



MADRID  
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NOISE CONTROL FOR A BETTER ENVIRONMENT

## Noise Mapping based on OpenStreetMap data

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15 Mai 2019





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  - Context
  - Objectives and methodology
  
- 2 Framework
  - Noise modelling tool
  - OSM data integration chain
  
- 3 Case study
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## Input data for noise mapping

buildings + roads/traffic + land use and topography + population distribution + ...





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- ▶ **access + manual formatting** ➤ time-consuming
- potentially error-prone



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## Data origin

- data provided by the state services (ex: IGN<sup>a</sup> or Insee<sup>b</sup> in France) ...
- ... and sometimes unavailable
- ▶ **open data sources** ➤ OpenStreetMap<sup>c</sup> (OSM)

<sup>a</sup>National Institute of Geographic and Forest Information, formerly National Geographic Institute

<sup>b</sup>National Institute of Statistics and Economic Studies

<sup>c</sup>OpenStreetMap: collaborative project to create a free editable map of the world. Crowdsourced data are made available under the Open Database License (ODbL).

## Objectives

Creation of noise maps based on OSM data

- open-access database available with worldwide coverage and regularly updated
- automation of the data access and formatting, and of the noise maps production

## Methodology

Evaluation of the relevance of the noise maps built with OSM data in comparison with sovereign and consistent data

- in terms of noise levels
- in terms of population exposure



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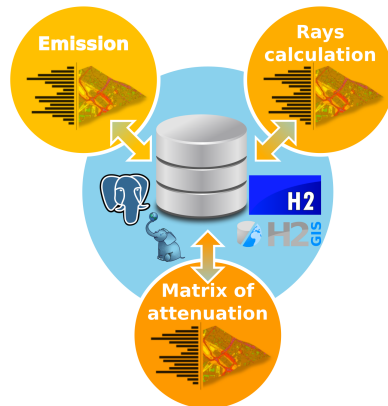
## Noise modelling tool

### NoiseModelling<sup>a</sup>

- free and open-source software
- integrated in OrbisGIS<sup>b</sup>
- CNOSSOS-EU implemented (road traffic emissions+noise propagation calculation)

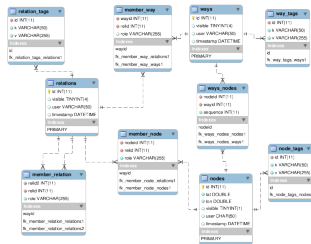
<sup>a</sup><http://noise-planet.org/noisemodelling.html>

<sup>b</sup><http://orbisgis.org/>



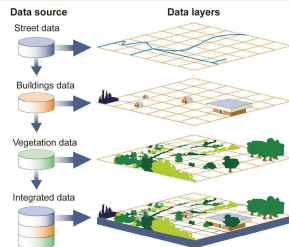
## OSM data model

- **nodes:** basic elements
  - geographical information (points)
- **ways:** set of nodes (2→2000)
  - roads, rails, avenues, etc.
  - areas, buildings, etc. (« closed lines »)
- **relations:** link between nodes/lines/relations
  - group of objects (ex: airport)
  - complex geometries (ex: buildings' inner yards)
- **tags:** semantic information
  - *key=value* (*building, highway, etc.*)



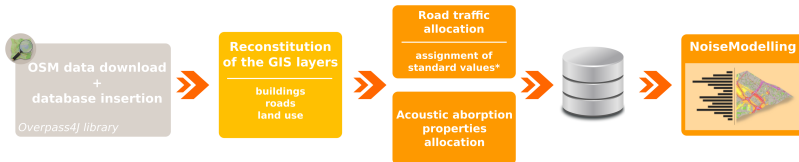
OSM model

(A. Hombiat, PhD Thesis, 2017)



OSM data layers

(https://www.nationalgeographic.org, 2018)



Processing chain of OSM data

\* for major highways: AADT from counts database of 2015 (source: Ministry of Ecological and Solidarity Transition)

else: recommendations of the European Commission Working Group Assessment of Exposure to Noise (WG-AEN, 2006)



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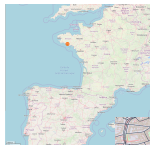


## Study Area

- case study in the city of Lorient<sup>a</sup> (France)
- area of about 2 km<sup>2</sup>
- 503 receivers randomly selected in the area
- 50 buildings assessed (→ 491 inh.)

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<sup>a</sup>CENSE project (« Characterization of urban sound environments using a comprehensive approach combining open data, measurements and modeling »)



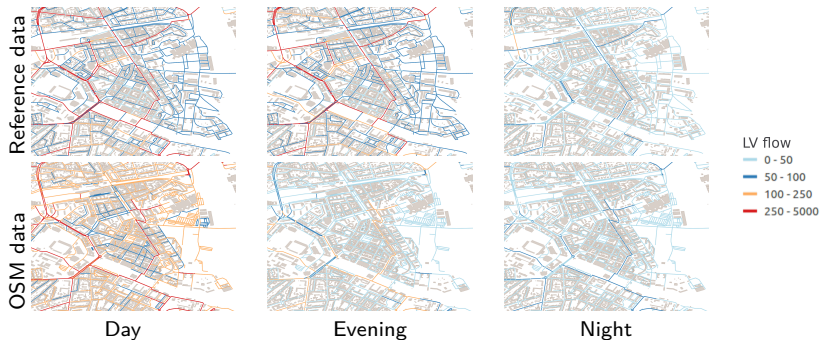


## Input data

Data sources: state services vs. OSM

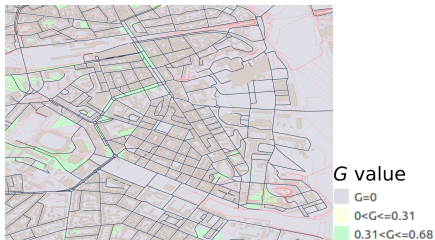
## Input data

Data sources: state services vs. OSM  
buildings + roads/traffic (LV+HV)

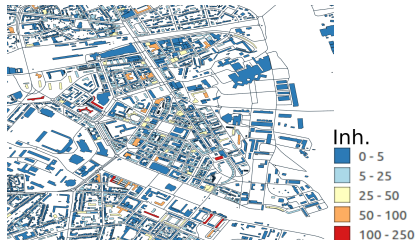


## Input data

Data sources: state services vs. OSM  
buildings + roads/traffic (LV+HV) + land use and topography + population distribution



Only taken into account for reference data



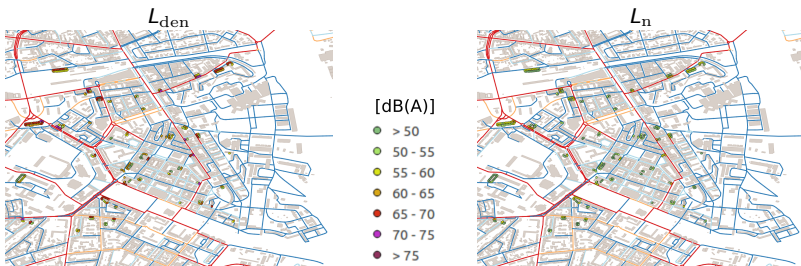
Issued from the reference database



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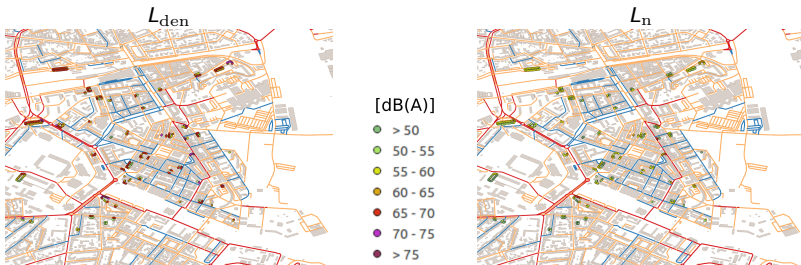


## Reference data



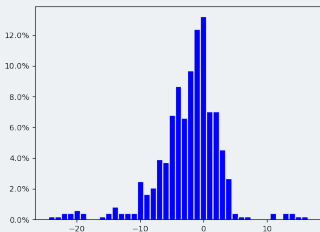


## OSM data

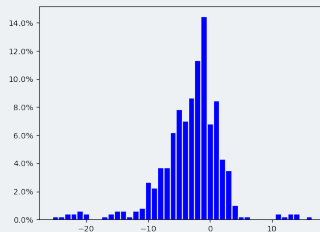




## Comparison in terms of noise levels



$$L_{den,ref} - L_{den,osm}$$



$$L_{n,ref} - L_{n,osm}$$



### Comparison in terms of exposed population

Range	$L_{den,ref}$	$L_{den,osm}$	$L_{n,ref}$	$L_{n,osm}$
<45 dB(A)	0.0%	0.0%	0.4%	0.4%
45-50 dB(A)	0.0%	0.0%	17.3%	0.0%
50-55 dB(A)	0.4%	0.4%	17.1%	17.3%
55-60 dB(A)	16.9%	0.0%	65.2%	79.6%
60-65 dB(A)	15.9%	17.3%	0.0%	2.6%
65-70 dB(A)	66.8%	79.6%	0.0%	0.0%
70-75 dB(A)	0.0%	2.6%	0.0%	0.0%
>75 dB(A)	0.0%	0.0%	0.0%	0.0%



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## Conclusion

- open-source framework for noise mapping with open input data
- comparison of long-term noise indicators and exposed population based on state services and OpenStreetMap data
- discrepancies observed due to different road traffic input and to the non-inclusion of land use and topography

## Perspectives

- integration of the land use issued from the OSM database
- improvement of traffic input data (classification of road sections, coupling with a traffic model)

# Thank you for your attention

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