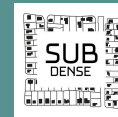


A Collaborative Dashboard to Study Periurban Densification

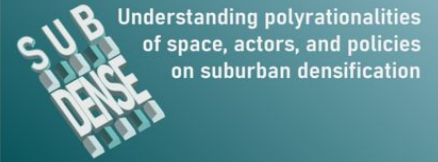
Mouhamadou Ndim¹, Juste Raimbault¹
Bénédicte Bucher¹, Ana-Maria Raimond¹,
Julien Perret¹

¹ LASTIG, Univ. Gustave Eiffel, IGN-ENSG, France

ECTQG, Braga, September 2023



The SubDense Project



The SubDense European project aims at better understanding the polyrationalities of space, actors and policies on suburban densification, by :

- **exploring how diverse strategies of land policy interact with landowners' and local stakeholders' interest and agency to shape suburban densification and their impact on suburbia across different planning systems (France, Germany, UK);**
- **combining quantitative approaches (geodata analysis and geosimulation) with qualitative approaches (social and policy science and planning).**



Project research objectives

- **WP1:** Which data, information infrastructures and approaches enable a comparative spatial analysis of suburban densification and allow for an integration of stakeholders' interests and agency?
- **WP2:** How can stakeholders' interests and agency be explained in relation to land policies for suburban densification?
- **WP3:** How do land policies respond to the interests and agency of stakeholders in an effective and efficient way?



Dashboard and Geodata analysis

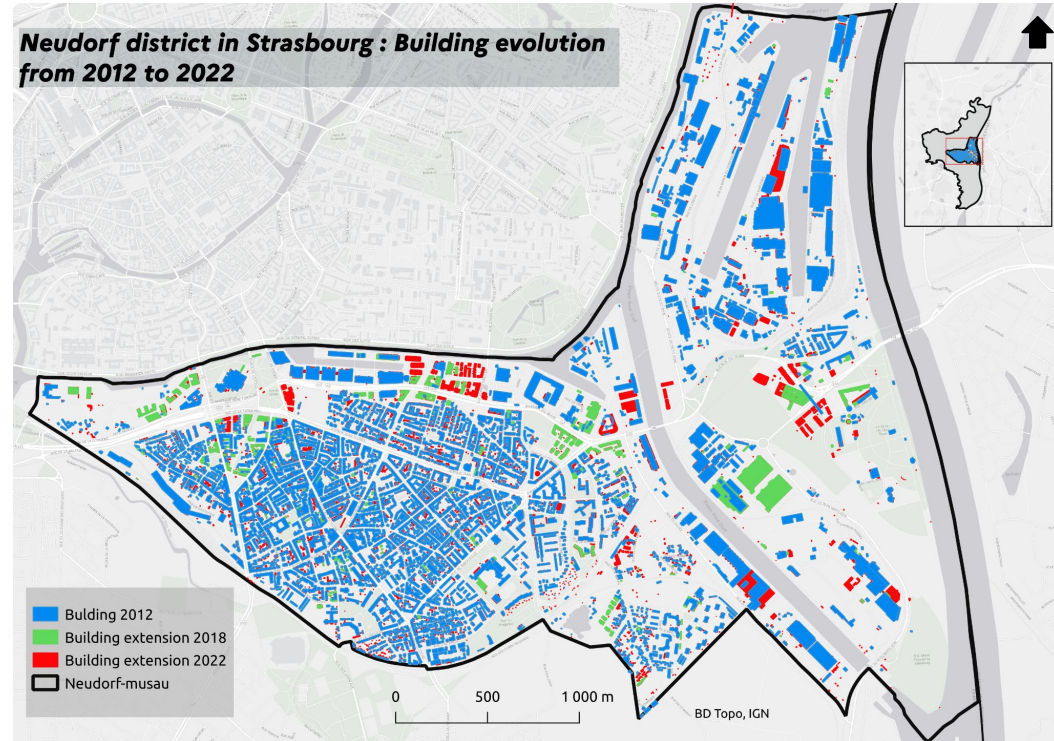
- Describing change in urban density with comparative data and matching libraries
- Discerning densification patterns with social data and in depth comparative analysis
- Decoding ground knowledge on densification

Aims of this research contribution :

Create a dashboard that will be a tool for collaboration and sharing between partners, enabling the exchange of data and methods, as well as the exploration of results through geovisualization.

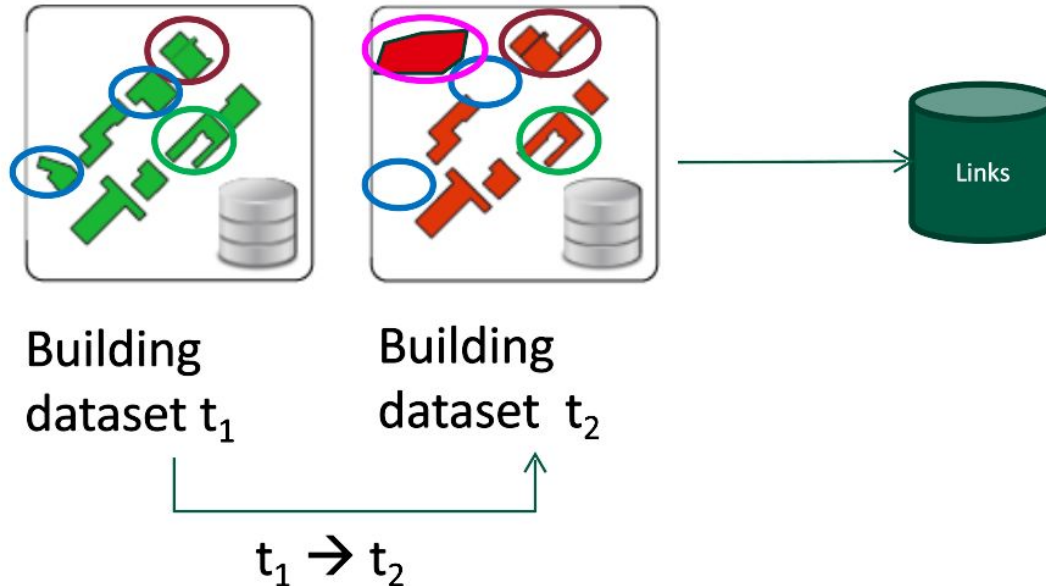
Data expertise and analysis

- How to share analysis and methods for reproduction on other case studies?
- How to integrate this knowledge on data specification into the dashboard so that it is discoverable and reusable by partners?



Materials and Methodology:

Polygon matching algorithm for building change detection



Typology of changes

1:1 stability

1:1 no change, but geometric modification

1:1 no geom change, but use change

1:1 no geom change, but height change

1:0 destruction

0:1 construction

1:m split

n:1 fusion

n:m aggregation

Current application to Strasbourg data (2012-2022)

Interpretation :

- Quickly identify areas where there has been significant growth (by focusing on "appeared" buildings), or conversely, areas where buildings have been removed or demolished (by focusing on "disappeared").
- The **split**, **merged** and **aggregated** types provide information on **how land use or zoning may have changed**. For example, in developing urban areas, you might find more buildings that have been split to make way for new construction.



A Collaborative Dashboard

- The **git-based** architecture for the **core dashboard** ensures tractability, full history, reproducibility, flexibility, and collaboration through branching, shared remote repository (<https://github.com/subdense>)
- Clients will implement interactions with the core and functionalities needed by partners for data analysis and integration (running change detection algorithms, adding data, exploring results and maps, . . .)
- An iterative process to produce **user stories**, finally leading to some specifications for the core architecture and functionalities of clients.

Core dashboard based on git for data and methods sharing, and reproducibility

Clients (applications/plugins):
Enable users' and contributors' tasks

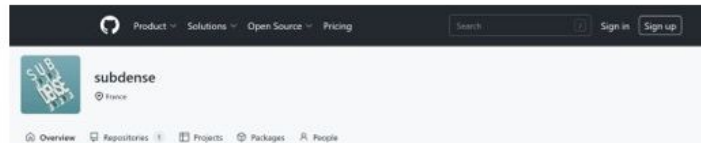
Examples:

- Visualisation / exploration of views
- Preparing a view
- Preparing change data using matching algorithms
- Launching a simulation with OpenMOLE
- Editing metadata



Data management plan

FTP server



Git core repository for SUBDENSE:

- Views (Static map...)
- Styling rules
- Change data (references to)
- Source data (references to)
- Indicators
- Metadata on data, documentation of biases
- Libraries, script, detailed and replicable workflows
- Tutorials, animation



Types of dashboard users involved in the collaborative specification of core and clients functionalities

“User stories” are iteratively co-constructed to specify needs, requests, contributions, etc. of various users

END USERS

- Exploit the visuals to produce knowledge related to densification
- Interact with operational stakeholders
- Specify the concepts to be studied
- Search for "indicators"
- Engage in the criticism of "indicators" and proposal of new indicators

CORE DESIGNERS

- Provide core structure, GUI, workflows

DATA EXPERTS

- Identify data, tools, ...
- Design innovative data, tools,

DATA CONTRIBUTORS

- Produce change data, integrate data, produce visuals



Interactive front-end of the dashboard

- .md files in the git repository, edited through partners' commits, are automatically converted to html using pandoc
- github pages - automatic deployment of a website from html pages in a git repository, are used for continuous integration
- current work to: (i) automatise the deployment of an interactive mapping sub-page from a current state of the git repository; (ii) integrate both aspects into a single front-end; (iii) integrate a git interaction within the front-end, using a javascript library for git

Collaborative Dashboard for Periurban Densification Study



Liverpool



Strasbourg



Dortmund



Bristol

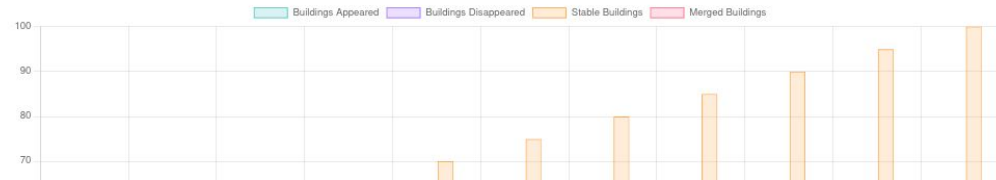


Toulouse



Frankfurt

Building Evolution



<https://subdense.gitlab.io/dashboard/>



Dashboard: synthesis

- The dashboard will act as an integrator and mediator between interdisciplinary partners
- It is a crucial element in avoiding bias from the use of heterogeneous data across countries
- It is finally a place to share and exchange ideas, but also collect Geospatial User Feedback through metadata



Research perspectives

Related future work at LASTIG in the subdense project:

- **heterogeneous data integration** (Bucher et al., 2021), to couple densification analysis with socio-economic data and qualitative data from fieldwork within the dashboard;
- development and exploration of **simulation models** for the impact of policies on densification processes, parametrise these models including qualitative data.



Thank you for your attention !

Any questions or contributions ?

`mouhamadou.ndim@ign.fr`

`https://github.com/subdense`