IDF_02 'Setting-up of a dynamic Digital Twin of the territory'

Objectives of the measure

- **At measure level:**
  - Facilitate the detailed observation of mobility on the territory with in particular the PT interactions with the other mobilities.
  - Facilitate the estimation of the non-measured information (carbon footprint and local emissions, ...).
  - Facilitate decision-making by providing a framework allowing to assess prospectives mobility scenarios.
- **Contributing to city level objectives of:**
  - Improve the understanding of mobility at the scale of the territory.
  - Assess the impact of the implementation of the current or future (prospective) mobility actions or scenarios.
  - Estimate non-measured information (carbon footprint and local emissions, ...) for the current and future mobility scenarios.

Description of the measure

- **Situation before**:

Currently, the urban community of Versailles Grand Parc doesn't have our own mobility simulator on the scale of the territory. A mobility simulator on the whole region is maintained by the transport authority (Île-de-France Mobility), but this tool isn't available for the different cities.
An agent-based transport model is currently available in a collaborative simulator for the Ile de France region. However, the execution of this model is time-computationally consuming, especially for scenarios at the scale of the total population. Therefore, it is more relevant to simulate trips on the scale of the territory and to focus on the interactions only in this zone.
Moreover, the current model is based on out-dated data and would need to be updated with recent data to get closer to reality.

- **General description:**

The work will consist in restricting this simulator to the scale of the territory and setting up modules allowing to calibrate the model in a dynamic way with the help of the available data. This digital twin will allow to obtain a more complete observation of mobility on the territory with the PT interactions with the other mobilities, to follow the impact of the implementation of the actions and also to provide estimates of the non-measured information (carbon footprint and local emissions, ...).

- **Sub-measures description:**
  - **IDF_02_01: Improvement of the model by new data sources:** The current model needs to be updated by the recent data. Here are the resulting actions:
    - Integrate new data sources (EGT 2018, BDTOPO).
    - Improve the locations of the activities.
    - Recover transport mode flows with dynamic data.
    - Simulate and calibrate the model of Ile-de-France actual population.
  - **IDF_02_02: Restricting the study area to the scale of VGP:** To reduce the computation time and focus only the VGP territory, the following action will be performed:
    - Extract the VGP mobility scenario from the Ile-de-France calibrated model.
    - Calibrate or validate the resulting VGP baseline scenario according to the available data.
  - **IDF_02_03: Estimation of non-measured information:** The estimation of the carbon footprint and the local pollutant emissions (NOX and PM) of each specific mean of transport (vehicle passenger, motorbike, truck, bus, …) will be added to the simulator thanks to a model of the passenger car fleet.

- **Measure outputs:**

This measure will deliver:

- Calibrate simulation framework allowing to analyse the current mobility (traffic flow, use of PT, emissions…).
- Simulation framework to access prospective scenarios as specified in the IDF_03 (e.g., low emission zones).

- **Supporting activities**:

Connexion and support of U-TWIN / U-SIM group.

- **Interaction with other city measures: UPPER and non-UPPER measures**

This measure is related to other measures in Ile de France to:

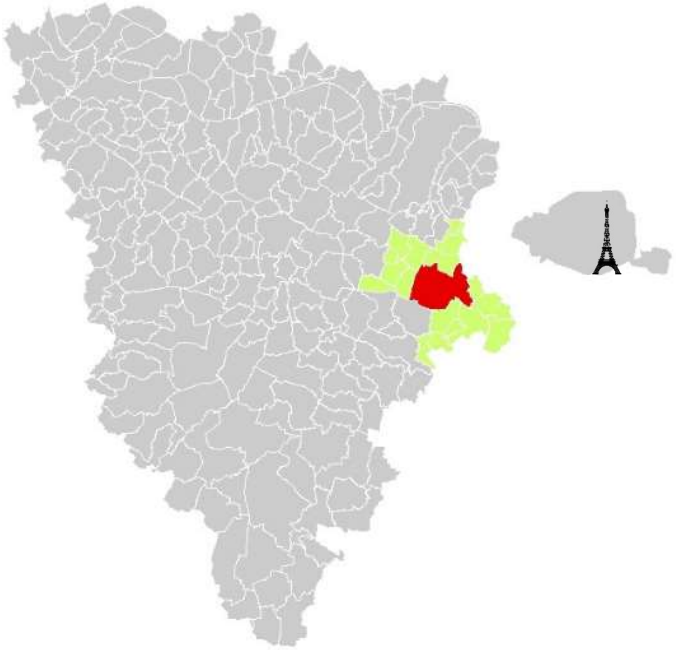
- **IDF_03:** Evaluate futures measures (low emission zones and restricted traffic zones).
- **IDF_06:** Enrich the collected data of the mobility observatory.
- **IDF_08:** The surveys realised will help to tune the simulator with qualitative information.

Target groups and/or geographical impact areas

- **Target groups:**

  - Local authorities (Mayors and Deputies)
  - Municipal teams (security, traffic, urban planners)

- **Geographic implementation area:** The whole urban community of Versailles Grand Parc. Hereafter is a map of the Yvelines department in Île-de-France Region. In red is the city of Versailles, and in green, the other cities that, together with Versailles, represent the urban community of Versailles Grand Parc. Versailles is located 18 km from Paris as a crow flies.



Stakeholders

The following stakeholders will be required for the implementation of this measure:

- **Versailles Grand Parc:** Decision maker.
- **RedLab:** In charge of the integration of the output of the digital twin in the mobility observatory.
- **IFP Energies Nouvelles:** In charge of the technical development of the digital twin.
- **IPR:** Can provide specific static data and maps on the territory.
- **Ile de France Mobilité (PTO on the region) :** Provide public transport flow measurement.
- **Other transport operators:** All these transport operators can also provide data for mapping the citizens mobility patterns.

U-tools support

The implementation of this measure will be actively supported by two IT tools from the UPPER toolkit:

- **U.TWIN**
- **U.SIM (and more specifically, U-SIM.plan)**

Link to other UPPER measures

This measure is similar to UPPER measures implemented in other cities, especially:

- **ROM_07:** Use of advanced technology to increase the efficiency and reliability of PT.
- **TES_02:** To simulate and analyse the needs of PT for LEZ demand fulfilment.
- **LEU_02**: To study the needs of parking and public transport in different areas of the city.

Process of implementation of the measure

Stages	Description	Intermediate milestones
Preparation	Data collection, geospatial analysis of user flows	- Data collection of traffic flows - Data collection of surveys - Data collection of static data - Treatment and qualification of the processed data - Data analytics
Design	Technical development on the digital twin	- Update of the digital twin with dynamic data - Integration of an accurate car fleet model - Pollutant emission estimation integration add-on
Validation	Comparison of the outputs of the digital twin to available measurements	- Analyse of the results obtained with the digital twin

Sub-measures and preliminary indicators

Measure	Sub-measure	Impact indicators
IDF_02	**IDF_02_01**	- Accuracy of the mobility simulation output descriptors
IDF_02	**IDF_02_02**	- Simulation duration - Accuracy of the mobility simulation output descriptors
IDF_02	**IDF_02_03**	- Carbon footprint - Local pollutants emissions on each street (maps)