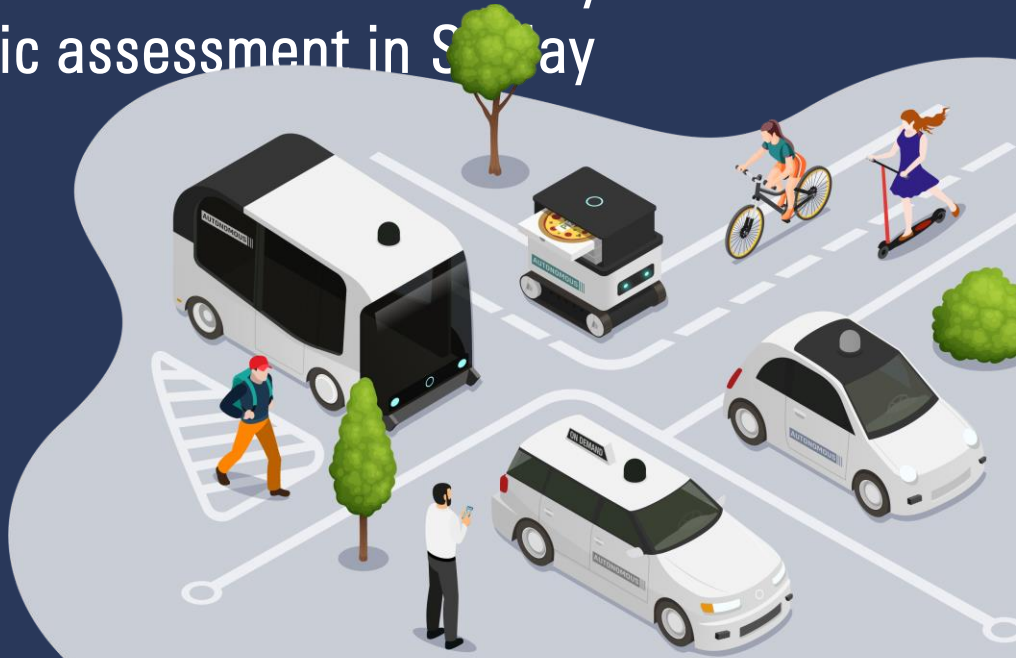
SÉCURITÉ
ACCEPTABILITÉ
MOBILITÉ AUTONOME

Autonomous vehicles in France : where do we stand today and first insights of socio-economic assessment in S ay

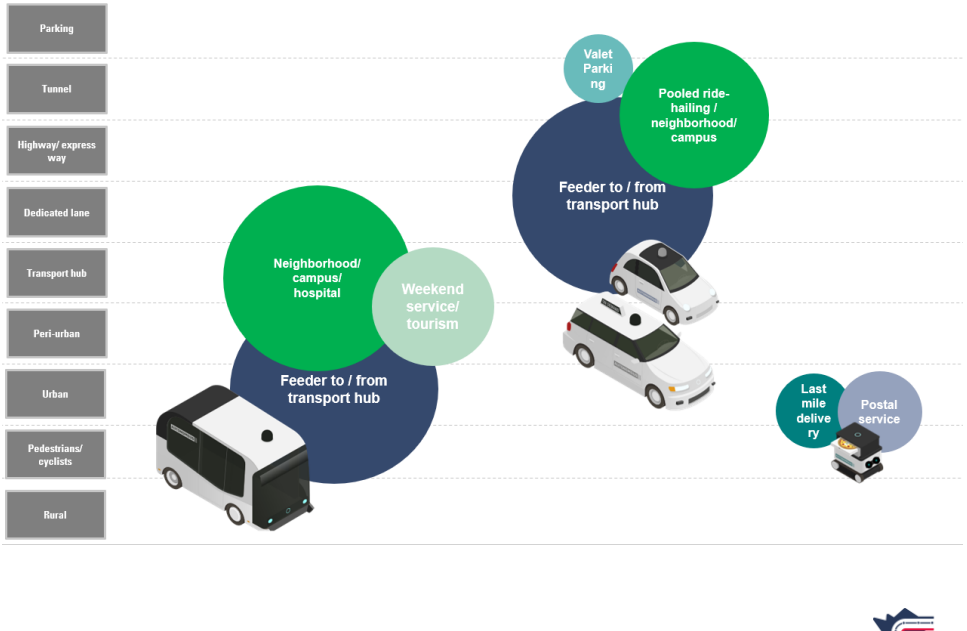


Nadège Faul and Jaâfar Berrada
ECAV Symposium, November 24th 2020

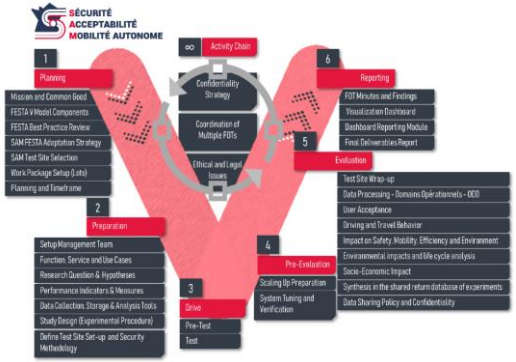
NEW METHODOLOGY FOR MULTI ADL4 FOT

1 multi FOT project :
- Multi vehicles
- Multi services
- Multi environment

Adaptation of FESTA methodology



New implementation plan



Common assessment methodologies

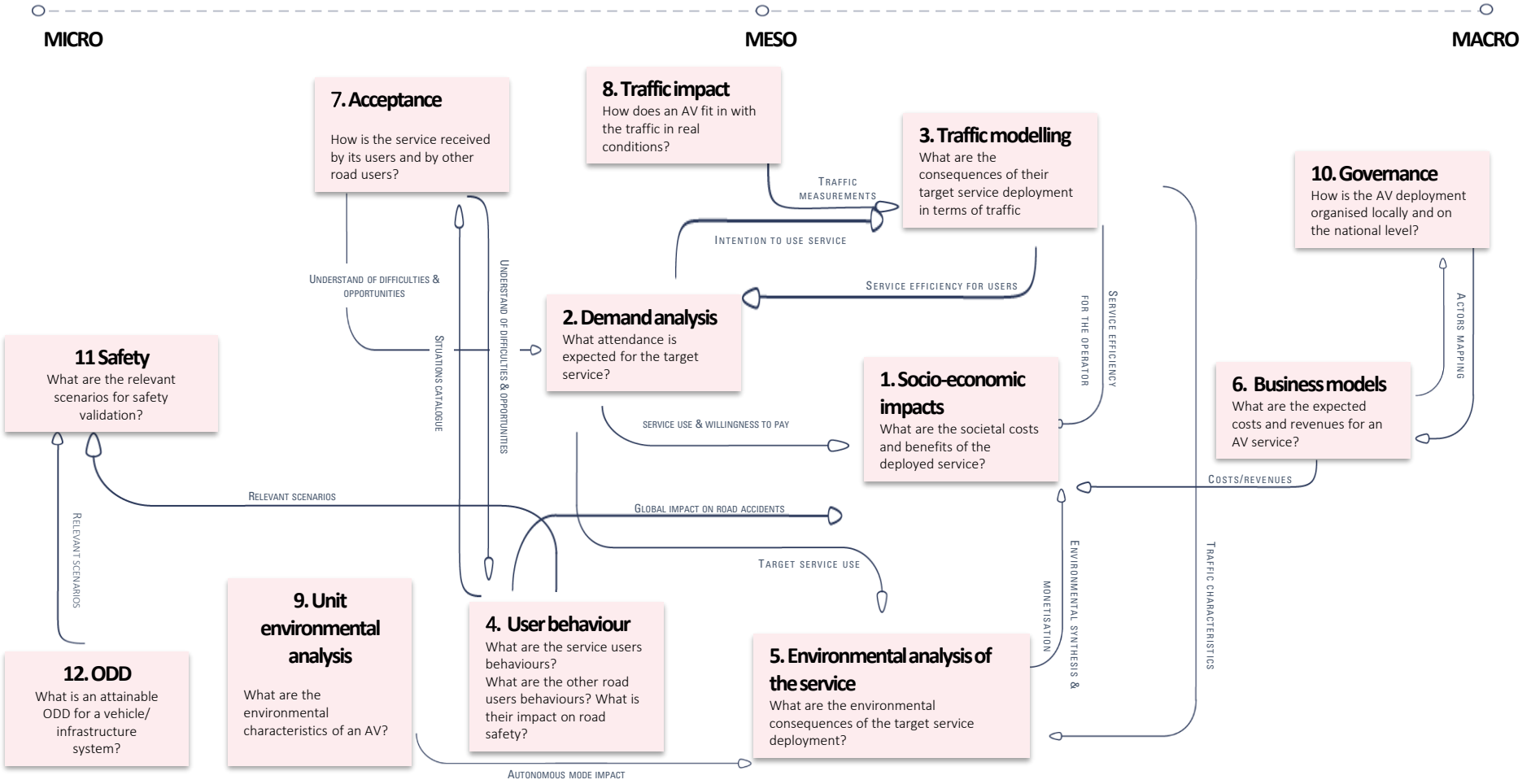
Common descriptions : Use cases, Service description, Data framework

Results
12 Assessment domains
60 level 1 research questions
77 KPIs identified
More than 200 data models

MICRO

MESO

MACRO



Methodologies for demand analysis

OVERVIEW

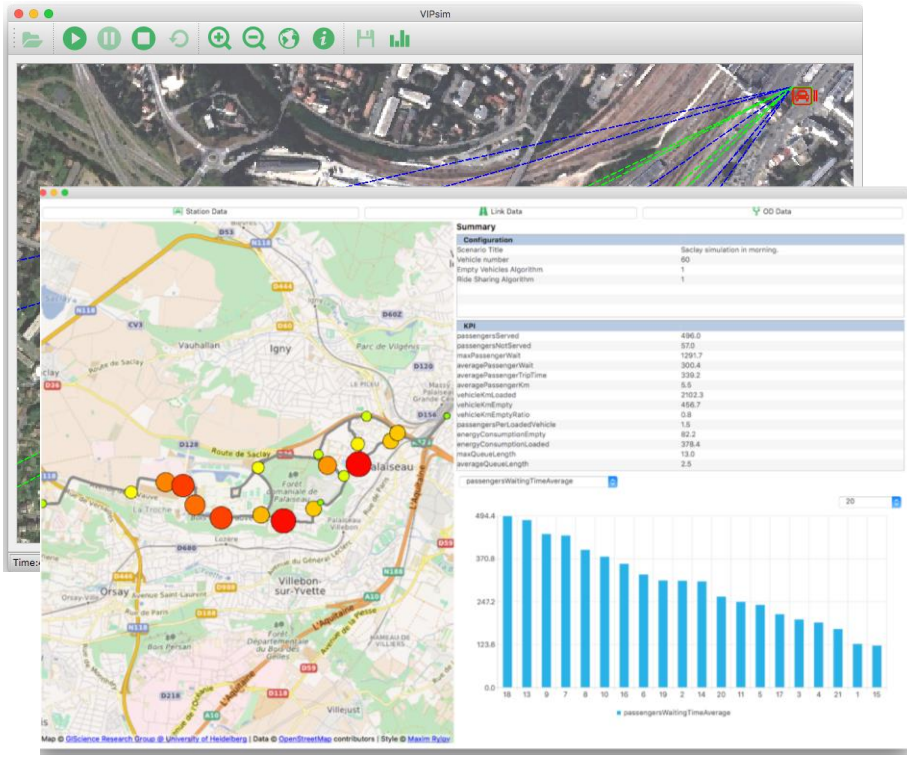
Discrete choice model	Simulation model	
Stated preferences surveys	**Agent-based model (VIPSIM) coupled to macroscopic model (VISUM)**	**Agent-based model (MATSIM)**
Experimental service Target service under specific constraints	Target service	
+ Based on real data + Revealing users preferences ⇒Administration and analysis costs ⇒Analysis limited to the surveyed area	+ Assessment of socio, eco and env impacts + Spatial and temporal upscaling + Representation of impacts ⇒ Model Development ⇒ Model Calibration	
• Sensitivity to the quality of service and fare • Value of time • Willingness to pay	• Socioeconomic Impacts • Mode share evolution ⇒Specific period of the day and a specific travel purpose.	• Socioeconomic Impacts • Mode share evolution ⇒Activities of the day

General/ Aggregated → Person/ Desaggregated

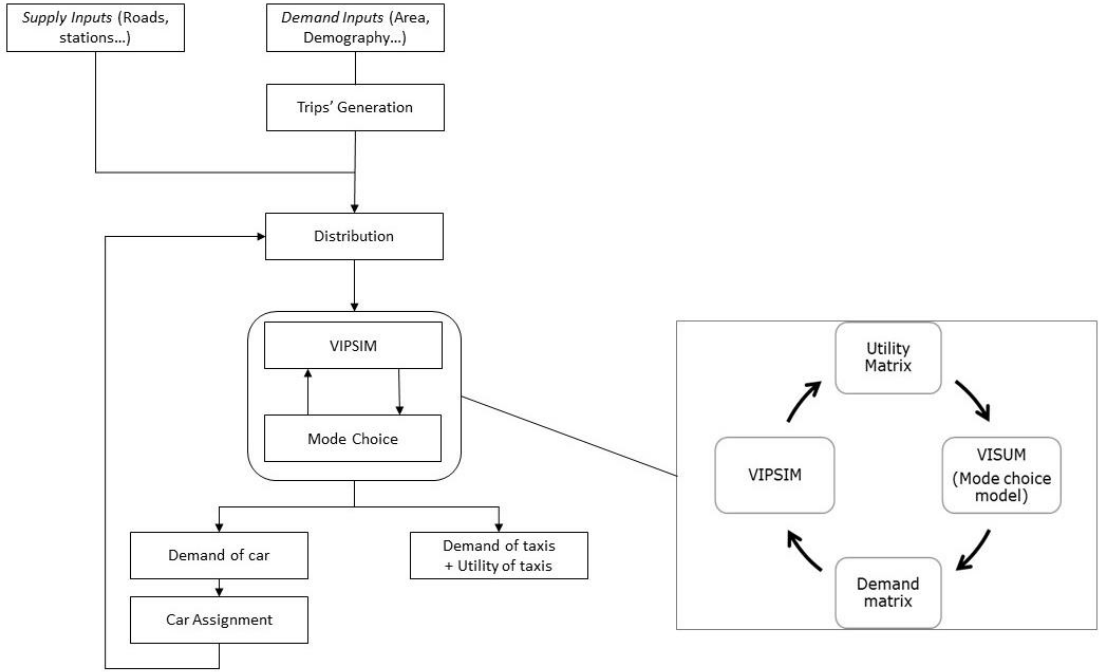
MICROSCOPIC SIMULATOR OF AUTONOMOUS TAXIS : VIPSIM

- **VIPSIM** (Vedecom Integrated Passenger transport SIMulator) is a **microscopic agent-based simulator** developed par VEDECOM to describe a **shared autonomous taxi service,** in particular :

- **Movements** and **interactions** of **vehicles** and **passengers**.
- **Relocation** strategies of **empty** vehicles.
- **Ridesharing** strategies.



ARCHITECTURE OF THE SIMULATOR VISUM – VIPSIM



MODEL ASSUMPTIONS

- **No regulation**

- **Production costs based on the literature**: per vehicle:
  - Fixed Costs [+]: 50€ per day per taxi
  - Variable costs: 0,4€ par km

[+] *Supposant le coût d'achat à 36000 € par véhicule et la durée d'amortissement 2 ans*

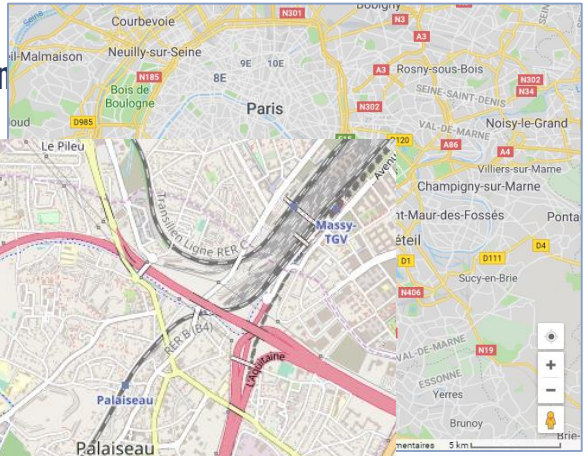
- **Demand estimated from surveys**

- Utility parameters
- Mode preference
- Origines and destinations

Application case : Saclay

PRESENTATION OF THE TERRITORY

- **An heterogeneous urbanization, East-West and in progression**



MOBILITY CHARACTERISTICS

SUPPLY

- Road Infrastructure : **645 km**
  - Four major axes: Highway A10, National route 118 et 2 Departmental routes
- **12** bus lines, 1 BRT bus line
- 2 train lines

DEMAND

- **Imbalance of population and jobs**
  - 33000 inhabitants vs 22000 jobs *(insee, 2017)*
- High exchanges with **Paris** and neighbor cities
- **78%** of **active inhabitants** in Sacaly are **working outside of** Palaiseau *(insee, 2017)*

AV SERVICE

- An **Autonomous taxis** service is proposed in order to **enhance the current PT** supply.

It uses the **BRT infrastructure** while offering in addition a **feeding service**.

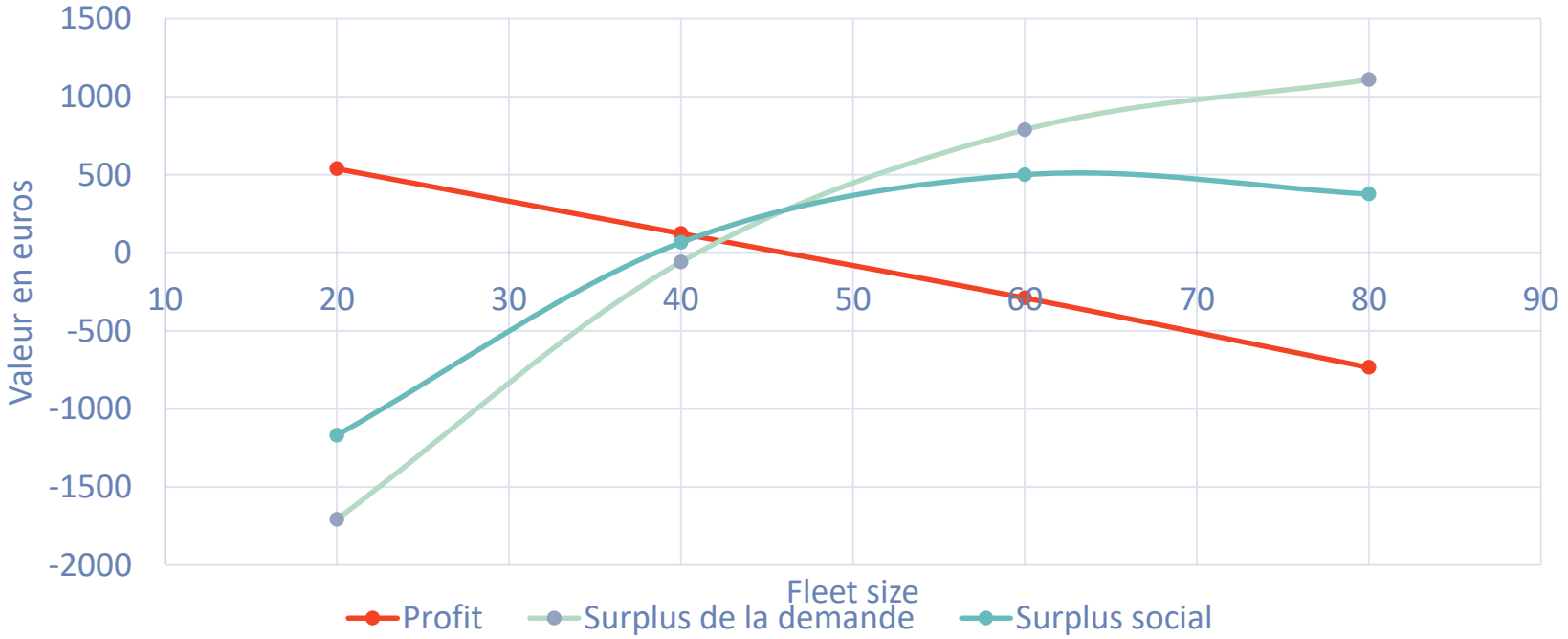
Feature	Value
Network length	13 km
Stations	21 stations
Fleet size	60 vehicles
Average speed	30 to 70 km/h

OPERATIONAL PERFORMANCES

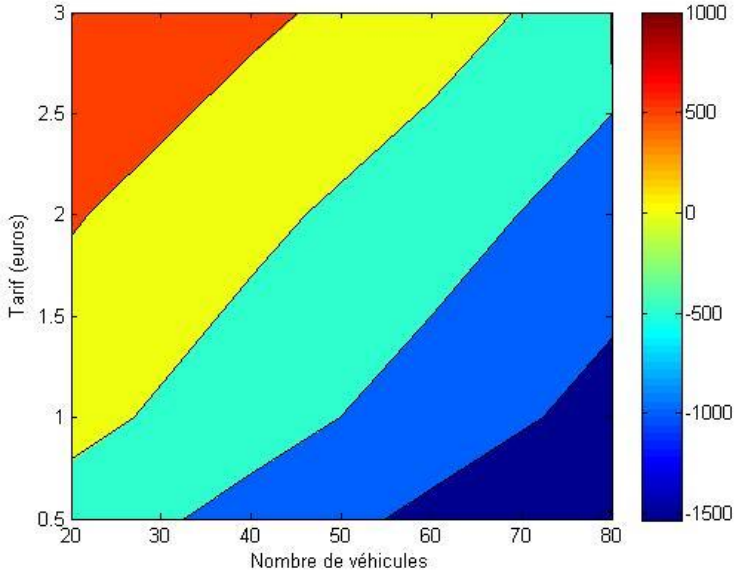
Indicateurs de performance techniques	Valeur
Mean waiting time	3 minutes
Maximal waiting time	19 minutes
Mean travel time	3 minutes
Mean trip distance	4 km
Mean distance per vehicle (for one peak hour)	22,5 km
Mean loading rate of vehicle	1,4
Empty vehicle kilometers	70 %

Modal share	Public transport			Motorized modes	
	aTaxis	BUS	aTaxis+BUS	Public transport	Car
Before	0%	100%	0%	32.8%	67.2%
After	21%	30%	49%	42.0%	58.0%

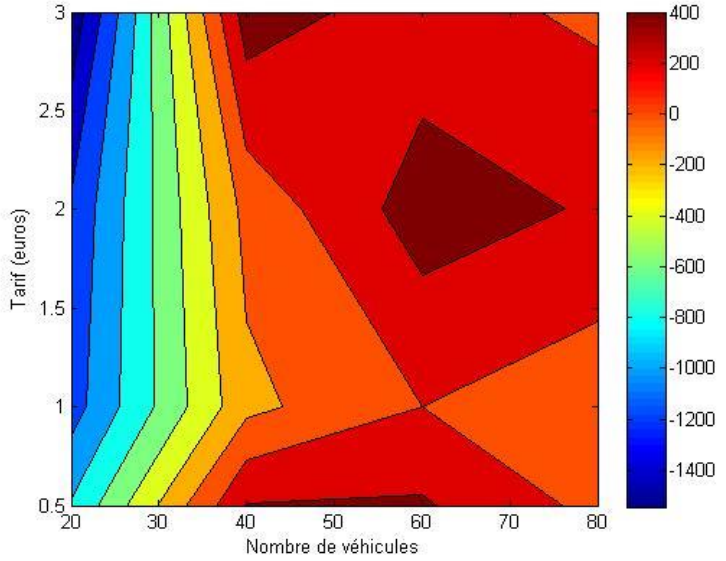
IMPACT OF FLEET ON PROFIT FOR A FIXED FARE (2€)



IMPACT OF FLEET SIZE AND FARE



Profit



Social surplus

NEXT STEPS

- Different methodologies for the evaluation of a multi-service and multi-environment projects.
- Connections between methodologies established and a FESTA methodology consolidated.
- Three methodologies identified for demand analysis, allowing to address different scales of analysis.
- The simulation approach will allow to evaluate future upscaled scenarios, but calibrated on experimental observations, conducted surveys, etc. with different projection scenarios.
- Coupling an agent-based model and a macroscopic model achieved, allowing to optimize operating conditions.

Thank you for your attention

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