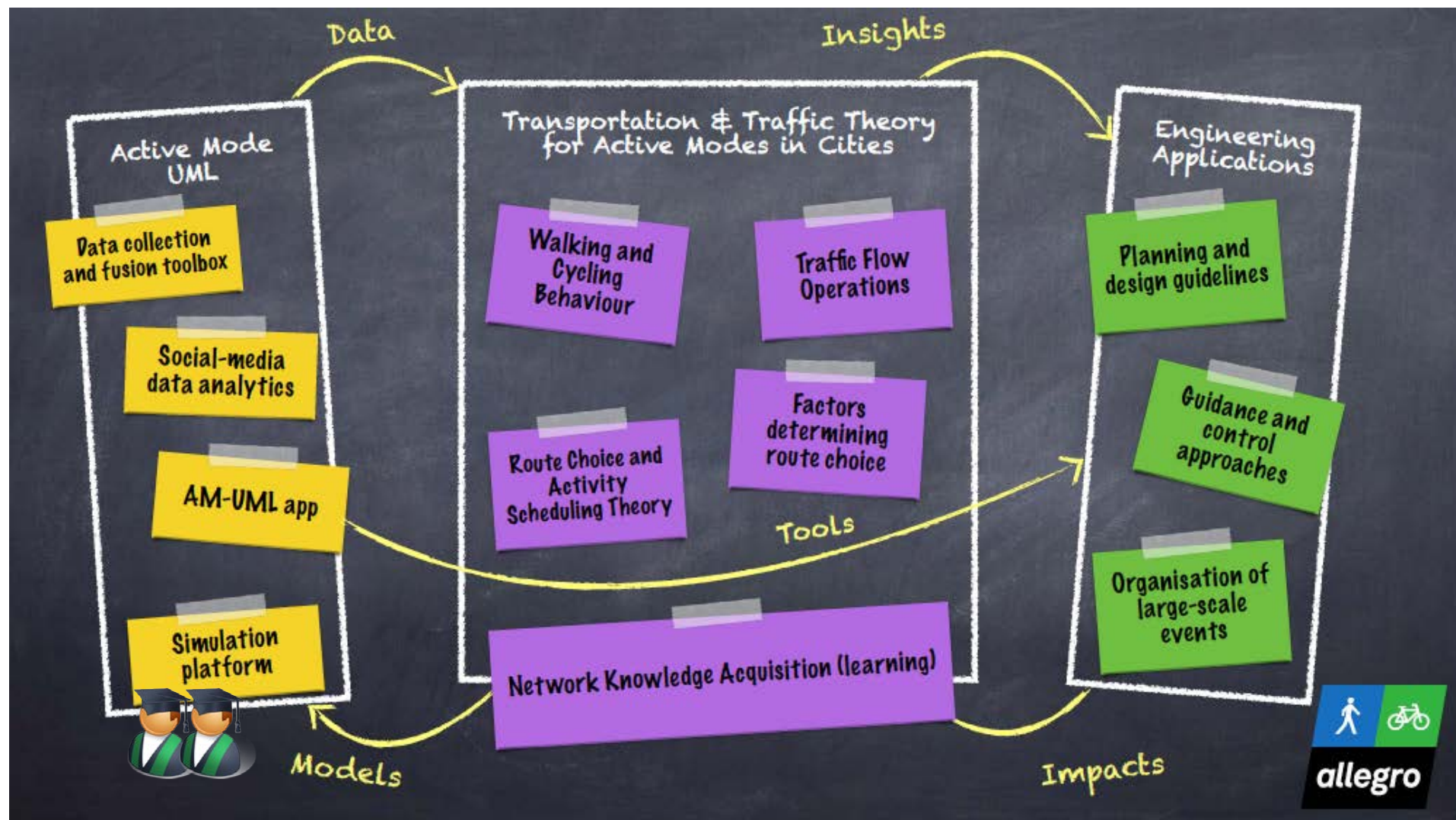# L4: Multi-Scale Multi-Agent Simulation Platform for Active Mode Traffic in Urban Areas

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allegro

Main challenges and innovations

- To integrate the existing and newly-developed **simulation models** for active modes (**both pedestrians and cyclists**) at different scales (**micro, macro, meta**) in one platform (same infrastructure, data input)

- With **accessible, extendable and stand-alone building blocks** to test, integrate and apply the various models

- To develop theory/method to guarantee the **consistency of models** at **different scales** OR to develop a model with multiscale details/features
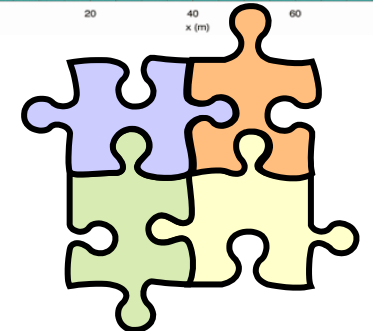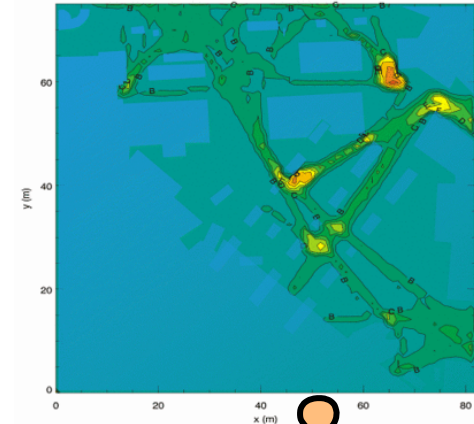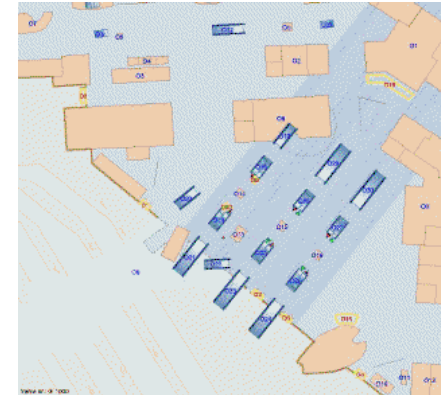
Selection procedure

1. Long list of platforms

2. Define requirements of an envisaged simulation platform

3. Short list of platforms

4. Pilot project to select the platform to continue developing…

Functional requirements of the platform

Simulation requirements

Essential

- Three-dimensions and multi-directions

- Various levels of detail, with local and global consistency

- Individual travellers' choice behaviour at various decision levels

- Different pedestrian and cyclist classes

- Internal/external interactions between different types of traffic

- Description of pedestrian/cycling facilities and environmental conditions

Optional

- Incorporate wide range of sensors and traffic management measures in the simulation
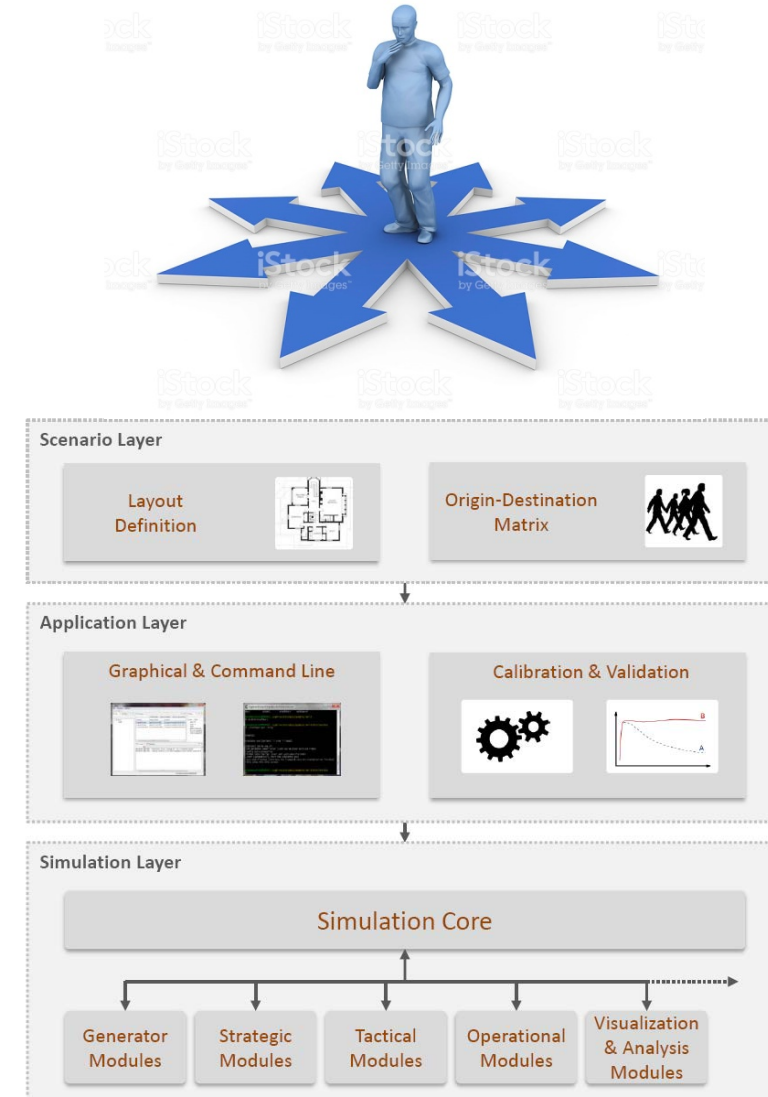
Functional requirements of the platform

Architecture requirements

Essential:

- Easily accessible and extendable modules

- Clear distinction between base models and the under-developing models

- Inclusion of tools to visualize, analyse, evaluate and/or export the model output data
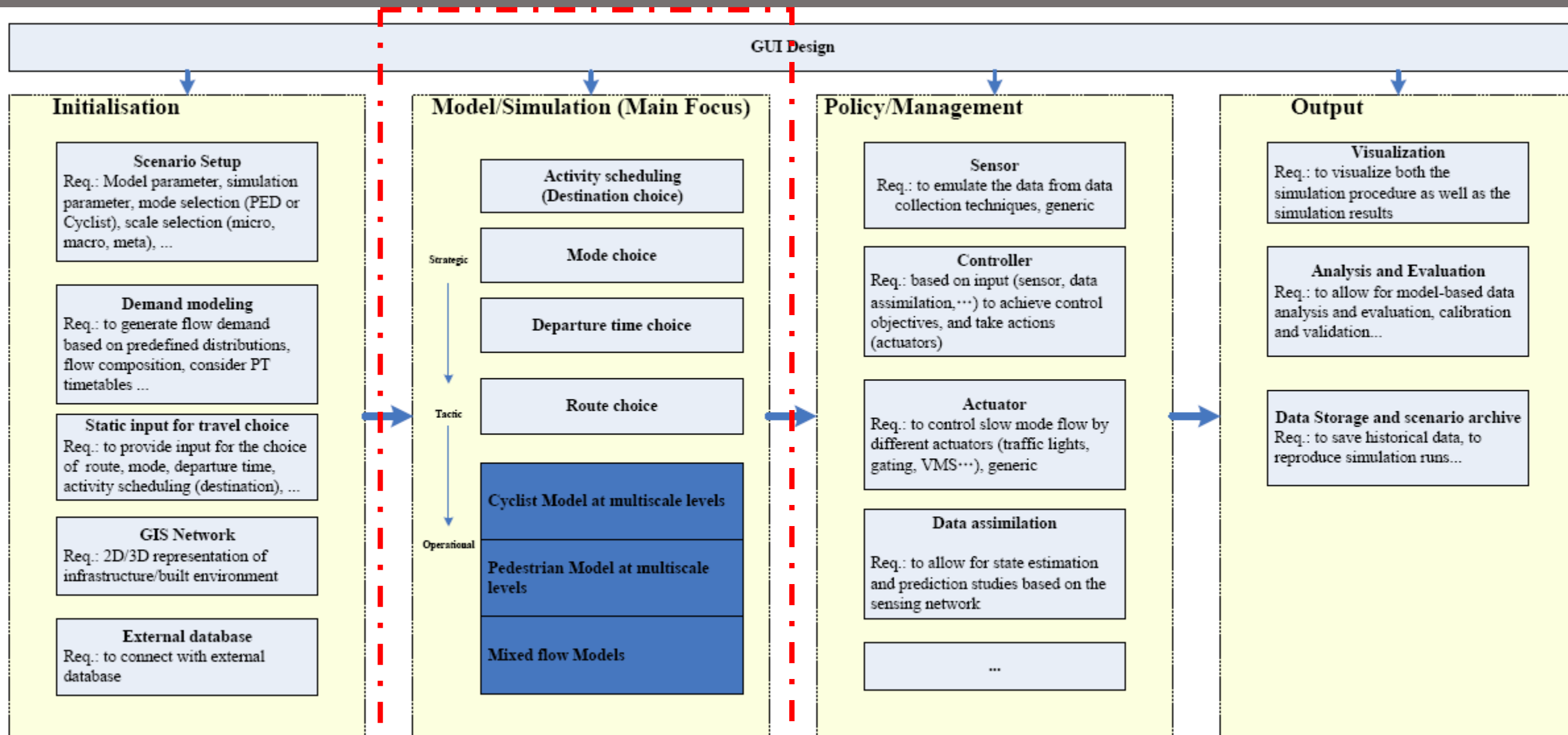
Optional:

- Easy procedure to import historical and real time traffic data (in connection with project L1)

- Inclusion of tools to calibrate and validate traffic models

- User-friendly graphical user interface
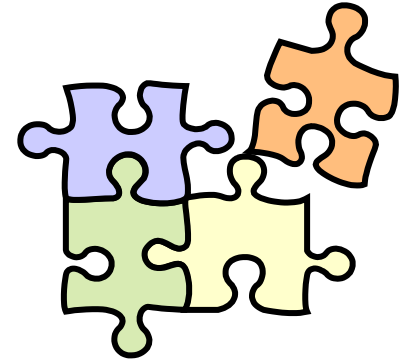
Conceptual simulation framework

GUI Design

Initialisation

Scenario Setup
Req.: Model parameter, simulation parameter, mode selection (PED or Cyclist), scale selection (micro, macro, meta), ...

Demand modeling
Req.: to generate flow demand based on predefined distributions, flow composition, consider PT timetables ...

Static input for travel choice
Req.: to provide input for the choice of route, mode, departure time, activity scheduling (destination), ...

GIS Network
Req.: 2D/3D representation of infrastructure/built environment

External database
Req.: to connect with external database

Model/Simulation (Main Focus)

Activity scheduling (Destination choice)

Strategic

Mode choice

Departure time choice

Tactic

Route choice

Operational

Cyclist Model at multiscale levels

Pedestrian Model at multiscale levels

Mixed flow Models

Policy/Management

Sensor
Req.: to emulate the data from data collection techniques, generic

Controller
Req.: based on input (sensor, data assimilation,⋯) to achieve control objectives, and take actions (actuators)

Actuator
Req.: to control slow mode flow by different actuators (traffic lights, gating, VMS⋯), generic

Data assimilation
Req.: to allow for state estimation and prediction studies based on the sensing network

...

Output

Visualization
Req.: to visualize both the simulation procedure as well as the simulation results

Analysis and Evaluation
Req.: to allow for model-based data analysis and evaluation, calibration and validation...

Data Storage and scenario archive
Req.: to save historical data, to reproduce simulation runs...

Selecting capable candidates

- Shared-space area behind Amsterdam-Centraal station

- Existing pedestrian model considering interaction with cyclists

- New simple cyclist model considering inter-/intra- interaction
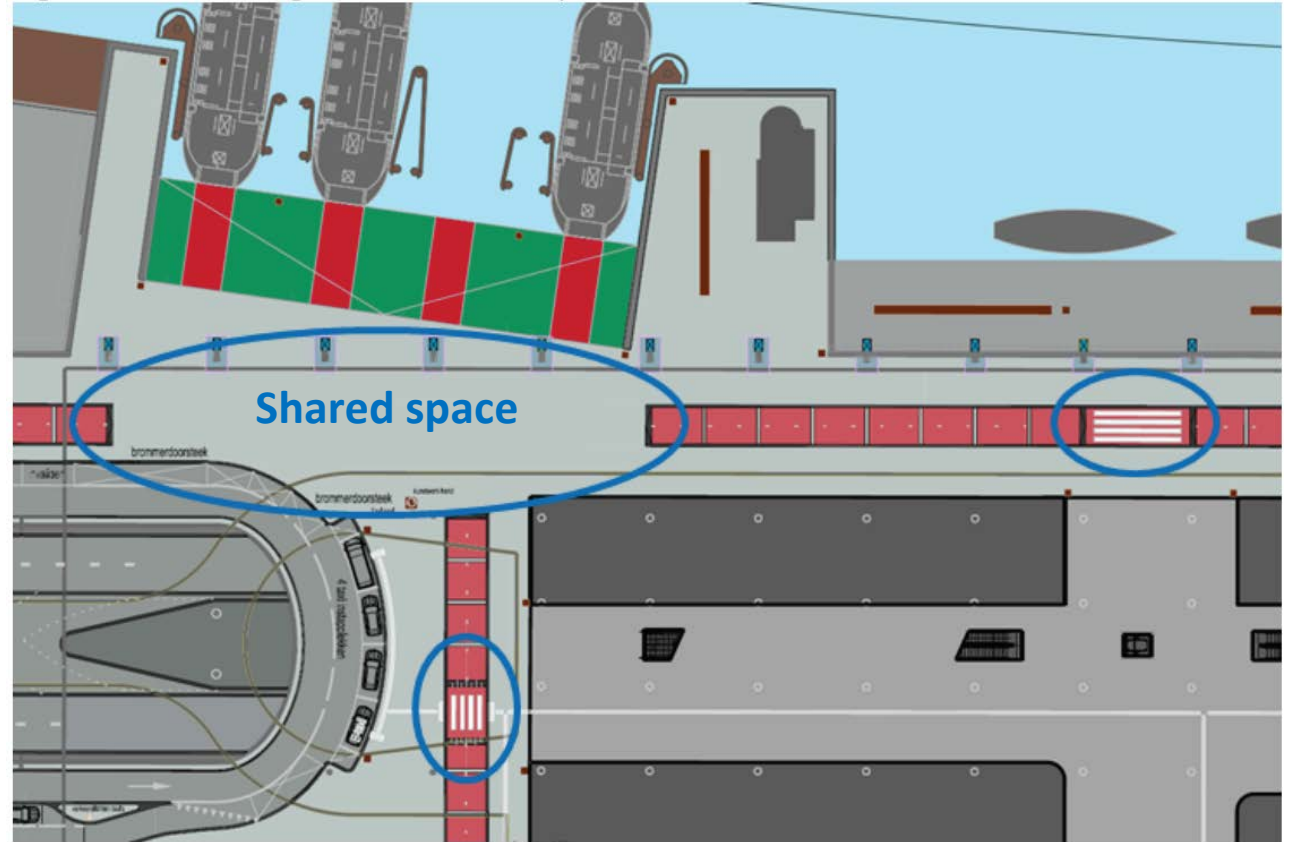
Pilot project at a shared-space area

Steps taken:

- Video record and trajectories at the area
- Learning sim-platform
- Infrastructure modelling
- Formulating a simple cyclist model, considering interaction
- Incorporate model into the platform
- Extend the existing walking model considering interaction
- Verify, calibrate and validate the new models on the basis of empirical data
- Result comparison and assessment in terms of requirement criteria
- ….

Future research within L4

Developing new cyclist behaviour model (microscopic)

Calibration and validation of simulation models

- Cyclist interaction experiments

- Empirical cyclist fundamental diagram research (for model calibration purposes)

…

Implication for practice

- Active mode simulation tools for scenario analysis under normal and emergency situations

- Assess the performance of walking & cycling infrastructure

- Support planning and management of pedestrians, bicycles and mixed flows in an urban context

…

Questions