Midlands focuses on scenario testing and simulations to understand the impact of proposed transport interventions (including new cycling facilities and highway and junction remodelling) on road user behaviour, mode selection, and safety outcomes. The aim is to encourage active travel, enhance safety for cyclists and pedestrians, and improve overall transportation efficiency in the region.

The deliverable also presents the different sections of the PHOEBE Dashboard and what users can get from each of them, as well as how they lead to further information.

Key terms
Dashboard, usability, accessibility, user-friendly

1 Introduction

1.1 Overview

The PHOEBE project developed an integrated, dynamic, and human-centred predictive safety assessment framework capable of supporting safer and more sustainable urban mobility systems. The framework combines traffic simulation, road safety assessment, behavioural modelling, mode choice analysis, induced demand modelling, and emerging mobility datasets into a unified analytical environment capable of evaluating future mobility scenarios and their impacts on urban road safety.

Unlike conventional safety assessment approaches, which often rely on historical crash data and static evaluations, PHOEBE adopts a prospective and scenario-based methodology that allows authorities and practitioners to estimate the potential impacts of transport interventions before their implementation. This approach enables the assessment of changes associated with infrastructure modifications, speed management measures, behavioural adaptation, modal shifts, and emerging mobility patterns within a controlled simulation environment.

The PHOEBE framework places particular emphasis on vulnerable road users (VRUs), including pedestrians, cyclists, and micromobility users, whose interactions within increasingly complex urban transport systems require more advanced and behaviourally informed safety assessment methodologies. Through the integration of simulation, behavioural analysis, and dynamic risk assessment, the framework supports a more holistic understanding of how transport systems, infrastructure conditions, and user behaviours interact to influence safety outcomes.

The framework has been developed and tested across three pilot use cases: Athens (Greece), Valencia (Spain), and the West Midlands (United Kingdom), representing diverse urban mobility conditions, behavioural patterns, and policy priorities. These use cases provide the operational and analytical foundation for evaluating the applicability, scalability, and transferability of the PHOEBE framework across different European urban contexts.

Within this context, Work Package 5 (WP5) focuses on the integration, operationalisation, and transferability of the PHOEBE framework. Building upon the modelling environments and analytical methodologies developed in previous work packages, WP5 aims to transform the PHOEBE framework into a deployable and user-oriented decision-support ecosystem capable of supporting evidence-based urban mobility and road safety planning.

1.2 Role of D5.2 within WP5

This deliverable represents the operational implementation phase of Work Package 5 (WP5) within the PHOEBE project. While previous deliverables focused on the development and consolidation of the PHOEBE methodological framework, D5.2 shifts the focus towards deployment, usability, and practical implementation.

The role of D5.2 is to transform the integrated modelling environment developed throughout the project into a user-oriented decision-support ecosystem capable of supporting urban road safety assessment, scenario testing, and policy evaluation. In this context, the deliverable acts as the bridge between the scientific and technical developments of PHOEBE and their practical application by transport authorities, planners, and stakeholders.

Particular emphasis is placed on the operationalisation of the framework through interactive visualisation environments, scenario-based workflows, interoperability between modelling components, and implementation guidance for future deployment in external urban contexts.

1.3 Objectives of the deliverable

The main objective of D5.2 is to support the practical deployment and operational use of the PHOEBE predictive safety framework.

More specifically, the deliverable aims to:

- develop the operational structure required for implementing the PHOEBE framework
- explore users' needs and how they shaped the user interface
- define the functionalities and structure of the user interface
- support the visualisation and interpretation of predictive safety outputs through decision-support tools
- demonstrate the operational application of the framework across the PHOEBE use cases
- provide guidance regarding transferability, scalability, and future implementation in other urban environments.

1.4 Relationship with D5.1 and previous work packages

D5.2 builds directly upon the outcomes of previous PHOEBE work packages and particularly on Deliverable D5.1, which consolidated the methodological framework, modelling structure, and integration logic of the PHOEBE system.

The data harmonisation procedures developed in WP2, the behavioural, simulation, and risk assessment models developed in WP3, and the implementation of the three pilot use cases in WP4 provide the operational and analytical foundation upon which D5.2 is developed.

While D5.1 focused primarily on framework consolidation, integration methodologies, and technical workflows, D5.2 focuses on the practical implementation of these components through user-oriented interfaces, deployment environments, and operational decision-support functionalities.

In this sense, D5.2 represents the final operational layer of the PHOEBE framework, translating complex modelling outputs into accessible tools and implementation workflows suitable for authorities, planners, and practitioners.

2 The PHOEBE User Interface

2.1 User Interface - The PHOEBE Dashboard

The final step of the PHOEBE project is the user interface. The user interface should work as the “front door” for users to access the PHOEBE framework and its components. Following the work done during the project and the pilots’ experience, the questions that guided the development of a user interface for PHOEBE were: why such an interface, who would use it, and why would they use it.

Considering feasibility, usability, and accessibility, the user interface was conceived using the work and examples of the PHOEBE pilots in Athens, Valencia, and the West Midlands, and the principles developed for the framework's transferability and replicability. The result is the PHOEBE Dashboard, where the different users can navigate through quick explanations of the PHOEBE framework and its components, the replication protocols, the Decision Support Tool and the intervention explorer. In the Decision Support Tool, users can explore the values, characteristics and interventions coming from the three pilots, to understand the possible results in other comparable contexts.

PHOEBE target users cover many different stakeholders working on and with road safety. The main stakeholders include researchers, road safety specialists, city planners, transport authorities, policymakers and decision makers. The PHOEBE Dashboard provides these groups with an easy and accessible way to understand how the PHOEBE framework can support them. It will provide users with a quick snapshot of the possibilities for using the PHOEBE framework for road safety interventions. The Dashboard will then guide them to access additional information and materials on implementing the PHOEBE framework, including technical and human requirements, the different components and how to use one or more of them, and the specifics of the PHOEBE pilots.

The PHOEBE Dashboard will support decision-making by allowing city authorities to evaluate various interventions and compare scenarios before implementing them. This capability is crucial in ensuring that decisions are well-informed and effective. The Dashboard will also foster stakeholder engagement by facilitating communication between transport planners, safety experts, and local authorities and instigating further scientific support and collaborations. Lastly, the PHOEBE Dashboard facilitates transferability by packaging the PHOEBE framework into a tool that is accessible beyond the project's technical core team. This broadens the framework's usability and allows more stakeholders to benefit from its insights. Those are key points of the PHOEBE exploitation and legacy, making the project outcomes accessible beyond its timeline.

For city planners and transport authorities, the PHOEBE Dashboard can support in choosing or supporting mobility interventions decisions. It will help them comprehend the safety implications of these interventions before they are implemented, or communicate these decisions effectively to the public and other stakeholders. The interface allows visualisation of different scenarios, enabling authorities to compare outcomes based on varying datasets and assumptions.

Furthermore, policymakers and decision makers can use the PHOEBE Dashboard to defend their policy choices with substantial evidence. They can evaluate the cost-benefit outcomes of different initiatives, ensuring that resources are allocated efficiently. The interface allows them to assess how well these decisions align with local and national safety targets and policies, promoting coherence in transportation policy.

For road safety specialists, the PHOEBE Dashboard will enable them to interpret estimates of Fatal and Serious Injuries (FSI) and track changes in iRAP star ratings. It will enable the comparison of various behavioural model scenarios, facilitating a deeper understanding of potential outcomes. Ultimately, it can serve as a tool for validating simulation results, ensuring that the data aligns with real-world conditions.

The PHOEBE Dashboard will work as a simple, easy-to-reach access to what the PHOEBE framework can offer. From the guiding questions, the development process also included a better understanding of users' needs and requirements when it comes to their road safety approaches. This was an important step to reflect on the usability and applicability of the user interface and how it is correlated to the intricacy of the PHOEBE framework. The assumption is that if a user cannot, or does not, want to fully engage in using the PHOEBE framework, for whatever reason, the PHOEBE Dashboard still allows them to explore PHOEBE outcomes. This creates a great opportunity for the project's legacy and for overall development in road safety research and practice. For the PHOEBE partners, it creates a great additional channel for dissemination and engagement with stakeholders beyond the project end.

2.2 User-Centred Design and Stakeholders' Needs

To ensure the usability of the PHOEBE Dashboard and the applicability of the PHOEBE framework, it was crucial to assess stakeholders’ needs. For that, the project primarily utilised the PHOEBE Community of Practice (CoP) and focus groups. Additionally, it engaged in specific interactions with other EU projects and institutions through the partners' networks.

From a local-level perspective, looking at professionals working within and for cities and regions, POLIS conducted several focus groups to discuss and develop an overview of the decision-making process, the capacities and limitations, and the role of data in road safety interventions and plans. These focus groups took place in the second semester of 2025 and aimed to better understand the feasibility, usability, and applicability of the PHOEBE framework within local authority settings.

The recruitment of these focus groups relied on the extensive contacts of the POLIS Safety & Security and Active Travel & Health Working Groups, as well as those with local and regional authorities and other institutions across Europe. During the work carried out under **Task 1.1 – SoA and end user needs review,** POLIS also conducted several focus groups that helped inform the development of this second round of focus groups, as well as the composition of the overview of requirements and needs at the local level.

The PHOEBE CoP, established at the beginning of the project, also played a crucial role in fostering a comprehensive understanding of stakeholder needs. The CoP was composed of a variety of professionals working on road safety, from research to companies and local authorities. During the different meetings, both in person and online, PHOEBE partners could present different aspects and stages of the project work for inputs and exchanges. These interactions helped the project refine specific aspects of its work and present the initial mock-up of the PHOEBE Dashboard, as well as the exploitation of this and other outcomes.

Within the focus groups and the CoP, the questions guiding these interactions were: *Who would use the interface? Why would someone use it? And what could they get out of it?*

While the CoP meetings followed an agenda, they were marked by the informal exchanges and discussions that naturally arose during these gatherings. The input and feedback from the different participants were valuable for the PHOEBE process. The focus groups followed a more formal structure to facilitate the collection and assessment of information. Aside from the overarching questions, specific questions such as *how intervention sites are chosen, how the decision-making process works in your organisation, what the role of data is in these decisions, and how your organisation can improve its way of working in road safety* were part of the discussions.

Within local authorities, the decision on where to intervene can follow very complex or even arbitrary processes. Structured processes vary widely from city to city, but even in cities with well-established processes, the prioritisation of interventions can be influenced by unstructured factors, such as media attention and public pressure. Organisations assess various factors to determine where to take action on safety. They can usually analyse crash data to identify dangerous hot spots (how many crashes there were and how serious they were) and create a list of them. The frequency of severe crashes is also considered.

Nevertheless, this needs to be balanced against community complaints, specific severe crashes, and political pressure, while factoring in funding constraints. For example, politics sometimes speeds up decisions after major crashes, due to public pressure. Most of the local authorities heard during the focus groups try to balance data, community input, and available funding when choosing road safety intervention locations.

Once the locations are chosen, whether through structured processes or political and public pressure, many cities assess factors such as speeding, traffic volumes, crash history, and adherence to safety guidelines to determine the best measures to implement. These measures sometimes are temporary or need to be fast to address specific issues, and at times, they might conflict with long-term mobility goals. The addressed cities discussed redesigning a busy avenue to accommodate cyclists and pedestrians due to safety complaints, introducing pedestrian overpasses and barriers on a highway-type road, temporarily reducing speeds, and taking other protective actions. The ad-hoc, or pressure for immediate solutions, adds more uncertainties to these processes and could lead to less effective long-term positive outcomes.

All cities acknowledge that data is crucial for enhancing road safety. However, not all cities have the same access to data, and data is not complete or easy to use. While some cities have full dashboards and models, others struggle with a lack of human capacity and budget to handle data. Unconnected data systems are a common issue for local authorities, where crash data and road design data reside in separate systems.

When discussing how their organisations could improve their approach to road safety, participants noted that enhancing road safety requires aligning safety measures with broader city goals, such as sustainability, environmental protection, and public health. They also talked about the importance of improved collaboration among different departments to ensure consistent decision-making rather than fragmented approaches. Increasing staffing levels and reducing workloads could also allow teams to adopt a more proactive rather than reactive approach to road safety.

Moreover, participants noted that a proactive mindset is necessary, putting focus on preventing crashes. This requires stronger political support, as bold decisions, such as removing parking or lowering speed limits, may be needed even in the face of strong opposition. Additionally, there is a need for better tools to connect and manage data effectively, including creating more cohesive data systems and providing easier-to-use tools that more personnel are trained to use. It was also mentioned that greater awareness is needed to acknowledge that neglecting road safety results in lost lives. Ultimately, all participants also appreciated the project and encouraged more research and support to help cities move toward Vision Zero.

Most of these views were also shared during the CoP interactions. These helped the project to shape its goals and make the PHOEBE Dashboard an accessible and easy-to-use platform. The different stakeholders' interactions refined the aim of the PHOEBE Dashboard, and ultimately of the PHOEBE framework, to facilitate the usually complex and uncertain dynamics of decision-making processes that happen on the ground. The PHOEBE Dashboard is a direct response to stakeholders' needs by favouring a simple interface that guides users to more complex information if needed.

2.3 The PHOEBE Dashboard Structure and Functionalities

The transition from the PHOEBE methodological framework to an operational implementation environment represents a critical step towards the practical application of predictive road safety assessment in urban mobility systems. To facilitate knowledge transfer and framework uptake beyond the consortium, the project developed an intuitive and interactive dashboard that consolidates the framework methodology, replication guidance, analytical tools, and intervention results into a single access point.

The PHOEBE dashboard is an interactive Power BI-based decision-support and knowledge-transfer tool designed to support the exploration, replication, and practical application of the PHOEBE road safety framework. It serves both as a communication platform for non-technical stakeholders and as an implementation support tool for practitioners interested in applying the framework in their own urban contexts. The dashboard provides access to key project outputs, methodological guidance, replication protocols, and decision-support functionalities through a user-friendly interface.

The dashboard is organised into four main sections: PHOEBE Framework, Replication Protocols, Decision Support Tool, and Interventions Explorer. Navigation between sections is provided through a dedicated menu, allowing users to move between conceptual, methodological, and operational content seamlessly.

2.3.1 PHOEBE Framework Explorer

The PHOEBE Framework section introduces the overall methodological structure of the framework and presents its main analytical components. This section allows users to explore the framework components, including Human Behaviour Modelling, Mode Shift and Induced Demand Modelling, Risk Assessment, Socioeconomic Analysis, and Traffic Simulation. The selected component is accompanied by an explanatory text, helping users understand the purpose, role, and analytical contribution of each module within the wider PHOEBE approach. *Figure 1* presents what users can see in the dashboard.

The component is illustrated in the example. When users click on the other framework elements, the explanatory text automatically updates to reflect the selected component. A direct link to Deliverable 1.2 is also provided for users seeking more detailed information.

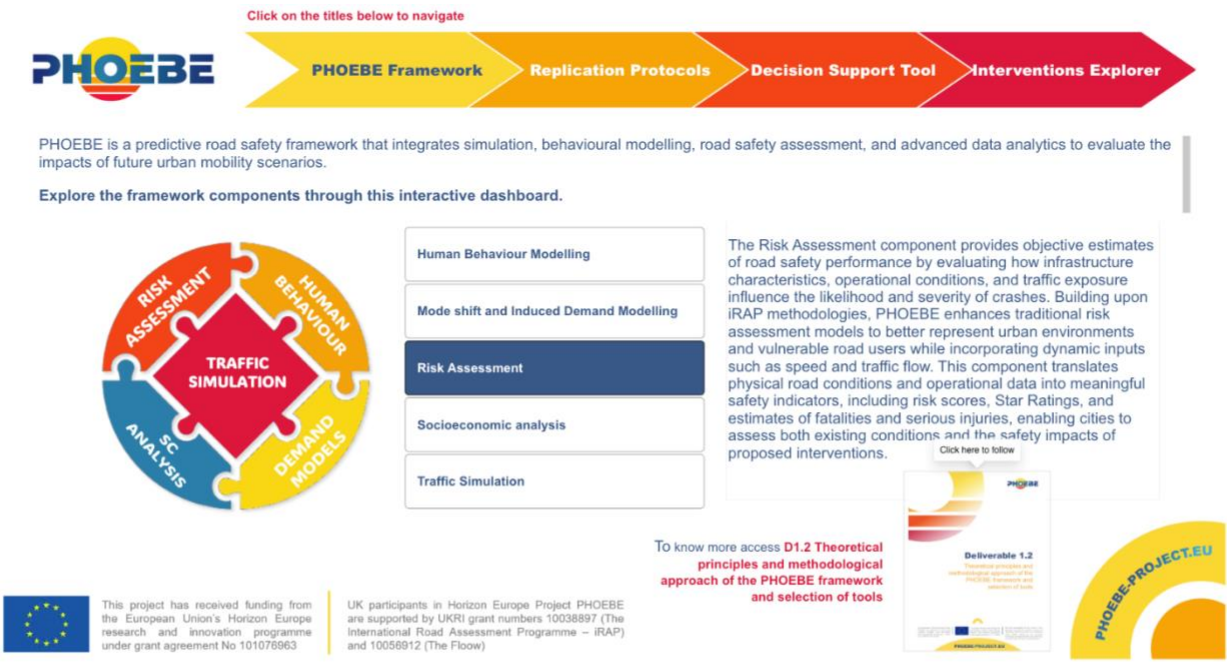

Figure 1 - PHOEBE Dashboard - User interaction with the framework

2.3.2 Replication Protocols Section

The Replication Protocols section provides access to the PHOEBE Framework replication materials and explains how the framework can be adapted and applied across different urban contexts. The dashboard presents the PHOEBE Framework flowchart, illustrating its three-stage process: baseline assessment, scenario evaluation, and socioeconomic analysis.

This section also offers direct access to the replication protocols, which provide comprehensive guidance on the development and integration of framework components, methodologies for calculating PHOEBE Key Performance Indicators (KPIs), and the skills, expertise, data requirements, and resources needed for effective implementation and replication.

Figure 2 presents the structure and visual organisation of the Replication Protocols section.

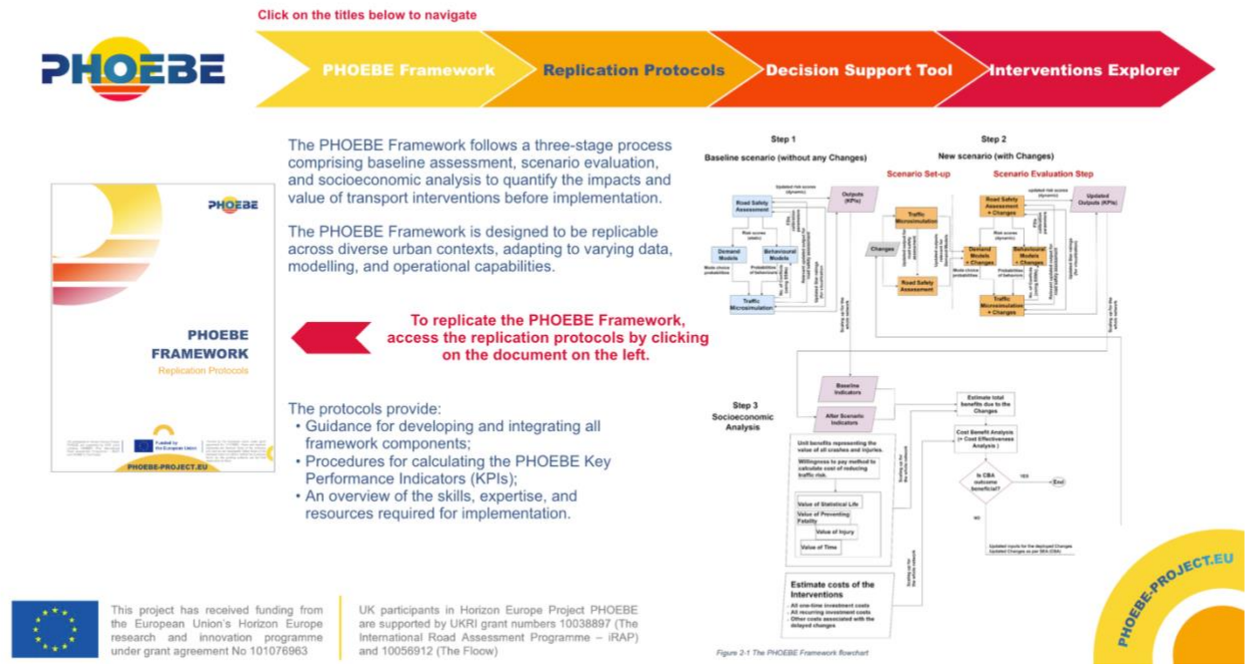

Figure 2 - PHOEBE Dashboard - Replication protocols

2.3.3 Decision Support Tool

In addition to developing implementation guidelines that support the consistent and replicable application of the PHOEBE Framework, the project has established a transferable methodology for extrapolating the results of the demonstration use cases to other cities and contexts. As described in *Deliverable D5.1*, a suite of statistical methods was developed to enable robust comparisons between baseline and intervention scenarios. In particular, paired t-tests were applied to compare Fatal and Serious Injuries (FSI) estimated through the iRAP safety models, alongside operational indicators derived from traffic simulation outputs. These analyses enabled the calculation of Impact Modification Factors (IMFs), which quantify the safety effects of the interventions evaluated within the PHOEBE pilots.

The resulting IMFs provide a practical evidence base that can be used by other cities to estimate the potential safety benefits of similar interventions, even where detailed local modelling or extensive datasets are not yet available. By translating pilot results into transferable impact estimates, this approach enhances the scalability, applicability, and policy relevance of the PHOEBE Framework.

To facilitate the exploration of these results, the Decision Support Tool allows users to analyse intervention impacts through a set of interactive filters and performance indicators. The interface includes filters for Intervention, Use Case, Indicator, Road User, and Road Type, enabling users to customise the analysis according to the specific scenario and assessment objectives.

The tool presents key analytical outputs, including the Impact Modification Factor (IMF), Baseline Value, Scenario Value, 95% Confidence Interval Upper Bound, and p-value. These indicators support the comparison of baseline and intervention conditions and provide a structured and statistically reliable basis for interpreting the expected impact of different measures on road safety performance.

By enabling users to explore the effects of interventions across different contexts, road user groups, and infrastructure types, the tool supports evidence-based decision-making and facilitates the transfer of knowledge generated through the PHOEBE demonstrations to new environments. *Figure 3* presents the filters available in the dashboard.

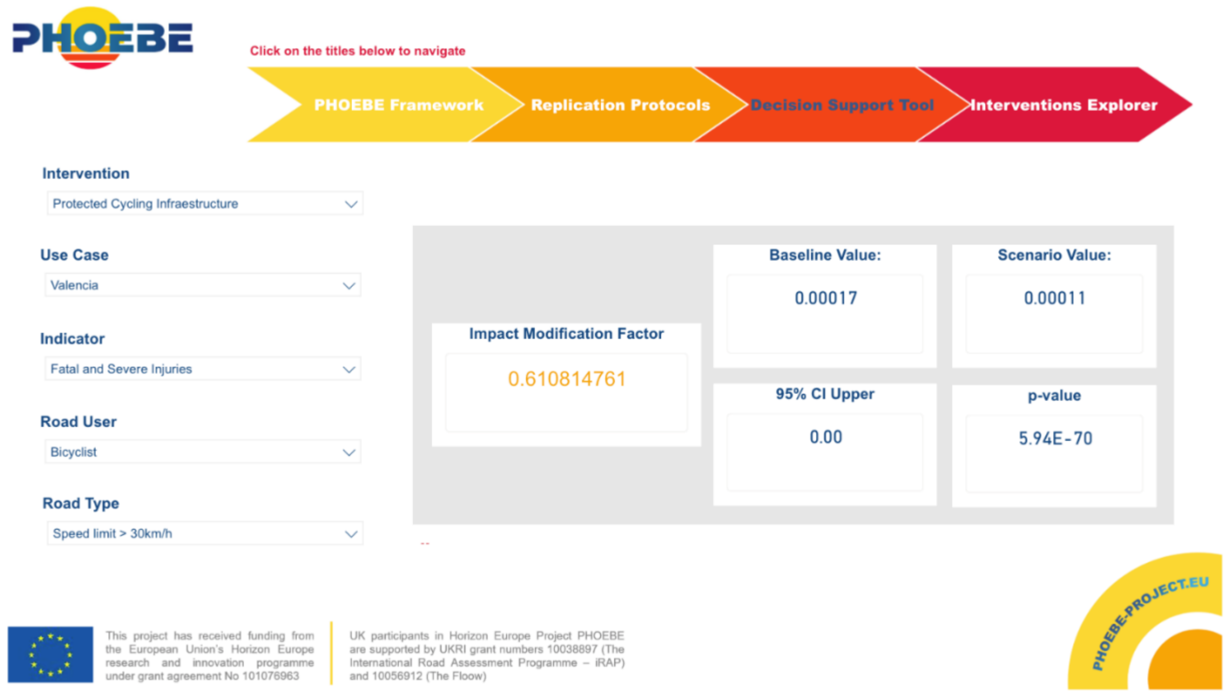

Figure 3 - PHOEBE Dashboard - Decision Support Tool

2.3.4 Interventions Explorer

The Interventions Explorer provides a user-friendly interface to review the interventions assessed within the PHOEBE use cases. The section includes filters for **Use Case,** allowing users to select among the PHOEBE pilots in *West Midlands*, *Valencia*, & *Athens*, and **Intervention**, with the interventions list, *Micromobility Demand Growth*, *Road Space Reallocation*, *Protected Cycling Infrastructure Upgrade*, *Speed Management Measures* & *Speed Limit Reduction*.

For each selected intervention, the dashboard presents a descriptive text explaining the scenario and its expected relevance, as well as a map visual linked to the selected use case, supporting the geographical contextualisation of the intervention. Users can also directly access Deliverable 4.1, where more information on the intervention description is available.

By clicking on the Use Case logos, users can access the corresponding use case descriptions available on the PHOEBE project website. The website can also be accessed directly through the link displayed in the bottom-right corner of each dashboard page, providing users with additional information on the demonstration sites, interventions, and project outcomes.

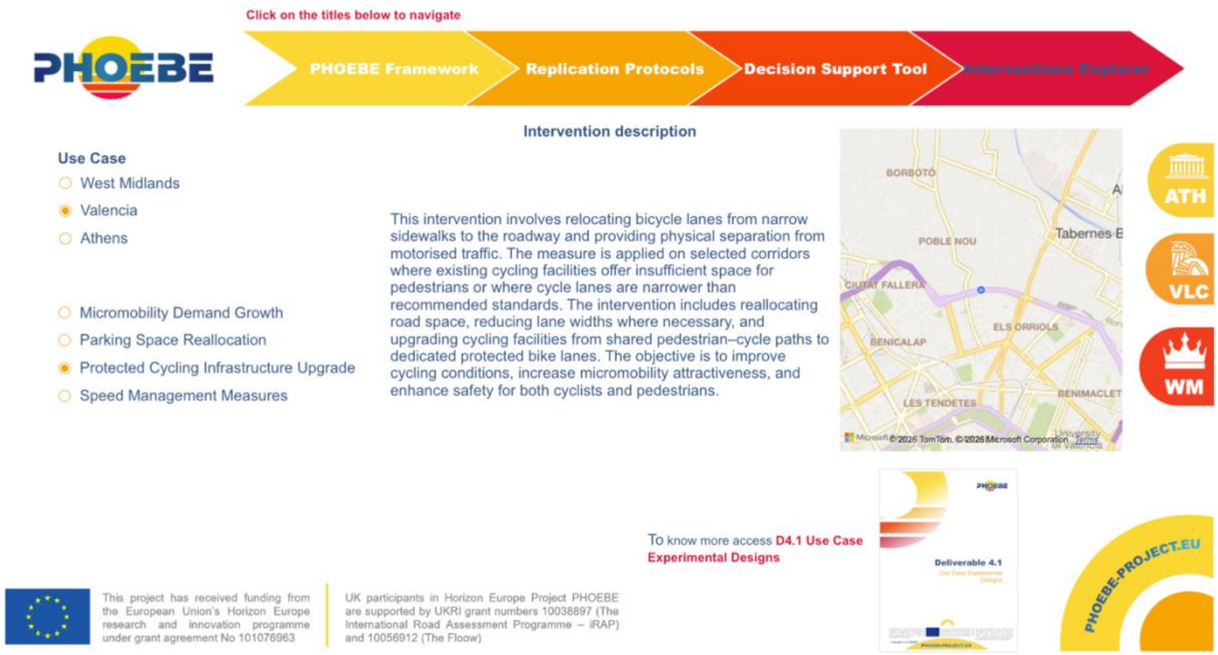

Figure 4 - PHOEBE Dashboard - Interventions Explorer

Phoebe dashboard are available at the link https://phoebe-project.eu/phoebe-dashboard/

3 Examples from PHOEBE Use Cases

3.1 Athens use case deployment

3.1.1 Scenario Descriptions

The City of Athens (population 664,000, within the wider Attica region of 3.75 million) faces a pedestrian road safety challenge typical of dense southern-European city centres, where passenger cars account for 69% of the regional vehicle fleet and motorcycles and mopeds for a further 24%. To address this, the PHOEBE framework was applied to assess the impact of three major interventions already implemented by the city:

- a network-wide 30 km/h speed limit enforced through measures ranging from signage to police presence, radars and speed cameras
- an extensive network of bicycle routes integrated within the existing road system, combining mixed-traffic sections, bike/bus lanes, and bike lanes on road shoulders
- and the broader promotion of public transport use.

These interventions were concentrated in central corridors, including Panepistimiou Street (fewer traffic lanes, wider sidewalks, a new dedicated bus lane), Syntagma Square (wider sidewalks and reorganised bus/taxi space), Vasilissis Olgas Avenue (closed to motor vehicles, pedestrians and cyclists only) and Ermou Street (motorcycle parking management). The deployment evaluated three scenarios,

- a pre-intervention baseline (Scenario 0),
- conditions after the interventions were implemented (Scenario 1),
- and the same post-intervention network combined with the 30 km/h speed limit (Scenario 2), with 10 replications simulated per scenario to ensure robustness.

3.1.2 Decision-support outputs

The evaluation combined an Aimsun Next microsimulation of a roughly 3 km² area of central Athens (47 km of road network, five user classes, private cars, trucks, buses, taxis and pedestrians, simulated over the 08:00-09:00 morning peak) with video-based monitoring of pedestrians. To capture safety-critical interactions realistically, the simulation dynamically modelled non-compliant behaviours, vehicle speeding and pedestrian red-light violations triggered through an API using observed, demographically-informed inputs. The baseline model was calibrated against 19 traffic-camera detectors from the Athens Traffic Management Centre, achieving 85.2% of GEH values below 5 (100% below 10) and an R^2 of 0.98. The post-intervention model, calibrated against 6 detectors, achieved 85% of GEH values below 5 (100% below 10) and an R^2 of 0.99, confirming an excellent fit in both cases.

The results showed that high traffic volumes and the redesigned infrastructure reduced vehicle speeding, while pedestrian red-light violations became more likely precisely under low-traffic, time-pressured conditions, with a logistic model identifying wide crossing width and high traffic as protective factors, and being in a rush or having a history of red-light violations as risk factors. At the mode-shift level, the interventions were associated with a decrease in private car and motorcycle use and an increase in public transport, walking and micromobility, indicating a shift towards more sustainable, people-oriented mobility alongside the observed safety improvements.

3.2 Valencia use case deployment

3.2.1 Scenario descriptions

Valencia faced a significant road safety challenge, recording approximately 400 to 500 crashes involving cyclists annually. To address this issue and promote active travel safely, the city utilised the PHOEBE framework to test the effectiveness of different policies and interventions. The deployment focused on evaluating four specific intervention scenarios to gain valuable insights into their impact on road user behaviour, mode selection, induced demand, and overall safety outcomes.

3.2.2 Decision-support outputs

To accurately capture the complexities of urban traffic, the project utilised the Aimsun Next traffic simulation environment. The simulations were executed for 14 hours a day (from 5:00 to 19:00), covering the most critical and highly trafficked periods, with four replications performed for each of the four scenarios to ensure statistical robustness. Through this integrated approach, the framework generated highly specific decision-support metrics that revealed critical trade-offs between different urban policies. For example, while introducing variable speed limits by lane (Scenario 2) resulted in a massive 96% reduction in safety risk for cars and motorcycles, and adding a central parking lane (Scenario 4) reduced overall Fatal and Serious Injuries (FSI) by 5%, these interventions inadvertently deteriorated pedestrian safety ratings by up to 18% and drastically increased pedestrian crossing risks. Similarly, the simulations showed that actively increasing micromobility usage without adding new physical protection (Scenario 3) could lead to a severe 16% increase in FSIs. Despite these safety complexities, the behavioural models successfully demonstrated strong mode-shift potential, predicting up to a 96.4% increase in cycling kilometres, a 25.7% overall increase in non-motorised travel, and a simultaneous 21.9% decrease in car usage under the right policy conditions. By translating these complex temporal and spatial simulations into such actionable, quantitative metrics, the outputs deliver concrete, data-driven evidence that empowers Valencia's local authorities to holistically evaluate the exact trade-offs between traffic efficiency, mode shift, and vulnerable road user safety, ensuring that future infrastructure investments effectively guide the city towards its Vision Zero objectives.

3.3 West Midlands use case deployment

3.3.1 Speed Limit Reduction

3.3.1.1 Scenario descriptions

At the start of the project, there were 27 roads where the speed limit was set to 40 mph, many of which pass through residential areas. TfWM sought to make these roads safer and encourage active travel by reducing the speed limit to 30 mph. PHOEBE provided a methodology for predicting the impact of this policy change in terms of both the improvement to road safety and the resulting mode shift.

3.3.1.2 Decision-support outputs

The project was able to evaluate the traffic and road risk implications of a change to the speed limit by studying the 40 mph roads within the microsimulation model region. Some of these roads, such as the A45, were subject to iRAP surveys, which allowed for the calculation of the current level of risk. The project studied the extent to which there is a proportional change in journeys per mode, the change in delay parameters for motor vehicles, and the difference between the speed limit and the 85th percentile speed for motor vehicles.

The results of the framework suggest that there could be as much as a fifty per cent increase in the number of journeys made by foot, driven mostly by changes made by older people (> 40 years old). However, the simulations also predict that the number of journeys made by car stays about the same because the initial number of car trips dwarfs the number of journeys made on foot.

The change in the speed limit led to an expected 45% reduction in the number of FSI incidents along the routes, with an average improvement of 24% between junctions. However, the analysis suggests that there could be an increase in the overall risk on adjacent roads as a result of an increase in traffic through those routes. This effect should be the subject of subsequent studies to understand the extent to which drivers reroute their journeys after the implementation of speed limit changes. If such rerouting does take place, in significant numbers, it could mean that more trips are being made on roads that are intrinsically riskier than the roads that previously operated under a higher speed limit. If realised, this effect could lead to an increase in FSI when an extended area is considered.

3.3.2 Incorporation of new cycle infrastructure

3.3.2.1 Scenario descriptions

TfWM aims to simultaneously increase the number of journeys made by active travel and also reduce the number of people who are involved in FSI incidents. In recent years, dedicated cycle lanes have been constructed that aim to improve both the perception of safety and the actual safety of key routes. These cycle lanes are physically segregated from the carriageway of the highway, which is a departure from the previous approach of having a designated, narrow lane within the carriageway itself. PHOEBE set out to understand how safe these new carriageways are and whether they will create a mode shift towards cycling.

3.3.2.2 Decision-support outputs

These experiments made use of both iRAP and CycleRAP surveys. The CycleRAP results are of particular interest, as these indicate a two-thirds reduction in FSI along an important arterial road, the A38. There is no significant reduction in the volume of motorised journeys along the route. However, the addition of the cycle lane led to a significant increase in the total number of trips made by bike across the region by a factor of 3 to 4 and a modest increase in the number of journeys made on foot.

These results can be easily deployed to support decision making by the local authorities working towards the strategic vision of the combined authority.

4 Transferability, Scalability and Replication Framework

4.1 Transferability of the PHOEBE Framework

The PHOEBE Framework was designed as a transferable methodology that can be applied across a wide range of urban environments, regardless of local governance structures, data availability, modelling tools, or intervention priorities. Its transferability is supported by a modular architecture that integrates behavioural modelling, traffic simulation, road safety assessment, and impact evaluation through standardised data flows and performance indicators. The framework was successfully demonstrated across three distinct urban contexts, West Midlands (UK), Athens (GR), and Valencia (ES), confirming that its core components can be connected and applied consistently while accommodating local conditions and policy objectives.

The transferability of the PHOEBE findings relates to the extent to which the project's methodological framework and behavioural modelling approach can be applied in other locations, rather than expecting identical empirical results. Because road-user behaviour is strongly influenced by local infrastructure, traffic conditions, regulations, enforcement practices, and cultural norms, transferability must be assessed carefully rather than assumed.

PHOEBE examined speeding behaviour in three diverse urban contexts, West Midlands (UK), Athens (GR), and Valencia (ES), using a common methodology based on Stated Preference Surveys and Random Parameters Ordered Probit (RPOP) models. This demonstrates that the data collection and modelling framework can be successfully applied across different settings, although behavioural outcomes vary according to local context.

The results indicate that some factors show relatively high transferability. Road infrastructure characteristics, such as the presence of physical medians, and traffic conditions, such as higher traffic density, were consistently associated with lower self-reported speeding in both the West Midlands and Athens. These findings suggest that infrastructure-related measures can promote safer driving across different environments, even if the magnitude of their effects differs.

In contrast, enforcement-related measures and posted speed limits exhibited lower transferability. Driver responses to speed cameras, visible enforcement, and speed limits varied substantially between locations and were heavily influenced by demographic characteristics, driving experience, cultural attitudes, and perceptions of legitimacy. For example, older drivers in Athens were more responsive to enforcement, while in Valencia, behavioural responses were more heterogeneous and dependent on individual attitudes toward traffic rules.

Overall, the findings suggest that infrastructure and traffic characteristics can be transferred more readily across contexts, whereas behavioural responses to enforcement measures are highly context-dependent. As a consequence, transferring results between cities or countries requires careful consideration of local behavioural, cultural, and regulatory conditions. While a full transferability assessment would require validation in additional locations beyond the PHOEBE use cases, the project demonstrates that its methodological approach is reliable and adaptable across diverse urban contexts.

More on transferability is available in *Deliverable 5.1.*

4.2 Adaptability to different urban contexts

One of the principal strengths of the PHOEBE Framework is its adaptability to different urban environments. Throughout the project, the methodology was tested in cities with substantially different transport systems, governance arrangements, data ecosystems, and mobility challenges.

The framework achieves adaptability through the separation of methodological principles from implementation tools. The process remains consistent (selection of interventions, simulation of impacts, safety evaluation, and extrapolation of results), while allowing individual cities to select the data sources, modelling tools, and governance approaches that best fit their needs. This flexibility enables application in cities with advanced digital infrastructures as well as in locations where only limited data resources are available.

A key feature that supports the transferability and scalability of the PHOEBE Framework is its modular design. Although the framework was conceived as an integrated methodology, it does not require all components to be implemented simultaneously. Instead, cities can adopt only the components that align with their available data, technical resources, analytical capabilities, and policy objectives. The framework was intentionally designed to allow varying levels of complexity while maintaining methodological consistency.

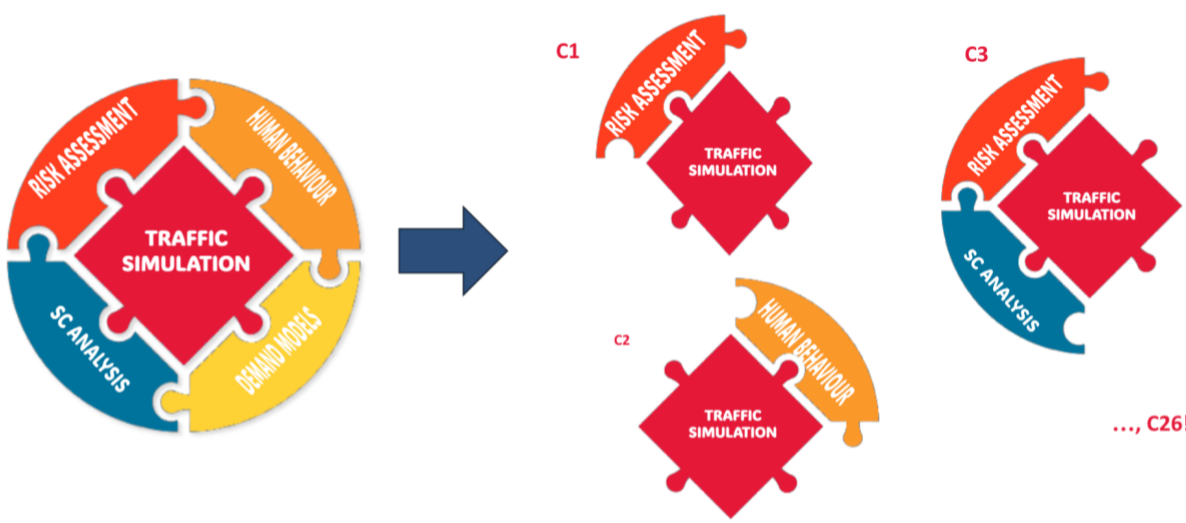

Figure 5 - PHOEBE Framework modular design.

At the most basic level, cities can implement a combination of traffic simulation and road safety assessment without requiring the full PHOEBE framework. In this configuration, traffic simulation models are used to estimate the operational performance of future scenarios before interventions are implemented. Key outputs such as operating speeds and traffic volumes can then be transferred directly into the enhanced iRAP Star Rating and FSI Estimation models. This enables cities to proactively estimate the road safety impacts of proposed interventions under future operating conditions, rather than relying on post-implementation crash data to assess effectiveness. The approach therefore supports predictive safety assessment, allowing road safety outcomes to be considered alongside operational and mobility objectives during the planning stage.

By combining simulation outputs with risk assessment models, decision-makers can evaluate trade-offs between safety, traffic efficiency, and environmental performance indicators when comparing alternative interventions. As seen in the PHOEBE use case testings, a scheme that improves safety outcomes can have impacts on delays and travel time (Please refer to Deliverable 4.2 for more information).

This implementation pathway is highly transferable because both components are founded on globally applicable methodologies. As a result, cities can apply this combination of models using locally available data and modelling platforms while maintaining a consistent and evidence-based approach to forecasting the safety impacts of future interventions. Consequently, even without integrating all PHOEBE components, this modular application already provides a practical and transferable framework that can be adopted in virtually any urban context.

More advanced implementations may incorporate behavioural and mode-choice models to estimate changes in travel behaviour resulting from proposed interventions, including modal shifts, induced demand, route choice changes, and user adaptation effects. These outputs can subsequently be linked to both the transport simulation and road safety assessment components, providing a more realistic representation of how travellers respond to policy measures and infrastructure changes. By accounting for these behavioural dynamics, cities can move beyond evaluating the direct effects of an intervention and begin assessing the broader network-wide consequences on mobility, exposure, and safety.

Unlike the infrastructure-based risk assessment models, behavioural models are highly context-dependent and must be calibrated to local conditions, travel patterns, socio-economic characteristics, and mobility preferences. Their development, therefore, requires city-specific datasets and analytical expertise to ensure that the behavioural responses represented by the models reflect local realities. Obtaining and preparing the necessary data often represents one of the greatest challenges for implementation, particularly in cities with limited data collection programmes or modelling capabilities. More on the requirements of these models can be found in the PHOEBE Protocols available in Deliverable 5.1.

The PHOEBE Framework does not seek to provide a one-size-fits-all behavioural model. Instead, it offers a structured methodology and implementation pathway that guides cities through the process of identifying data requirements, selecting appropriate modelling approaches, integrating outputs across different components, and translating behavioural changes into mobility and safety impacts. In this sense, the framework serves as a transferable blueprint that can accommodate locally developed behavioural models while ensuring consistency in how their outputs feed into transport simulations, road safety assessments, and ultimately the evaluation of intervention impacts.

The modular architecture, therefore, enables cities to increase the sophistication of their analyses over time progressively. A city may begin with a standalone infrastructure-based safety assessment, subsequently incorporate traffic simulation capabilities, and later integrate behavioural and socioeconomic models as data availability and technical expertise mature. This flexibility reduces implementation barriers and makes the PHOEBE Framework accessible to a broad range of urban contexts, from resource-constrained municipalities to cities with advanced digital planning.

4.3 Recommendations for future implementations

The PHOEBE demonstrations have shown that the framework can be successfully applied under different urban, institutional, and data contexts. However, future implementations should adopt a phased and pragmatic approach, recognising that cities differ significantly in their data availability, analytical capabilities, modelling expertise, and financial resources. Rather than attempting to deploy all framework components simultaneously, practitioners should begin with the components that can be supported by existing local resources and progressively expand the implementation as new data sources and capabilities become available. This incremental approach reduces implementation barriers while still allowing cities to benefit from predictive safety assessments and evidence-based decision making.

Future adopters should also prioritise the development of common data standards and data-sharing mechanisms between agencies responsible for transport planning, road infrastructure, safety management, and mobility services. One of the principal lessons from PHOEBE is that successful integration depends not only on modelling capabilities but also on efficient data exchange between different components of the framework.

Finally, future implementations should continue to exploit emerging data sources and technologies, including telematics, connected vehicle data, video analytics, trajectory extraction, and digital twins. These technologies offer significant opportunities to improve the calibration of behavioural, simulation, and safety models while reducing reliance on traditional data collection methods. As these data sources become increasingly available, the predictive capabilities of the PHOEBE Framework can be further strengthened, enhancing its ability to support proactive, data-driven, and safety-focused urban mobility planning. Ultimately, the framework should be viewed not as a fixed set of tools but as a flexible implementation roadmap that enables cities to progressively develop more sophisticated and integrated predictive safety assessment capabilities over time.

5 Practical Guidelines for Local Authorities and Decision Makers

5.1 Integration into urban mobility, road safety policies and vision zero strategies

The EU urban mobility landscape is being shaped by the building blocks of the New EU Urban Mobility Framework, where healthier and safer mobility that relies on walking, cycling and micromobility. More ambitious environmental goals and climate-neutral cities, along with a strengthened approach to Sustainable Urban Mobility Plans (SUMPs) and mobility management, are also central to this landscape.

PHOEBE is a direct response to this shift in the EU policy context, emerging as one of the projects advancing innovative solutions for road safety in the evermore complex urban mobility environment. Moreover, this shift also recognises that the green transition and climate neutrality cannot be achieved separately from road safety and Vision Zero. The PHOEBE framework delivers a blueprint that allows cities and road safety professionals to deliver better road safety solutions within these policies, which also consider social aspects such as behaviour, modal choices, environment and health benefits.

Aside from overarching EU policies, national policies, and strategies, SUMPs are the first step for cities to implement new holistic urban mobility. SUMPs are essential in anchoring the principles of sustainable mobility, and thus road safety, to the realities of cities, reinforcing the relevance of the PHOEBE framework's ability to offer valuable insights into the complexities and trade-offs associated with road safety interventions.

As SUMPs become mandatory for over 400 EU cities as part of the new TEN-T regulations and with the new SUMP guidelines just launched in June 2026, the PHOEBE Dashboard, and consequently the PHOEBE framework, present the opportunity to support professionals in different stages of the SUMP cycle and to advance in their implementation of safer roads and streets. This combination empowers cities to make informed decisions that balance mobility needs with safety concerns, ultimately contributing to a more sustainable urban future.

Road safety, safer streets and networks, safer walking and cycling, and the cross-cutting linkage of safety are present throughout the third edition of the SUMP guidelines. It also underlines the interconnectedness of safety with sustainable mobility, conveying the overarching message that mobility solutions must prioritise safety. The document outlines requirements for cities on actions and monitoring related to safety and provides various practical examples from across Europe.

PHOEBE can support professionals throughout the different stages of the SUMP cycle, ensuring that road safety is integral to the decision-making process for sustainable mobility and supporting the adoption of Safe System approaches at the local level. During stage 1. *Preparation & Analysis*, it can help by supporting the analysis of the mobility situation; during stage 2. *Strategy Development*, it can support the scenario creation and setting targets; during stage 3. *Measure Planning*, it can support measures decision-making; and during stage 4. *Implementation & Monitoring,* it can support by monitoring and adapting the interventions. The PHOEBE Dashboard becomes an ally for cities in planning their SUMPs as an easy-to-access platform.

Within the SUMP reference materials, many resonate with PHOEBE's goals, showing that the blueprint the project offers is aligned not only with high EU-level objectives, but also with the needs of cities. For all these guidance materials, PHOEBE offers a practical way to make informed decisions, facilitating often complex processes with a modular, structured approach.

On the topic guide on Linking transport and health in SUMPs, road safety, speed and the Safe System approach are presented as part of the core points relevant to health and transport. The guide reinforces the need for cities to create safer environments, particularly for walking and cycling, and argues that road safety measures that reduce risks at larger scales can have a greater impact on cities' overall health goals and represent more efficient use of resources.

As cycling gains momentum in EU policies, an updated topic guide has also been developed. The SUMP Reference Document on Cycling emphasise safety as a core principle for the uptake of cycling. The document provides a set of key recommendations for cities to ensure safe cycling, such as protecting infrastructure, lowering speeds, improving intersections and crossings and the overall adoption of the Safe System approach. As cities embark on the (re)design of streets and roads and the implementation of new infrastructure, the PHOEBE framework can help provide answers and better solutions across different contexts.

PHOEBE also aligns with the guidelines and offers support for decisions within other reference documents: Safe Use of Micromobility Devices in Urban Areas, Supporting and Encouraging Walking in Sustainable Urban Mobility Planning, UVAR AND SUMPS: Regulating vehicle access to cities as part of integrated mobility policies.

Whether with a quick overview of the PHOEBE framework, the Decision Support Tool, or even the Intervention Explorer, the PHOEBE Dashboard becomes another useful resource for cities developing, updating, or implementing their SUMP processes. Deliverable 5.1: Consolidated PHOEBE framework methodology, network-level demonstration results, and tools provide a good overview of how the PHOEBE framework is aligned with and responds to the EU and the pilots' national policies on road safety. This provides further reference for other cities to understand how the framework can support them.

5.2 User flow and how-to guide

The PHOEBE Dashboard will be the entry point for local authorities to explore the PHOEBE framework and support them in deciding, first, how much they want and are able to apply in their own context, and second, in accessing the necessary information once the initial decision is made.

PHOEBE Framework tab

Want to know what PHOEBE is?

The **PHOEBE Framework** tab presents what PHOEBE is, a predictive road safety framework that integrates simulation, behaviour modelling, road safety assessment and advanced data analytics to evaluate the impacts of future urban mobility scenarios. It also presents the framework's modular approach, where users can opt to use the combination of all or some of the components, according to their needs and capacity. Lastly, it presents a quick overview of each component: Human behaviour modelling, Mode shift and Induced demand modelling, Risk assessment, Socioeconomic analysis and Traffic simulation.

Do you want to know further details about the framework? You can check the following Deliverables:

D1.2 Theoretical principles and methodological approach of the PHOEBE framework and selection of tools

D3.2 Finalised models/simulation environments, methodology factsheets and user support materials

You want to explore the pilots' scenarios outputs? Want to know more about the pilots' interventions? Go to the Decision Support Tool tab for the PHOEBE framework application, and then check the Intervention Explorer tab to know more about the Athens, Valencia and West Midlands pilots.

Replication Protocols tab

Have experience with one or more components and want to know how they are integrated into PHOEBE? Want to know how to replicate them in other contexts? Want to know what is needed to implement the Framework?

The Replication Protocols tab presents the PHOEBE Framework flowchart with the three-stage process of baseline assessment, scenario evaluation and socioeconomic analysis. It also guides users to the detailed replication protocols document. The detailed protocols present guidance for developing and integrating all framework components, procedures for calculating the PHOEBE Key Performance Indicators, and lastly, the skills, expertise and resources for implementing the PHOEBE Framework.

Not ready to look into replication protocols or the necessary skills and resources? You can move to the next tab to see what outcomes are possible to get when using PHOEBE.

Decision Support Tool Tab

Want to explore the pilots' scenarios to see the outputs that the framework created? Want to see how it compares to similar scenarios in other contexts?

The Decision Support Tool tab is where you will be able to explore the outputs that the PHOEBE framework generated across the different pilot scenarios. It will also allow you to visualise and analyse the results, providing a clearer understanding of how the framework performs in diverse situations. Additionally, you can draw parallels to similar scenarios elsewhere, helping you to consider and envision the potential applications and outcomes in those contexts. No city is the same, but they are also not completely unrelated! The Decision Support Tool is a simple way to draw parallels and explore solutions.

Need to know more about the replication protocols and what goes behind them? Go back to the previous tab and check the document in detail!

Intervention Explorer Tab

Want to know more about the different interventions in Athens, Valencia and the West Midlands?

In the Intervention Explorer tab, you can learn more about each intervention assessed in Athens, Valencia and the West Midlands; from road space reallocation and speed reductions to increased micromobility demand and new cycling infrastructure. Once you have explored the details of an intervention, you can return to the Decision Support Tool tab to see how its outcomes might relate to your own context and needs, whether you are reviewing a decision already taken or preparing for one still to be made.

Are you convinced that the PHOEBE Framework can support you? Check the replication protocols and framework details again, and you will be able to apply them to your work and project. If you need further support, the PHOEBE partners can help!

Do you need to convince others of the benefits of PHOEBE? Invite them to check out the PHOEBE Dashboard for a quick overview of what is possible.

Is the PHOEBE Dashboard already useful for your current needs? Use and share it as much as you want. It is free and publicly available.

You can also check out the PHOEBE Library for all the deliverables and the PHOEBE Zenodo community for further documents and datasets.

6 Limitations and Future Developments

While the PHOEBE Dashboard serves as a gateway to the PHOEBE Framework, which has demonstrated its applicability across diverse urban contexts, it is crucial to recognise several limitations that may impact its broader implementation. One major concern involves current technical and operational hurdles that could impede its deployment in different urban settings. These encompass issues related to data interoperability, system compatibility, and the overall technological infrastructure required to support the framework. Additionally, there are challenges faced by local authorities, including capacity constraints and the overall scarcity of resources—spanning human expertise, technical support, and financial backing, which may affect their ability to fully leverage the PHOEBE framework's capabilities. Despite these limitations and challenges, potential future developments are anticipated. Efforts to improve resource allocation, enhance technical support, and streamline data processes could pave the way for more effective utilisation of the PHOEBE Framework in urban planning and management.

An important limitation relates to the complexity associated with integrating multiple modelling components. While the road safety assessment models can operate independently, the full PHOEBE methodology relies on the interaction between them. Developing and maintaining these connections requires technical expertise, computational resources, and coordination between multiple disciplines. For many cities, particularly those with limited modelling capacity, implementing the complete framework may represent a significant challenge.

Another important area for future development is the continued refinement of the links between operational transport models and safety assessment models. The PHOEBE demonstrations confirmed the feasibility of using simulation outputs such as traffic volumes and operating speeds to estimate future safety outcomes before interventions are implemented. Further advances could enable a broader range of simulation outputs, behavioural indicators, and network performance measures to be incorporated directly into risk estimation processes, improving the sensitivity and predictive capability of the framework.

Practically speaking, one of the main challenges for future implementations of the PHOEBE Framework is the need for specialised software licences, technical expertise, and computational resources to develop, calibrate, and maintain advanced transport simulation models. While these requirements may currently limit adoption in some cities, this barrier is expected to diminish as urban authorities continue their transition towards more digital planning environments. Increasing investments in integrated data platforms, cloud-based analytical tools, and urban digital twins are creating opportunities to streamline data collection, management, and model integration. By establishing interoperable digital ecosystems that connect transport, infrastructure, safety, environmental, and mobility datasets, cities can significantly reduce the effort required to support predictive assessment frameworks such as PHOEBE, which can be further developed to be operational in those environments. In the longer term, the development of digital twins will facilitate real-time data integration, scenario testing, and cross-domain analysis, making advanced modelling approaches more accessible and enabling more efficient, evidence-based decision-making for urban mobility and road safety planning.

Nevertheless, PHOEBE also provides guidance on the knowledge and expertise needed, the data requirements, and how to address insufficient or inadequate data. Such guidance, and the work done in collaboration with the EU Road Safety Cluster, also serve as EU-level recommendations to support cities in addressing data challenges and other local limitations. As the PHOEBE Dashboard remains available, along with the related project materials, it also increases the chances of further collaboration and development with external stakeholders.

7 Conclusions

As the PHOEBE project concludes, the PHOEBE Dashboard comes as the entry point of the PHOEBE Framework and all project work. Following several exchanges with different stakeholders through the CoP and focus groups, users' needs helped shape the final version into an accessible, easy-to-use platform. The PHOEBE Dashboard gives users the freedom to choose where and how much to engage with the PHOEBE framework according to their current needs, capabilities and context.

The deliverable presents the steps and details of the development of the PHOEBE Dashboard, showing how the stakeholder engagement and the project development happened in parallel and supported each other. This is translated in the PHOEBE Dashboard, where the interface connects the user with the framework. In designing the user interface, careful consideration was given to three key factors: feasibility, usability, and accessibility. The development process was heavily informed by the experiences and examples from the PHOEBE pilots in Athens, Valencia, and the West Midlands, as well as the principles established for the framework's transferability and replicability.

Moreover, the document also shows how the PHOEBE Dashboard, and thus the PHOEBE Framework, can be anchored in the reality of cities. The PHOEBE Dashboard responds to various EU, national, and local policies and regulations on road safety, enabling informed decision-making, communication support, and justification of interventions. The SUMP process is one example of how PHOEBE connects with the practical implementation of road safety.

The user flow, or how-to section, is designed as a broad guide to help users navigate the PHOEBE Dashboard for the very first time. It begins with a series of straightforward questions aimed at understanding the user’s needs and preferences. Users are encouraged to explore the platform at their own pace, with interactive elements that facilitate a hands-on experience. This guided exploration not only helps familiarise users with the dashboard features but also empowers them to utilise the platform effectively according to their individual requirements.

As an accessible, easy platform, the PHOEBE Dashboard also aims to be the point to instigate further collaborations and development, where the current limitations could be addressed, and the PHOEBE framework refined. This is also an important step in the exploitation of the project, also providing partners with a simple gateway to present to stakeholders in their own networks.

The PHOEBE Dashboard stands as a testament to the collaborative efforts and rich insights gathered throughout the project. By prioritising user engagement and adhering to principles of feasibility, usability, and accessibility, the dashboard not only enhances individual user experiences but also fosters a community-centred approach to road safety. As it integrates with existing policies and practices, it positions itself as a vital tool for stakeholders across various levels.

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