MultiModX

Integrated Passenger-Centric Planning of Multimodal Transport Networks

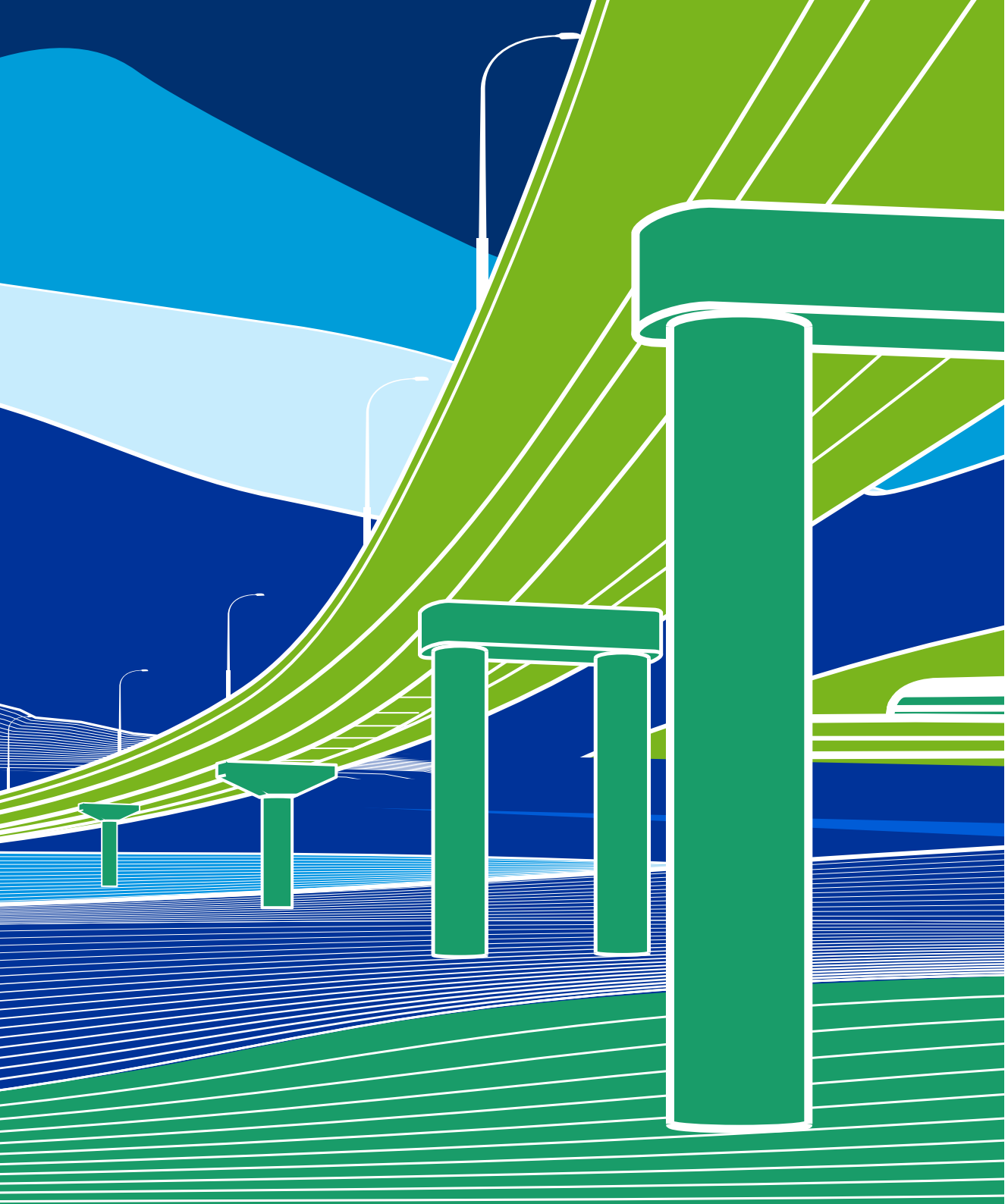
Acronym: MultiModX
Project budget: 1 750 380 € combined grant amount
Duration: 30 months
Project start date: 01/07/2023
Project end date: 31/12/2025
Partners: 6 partners from 5 countries
Project coordinator: Bauhaus Luftfahrt EV
Work programme: HORIZON-SESAR-2022-DES-ER-01
Grant agreement: n° 101114815

MultiModX envisions a fully integrated multimodal European transport system, where the coordination of air and rail networks optimises efficiency, predictability, environmental sustainability, and resilience in door-to-door passenger journeys.

SUPPORTED BY sesar JOINT UNDERTAKING

Co-funded by the European Union

MultiModX has received funding from the SESAR 3 Joint Undertaking (JU) under grant agreement No. 101114815. The JU receives support from the Europen Union's Horizon Europe research and innovation programme and the SESAR 3 JU members other than the Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union nor of the SESAR 3 JU. Neither the European Union nor the SESAR JU can be held responsible for them.



GOALS & OBJECTIVES

MultiModX goal:

To develop a set of innovative multimodal solutions and decision support tools for the coordinated planning and management of multimodal transport networks.

MultimodX objectives:

- **To identify and characterise current and future scenarios for long-distance passenger multimodal transport in Europe,** including passenger behaviour, existing and future policies and regulations, and the emergence of future multimodal concepts for specific European regional archetypes.
- **To develop a multimodal performance framework,** including a set of key performance indicators (KPIs) and the associated measurement mechanisms.
- **To develop a multimodal modelling and evaluation framework**, to be integrated in a Performance Assessment Solution that supports the design, development and assessment of strategic and tactical multimodal solutions, with focus on scheduling and disruption management.
- **To develop a Schedule Design Solution for the integrated planning of air and rail networks** that optimises the waiting times at transfer nodes in order to offer more and better options for multimodal passengers.
- **To develop a Disruption Management Solution** based on coordinated air and rail tactical schedule adjustments and passenger reallocation.
- **To nurture the conditions for the transfer of the MultiModX Solutions to the subsequent stages of the R&I cycle,** by engaging relevant stakeholders throughout the full project lifecycle and disseminating the project outcomes to potential adopters

SOLUTIONS

Performance Assessment Solution:
supports the design, development, and assessment of strategic and tactical multimodal solutions, focusing on scheduling and disruption management. It enables ex-ante assessment and ex-post monitoring of their impact on a comprehensive set of KPIs.

Schedule Design Solution:
for the integrated planning of air and rail networks that optimises the waiting times at transfer nodes in order to offer more and better options for multimodal passengers. It enables the coordinated design of air and rail schedules according to the expected demand behaviour.

Disruption Management Solution:
based on coordinated air and rail tactical schedule adjustments and passenger reallocation. The solution will support decision-makers' response to disruptive events in real-time to minimise the impact on the passengers.

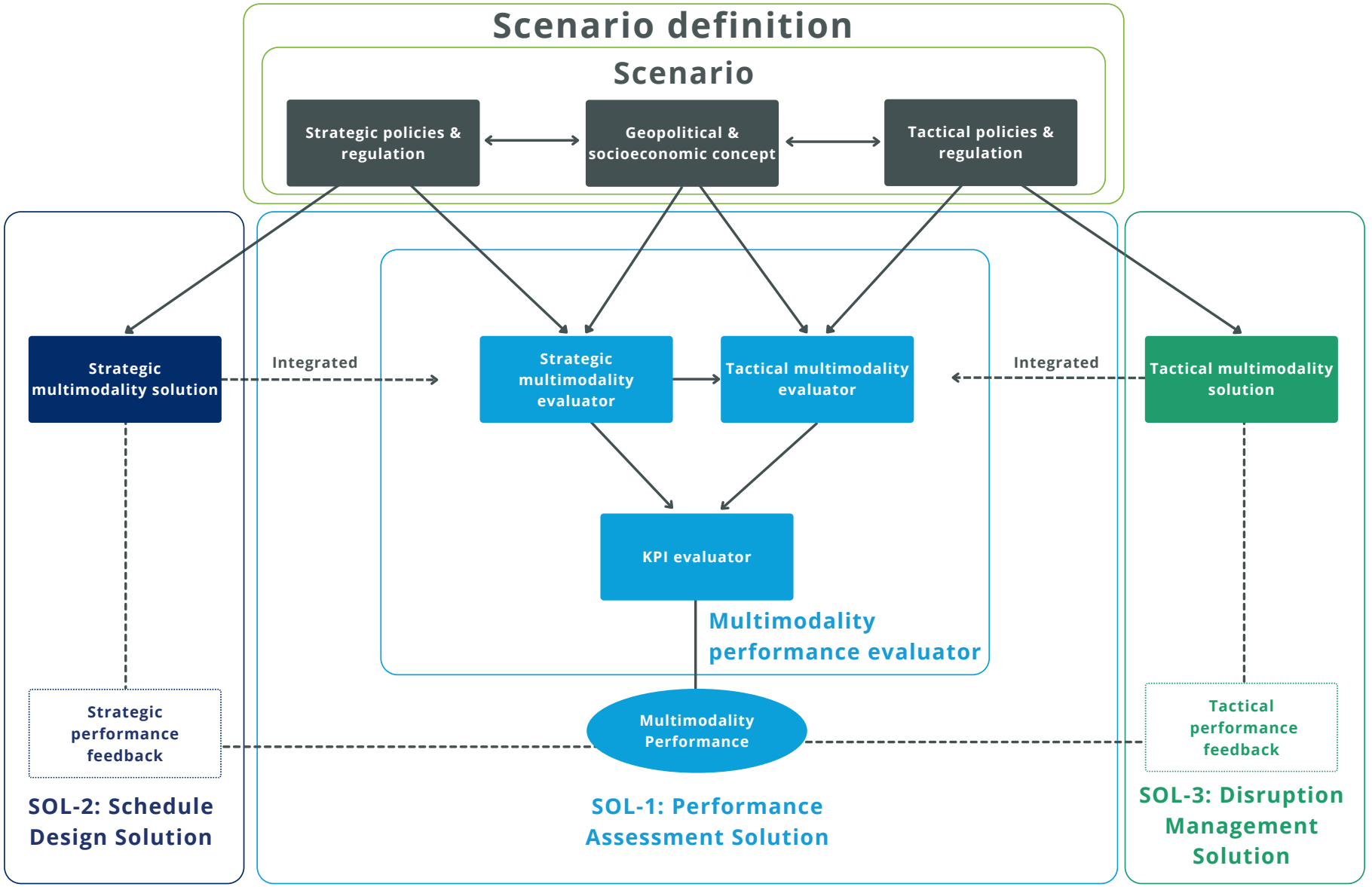
KEY RESULTS

- List of KPIs for a comprehensive characterisation of the impact of multimodal transport systems and multimodal solutions (plus KPAs)
- KPIs on strategic (planned) and tactical (delivered) levels; MultiModX will provide insight on these relationships and describe which estimators are required/suited for each phase (strategic, tactical)
- Measurement mechanisms for the proposed KPIs, including the required input data and the data transformation and processing pipelines

- Analysis of functional requirements and existing models and algorithms for rail and air schedule design.
- New coordination and cooperation principles for multimodal schedule design.
- Mathematical optimisation models and algorithms for optimal multimodal schedule design taking into account passenger behaviour, available vehicles, infrastructure capacity, and interdependencies between the air and rail networks.
- Experimental testing and evaluation of the new integrated Schedule Design Solution.

- Analysis of functional requirements and existing models and algorithms for rail and air disruption management.
- Mathematical optimisation models and algorithms for optimal multimodal disruption management considering tactical schedules adjustment for air and rail and speed / trajectory adjustment for flights, along with passenger multimodal re-routing alternatives. This optimisation is performed taking into account passenger behaviour (e.g. acceptable re-routing options), available services and interdependencies between air and rail networks.
- Identification of data sharing requirements to coordinate the solution due to the distributed nature of the decision-making process when dealing with disruption among stakeholders (e.g. airlines, rail operators, airports, passengers).
- Experimental testing and evaluation of the new disruption management Solution and comparison with alternative solutions such as centralised optimisation focused on just delay management.

CONCEPT


Scenario definition
Scenario
Strategic policies & regulation
Geopolitical & socioeconomic concept
Tactical policies & regulation
Strategic multimodality solution
Integrated
Strategic multimodality evaluator
Tactical multimodality evaluator
Integrated
Tactical multimodality solution
KPI evaluator
Multimodality performance evaluator
Strategic performance feedback
Multimodality Performance
Tactical performance feedback
SOL-2: Schedule Design Solution
SOL-1: Performance Assessment Solution
SOL-3: Disruption Management Solution

MultiModX

- **Germany** BHL TUD
- **France** UIC
- **Spain** NOMMON
- **UK** UoW
- **Belgium** ARC

CONSORTIUM

Bauhaus Luftfahrt The Aviation Think Tank

UIC INTERNATIONAL UNION OF RAILWAYS

NOMMON

TECHNISCHE UNIVERSITÄT DRESDEN

UNIVERSITY OF WESTMINSTER

ARC AIRPORT REGIONS COUNCIL

MultiModX official webiste: https://multimodx.eu/
MultiModX on official SESAR website: https://sesarju.eu/projects/

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