

24th nov. 2020

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Vandanjon

Environmental assessment of a line of autonomous shuttles based on open data and a multi-agent system: the case of an innovative mobility offer in Nantes.

Electric, Connected and Autonomous Vehicles for Smart Mobility (ECAV)

Ame/Ease

# Outline

Background

Implementation

Perspectives



# Background

## Multidisciplinary Network for the Evaluation of Public Policies and Transportation Systems

- Environmental assessment: Energy, GHG, Air pollution, Acoustics
- Socio-economic assessment
- Environmental justice: will this new service reduce noise or displace it?

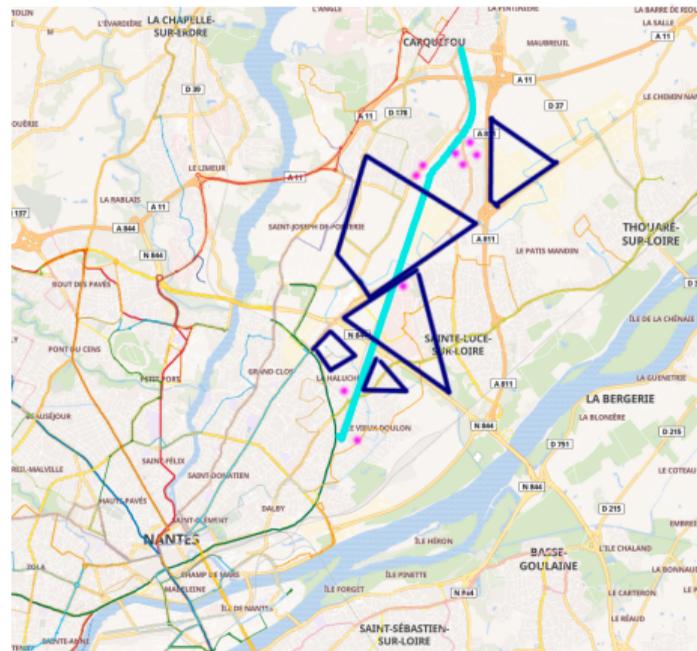


Figure: Line Doulon-Carquefou by autonomous shuttles

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## Special interest in:

dynamic exposure: especially for noise exposure

- classical static assessment: noise map, assignment of a noise level to dwellings
- dynamic evaluation: monitoring of individuals during their activities.

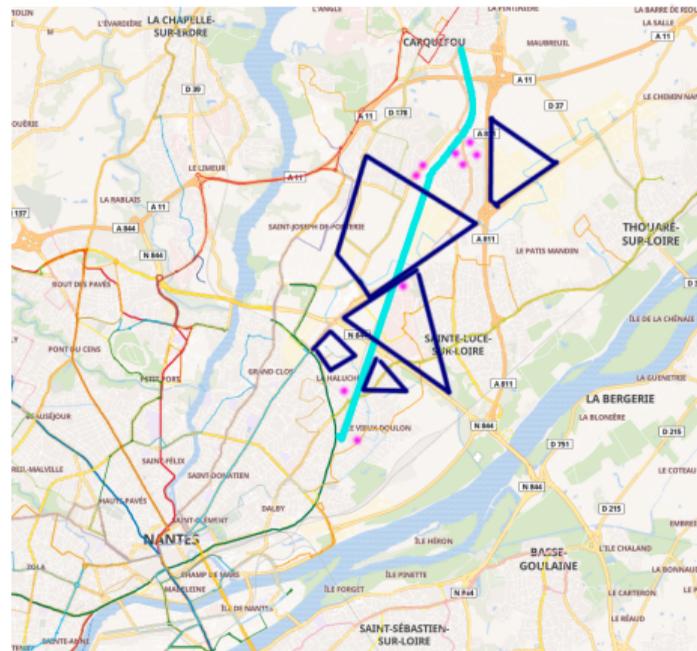


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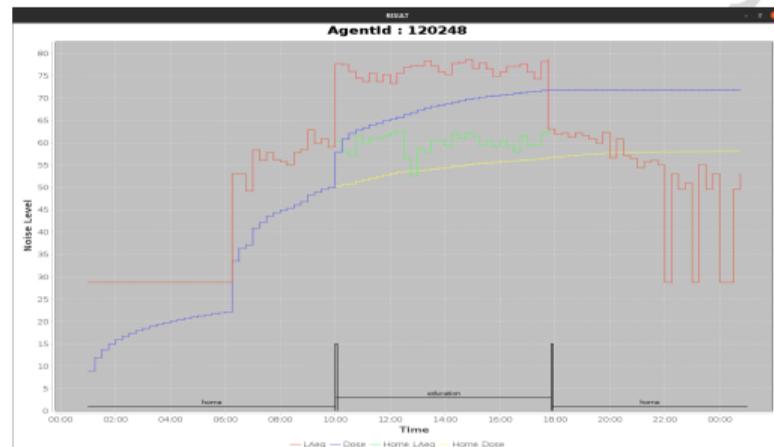


Figure: Impact sur un individu

# Background

## Favourable environment:

- Multi-agent systems for the simulation of transportation systems: Matisim
- Opening of demographic, socio-economic and transport data, ...
- Open Environmental Assessment Software



Figure: Impact sur un individu

# Why Matsim?

## Activities based model

- Detailed description of the agents and their behaviors.
- Spatio-temporal monitoring of the activities and movements of individuals.
- Dynamic assessment of impacts (noise exposure, etc.).

## Open source

- A dynamic community
- Open code facilitating coupling with other environmental assessment software (noise, pollution, etc.).

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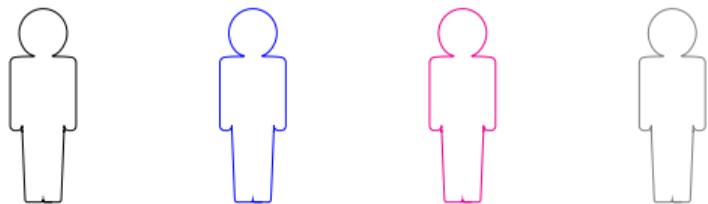
**Implementation**

Perspectives



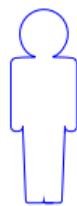
# Implementation

- Generation of synthetic population (demographic and tax databases)
- Activity Plan, Utility function to determine the modal choice: (Household Travel Survey database)
- spatialization (topographic and tax databases)
- Simulation of the transport system taking into account the autonomous shuttle line and its different operating modes (matsim)
- Coupling with environmental assessment software (noisemodelling)



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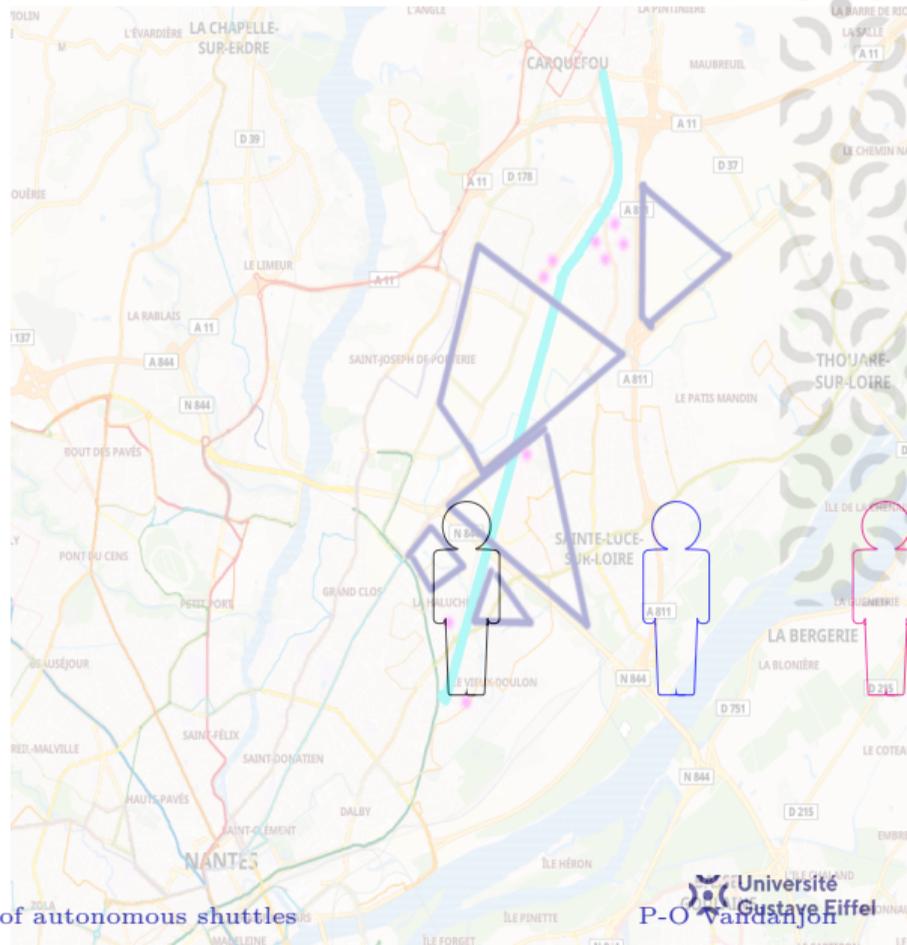


08:00 School-car  
08:30 Work-car  
18:00 School-car  
18:30 Home-car  
20:30 Sport-bike



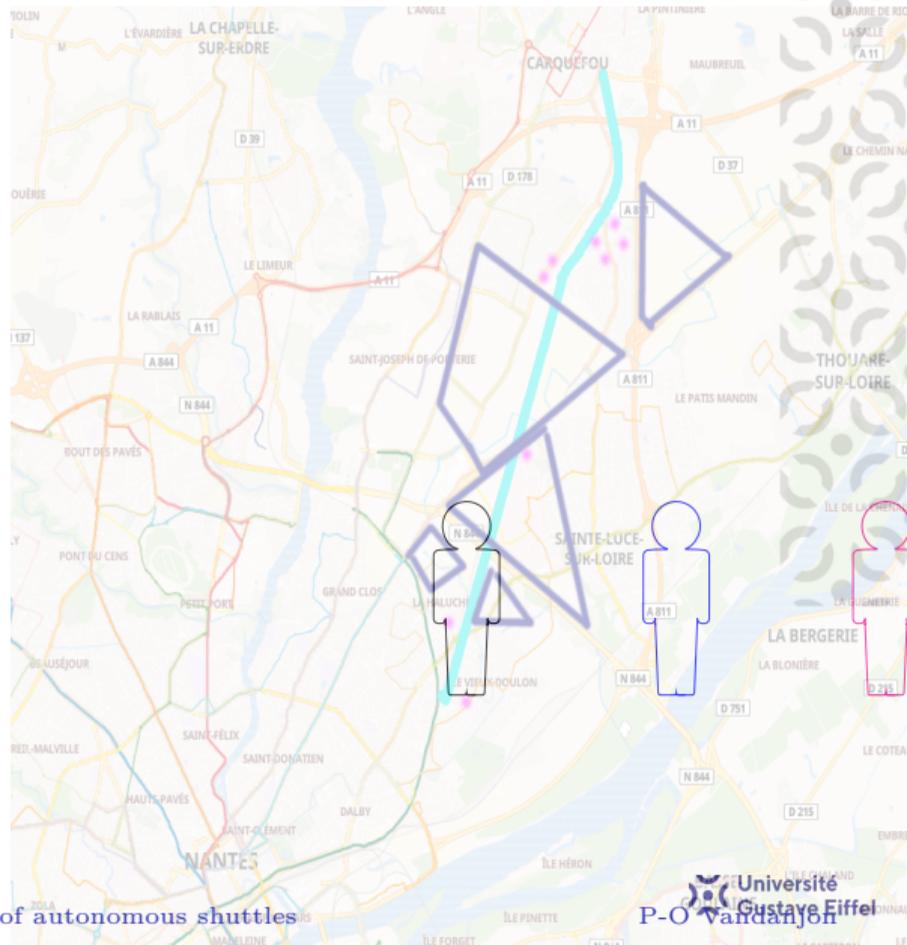
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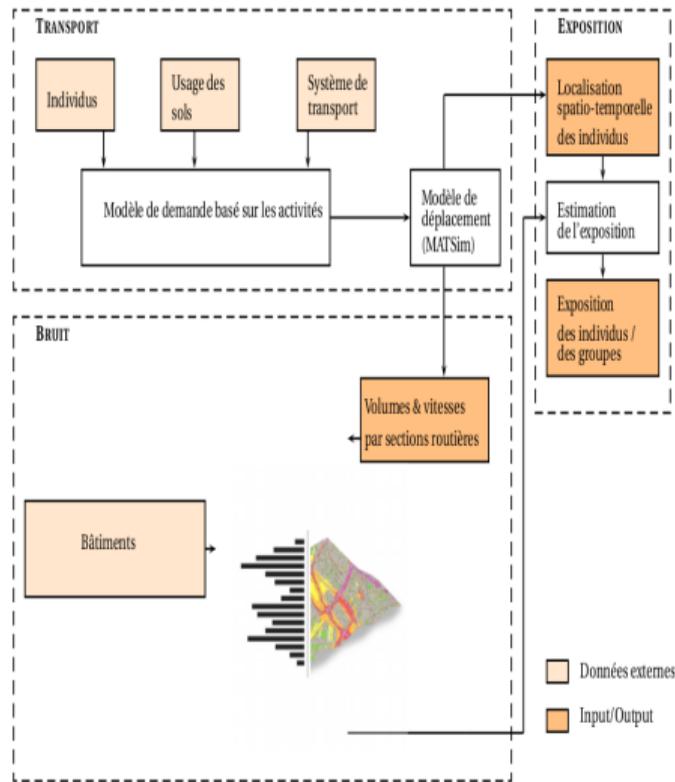
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- Methodologies for synthetic population generation and multi agents system calibration (geolocalization of cell phones)(thesis of Fabrice Yaméogo in progress (Ademe, SNCF), thesis funding requested for 2021);
- Matsim data analysis
  - Coupling with traffic software and pollutant diffusion software (CDD research engineer V. Le Bescond (I-site Future), project being set up in response to the call ANR AAPG2021)
  - Contribution of multi agent simulation fort socio-economic studies (internship L. Galassi Luquezi with SCE, setting up of a thesis funding for 2022)
- Logistics (arrival of a researcher, A. Beziat, at the University Gustave Eiffel on this purpose)