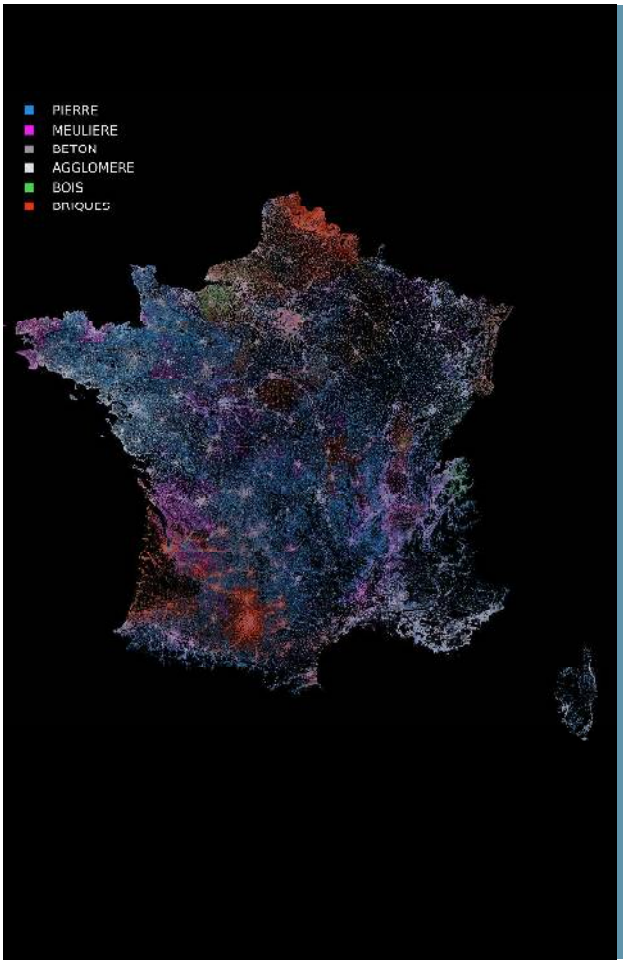


BDNB

Base de Données Nationale des Bâtiments

National Database of Buildings

Works on summer comfort and heatwave risks

2023

CSTB
le futur en construction

CSTB
le futur en construction

Nicolas NAVILLE, MSc

Coordinator of research activities on climate adaptation, R&D department

38 millions housing units

(67 m inhabitants)

1 billion m² tertiary buildings

- ✓ **Stratégie Nationale Bas Carbone (SNBC) : - 40% d'émissions GES en 2030** / Neutralité carbone 2050
- ✓ **Eco Energie Tertiaire : - 40% consommations en 2030** / -60% en 2050
- ✓ **Loi Climat & résilience :** résorption progressive des passoires thermiques (F et G / 2028)

Origin : the **Go-rénove project**

Decision support tools for renovation

février 2022

Web service for social housing operators

bailleur.gorenove.fr

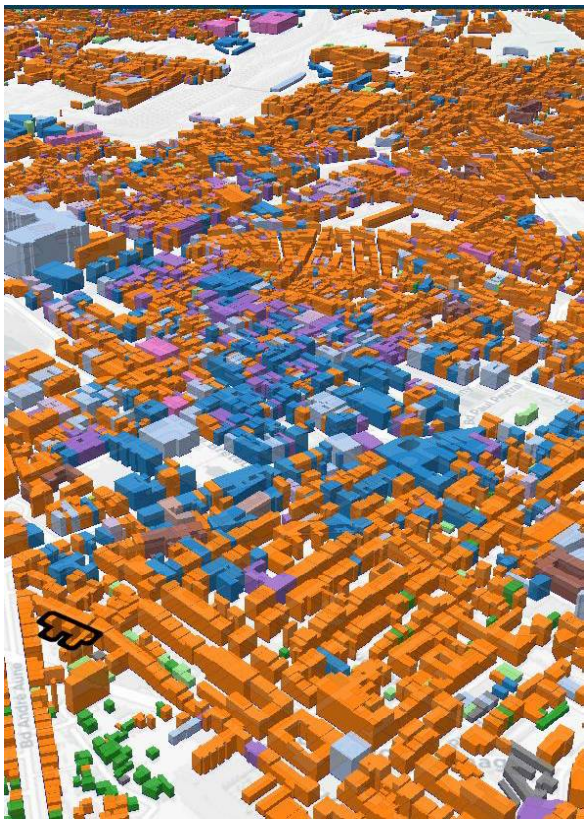
Avril 2022

gorenove.fr

BDNB

Les certificats D'ÉCONOMIES D'ÉNERGIE

PROFEEL Innover pour la rénovation des bâtiments



- A comprehensive database of the french building stock
- Housing + tertiary buildings
- Scale = **building**

✓ **27** millions buildings
✓ **1** identity card by building
✓ **400+** data

30 source databases
From public organisms

BAN

DONNÉES IGN
BDTOPO IGN

FICHIERS FONCIERS

L'OBSERVATOIRE DPE
base DPE de l'ADEME

LE REGISTRE DES COPROPRIÉTÉS

SDES
Données locales de l'Energie

Datafoncier
fichiers-fonciers
dv3f
Demande valeur foncière

ENEDIS
Base Points de livraison

DIRECTION GÉNÉRALE DES FINANCES PUBLIQUES

GÉORISQUES
Mieux connaître les risques sur le territoire

NEW SDES
Permis de construire SITADEL2 complet

POLITIQUE DE LA VILLE
Base des QPV

MERIMEE

SIRET
Système d'identification du Répertoire des Etablissements
Base SIREN

arcep
Base immeuble localisé

RÉPUBLIQUE FRANÇAISE
RPLS

Available data

Morphology

- Ex.: surface

Uses

- Ex.: activity type

Materials

- Ex.: type of glazing

Equipments

- Ex.: heating system

Energy consumptions

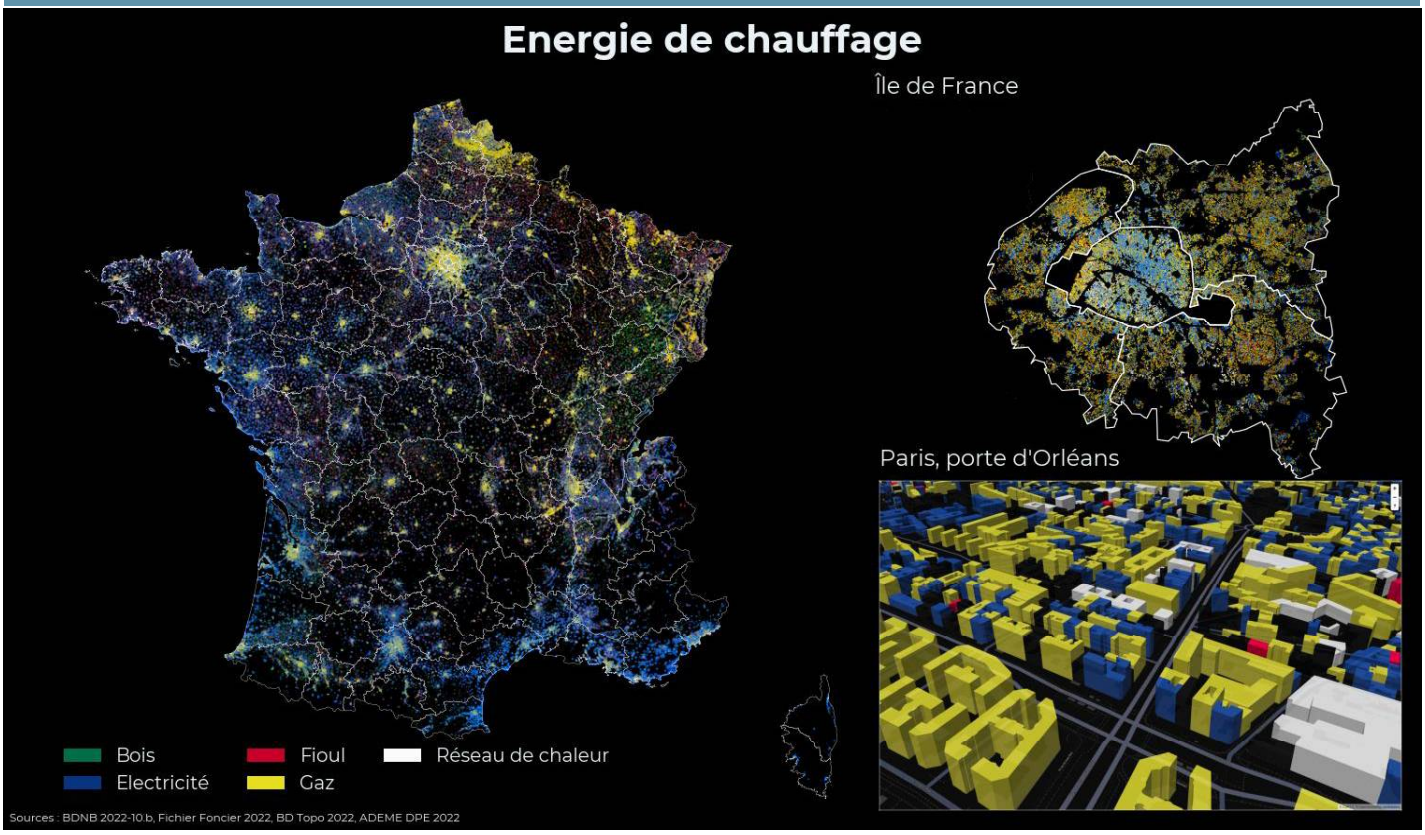
- Ex.: yealy energy consumption (OpenData)

Performance

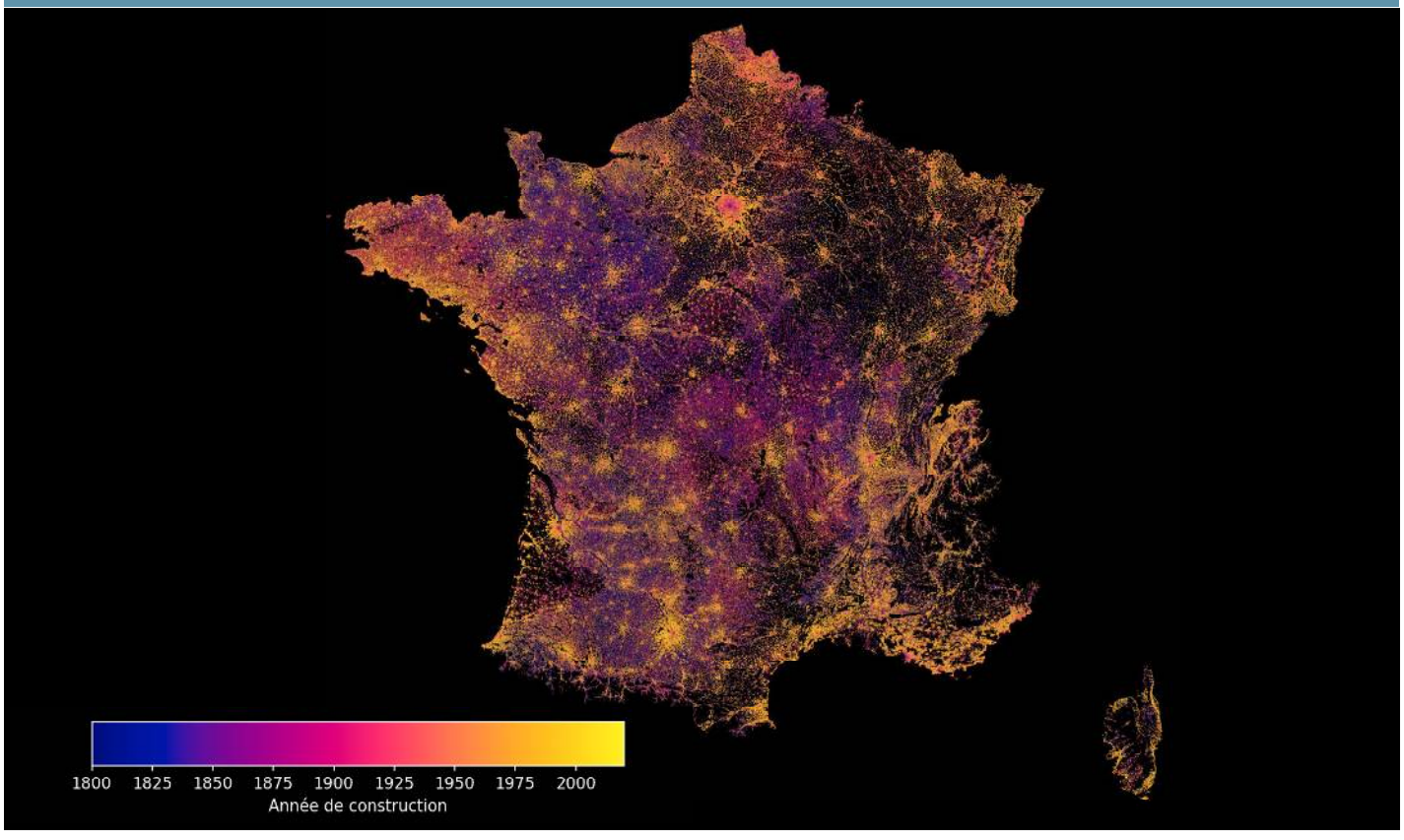
- Ex.: Energy Performance Certificate

BDNB : illustrations

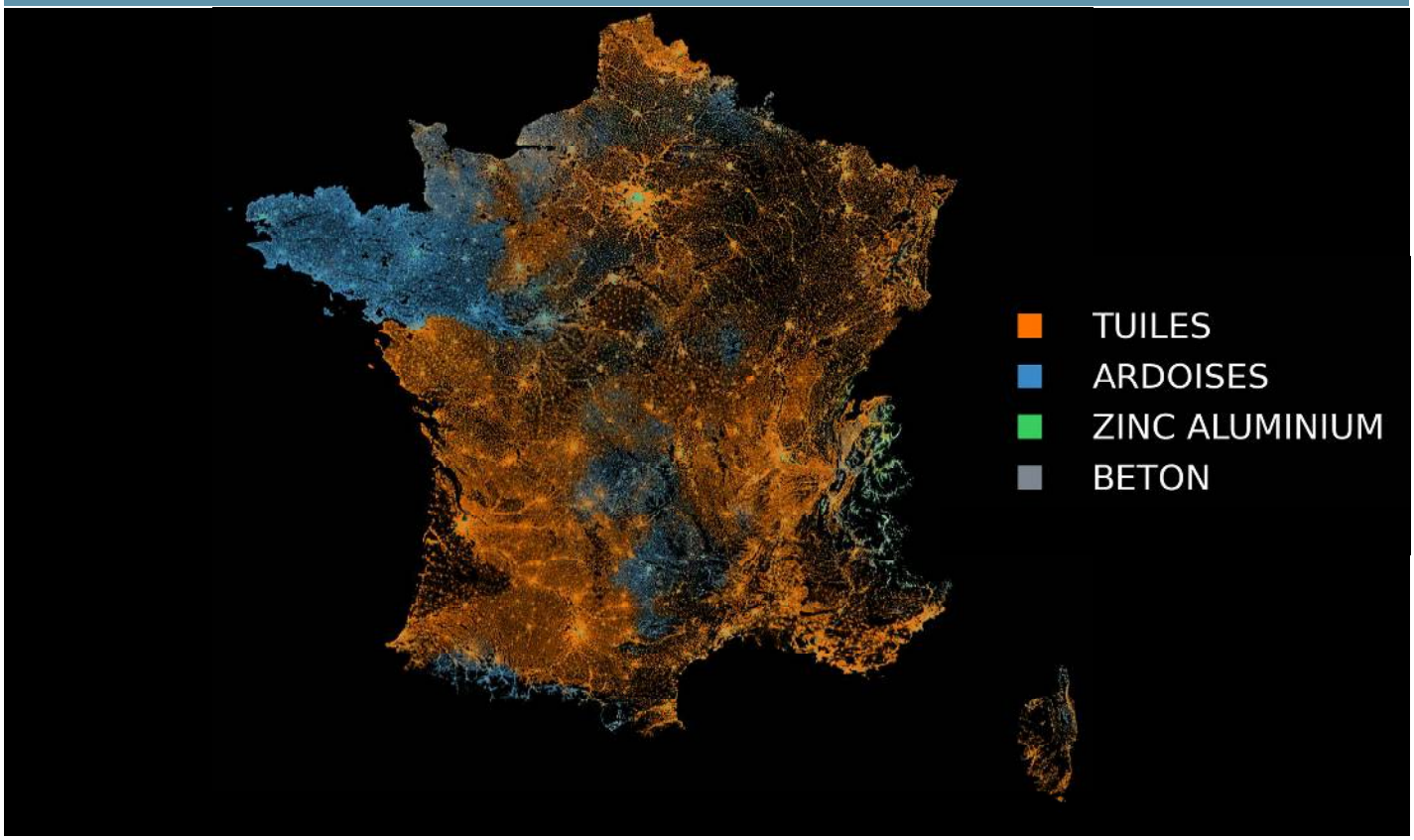
Heating energy sources



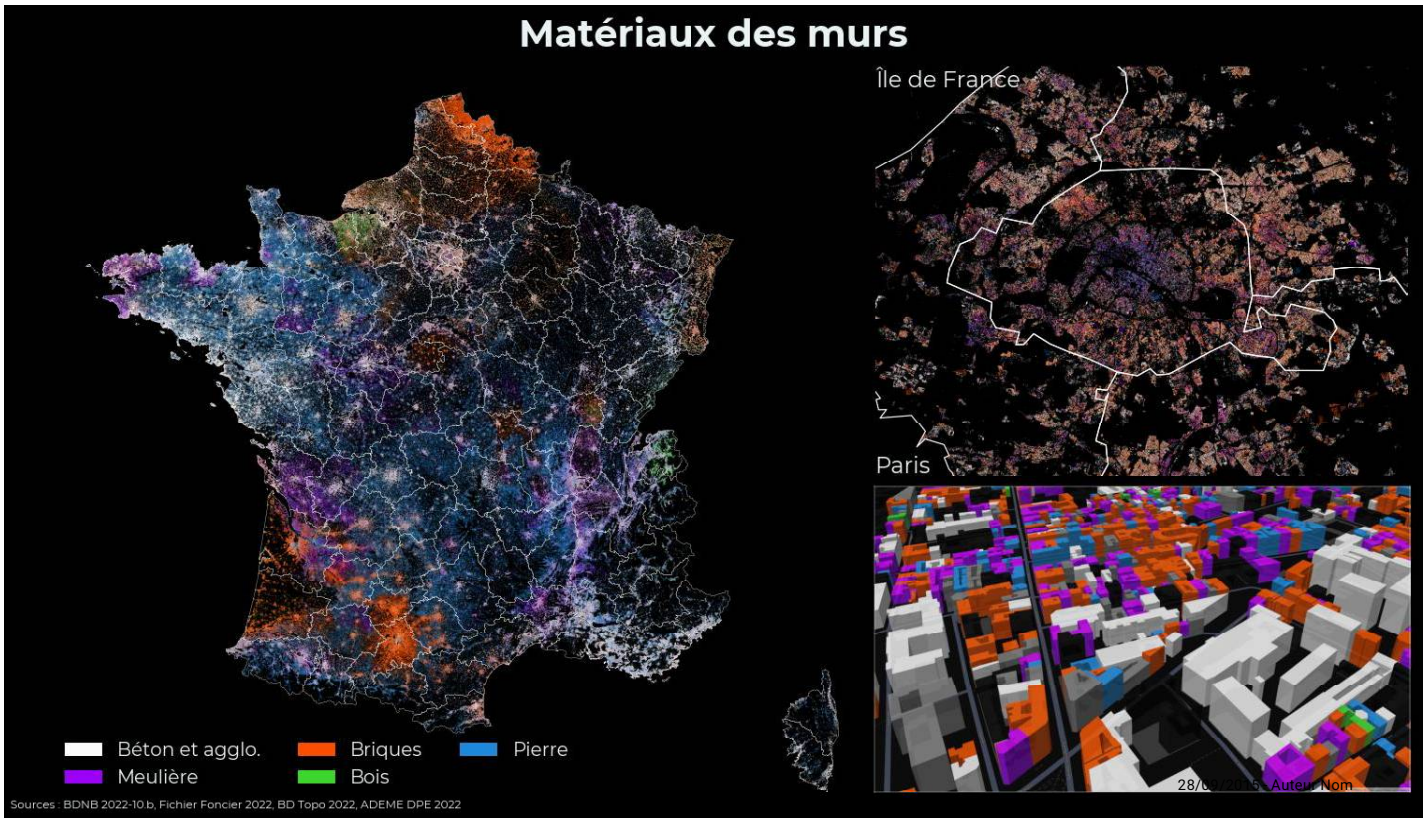
Construction periods



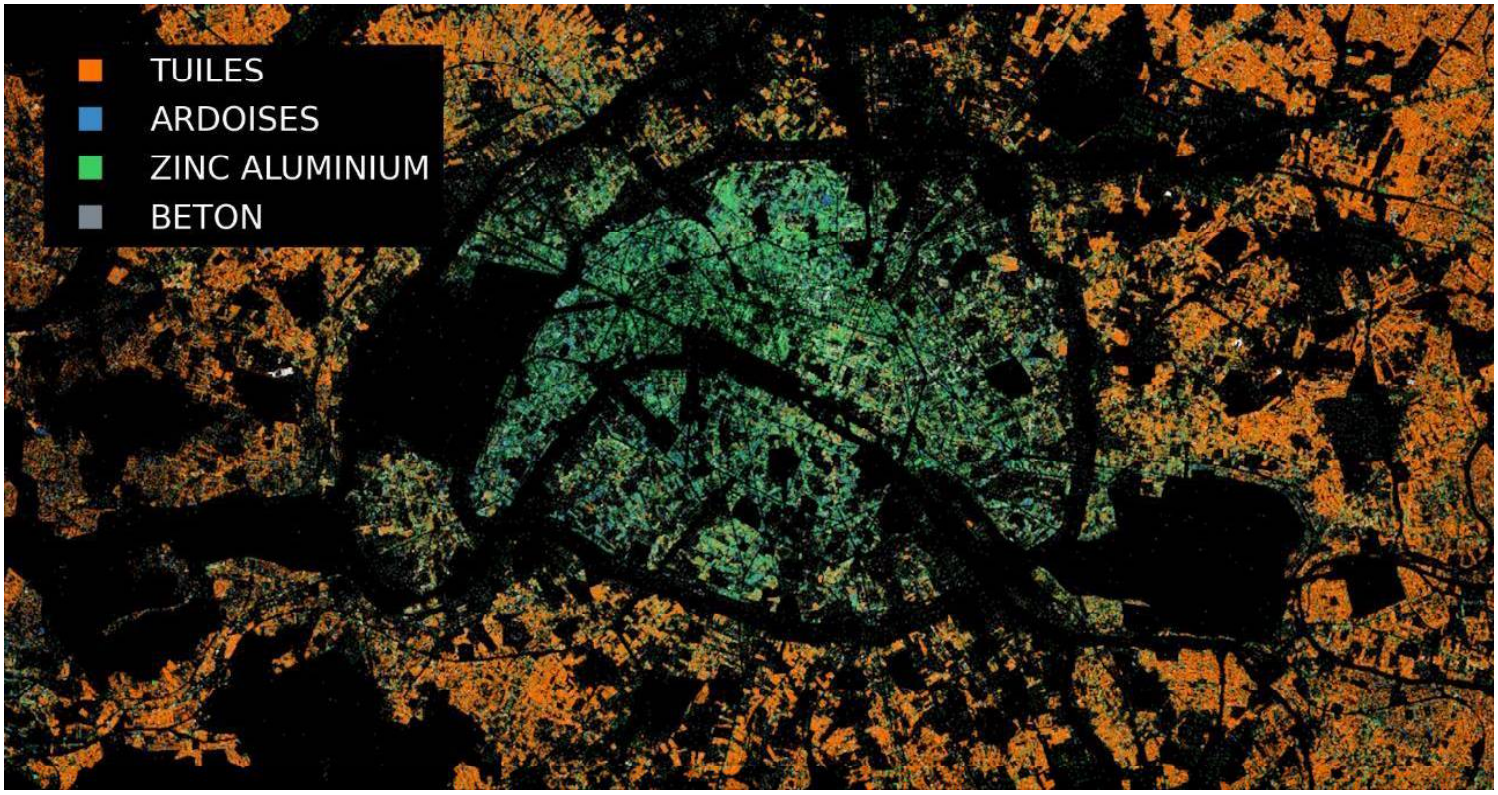
Roof materials



Wall materials



Roof materials

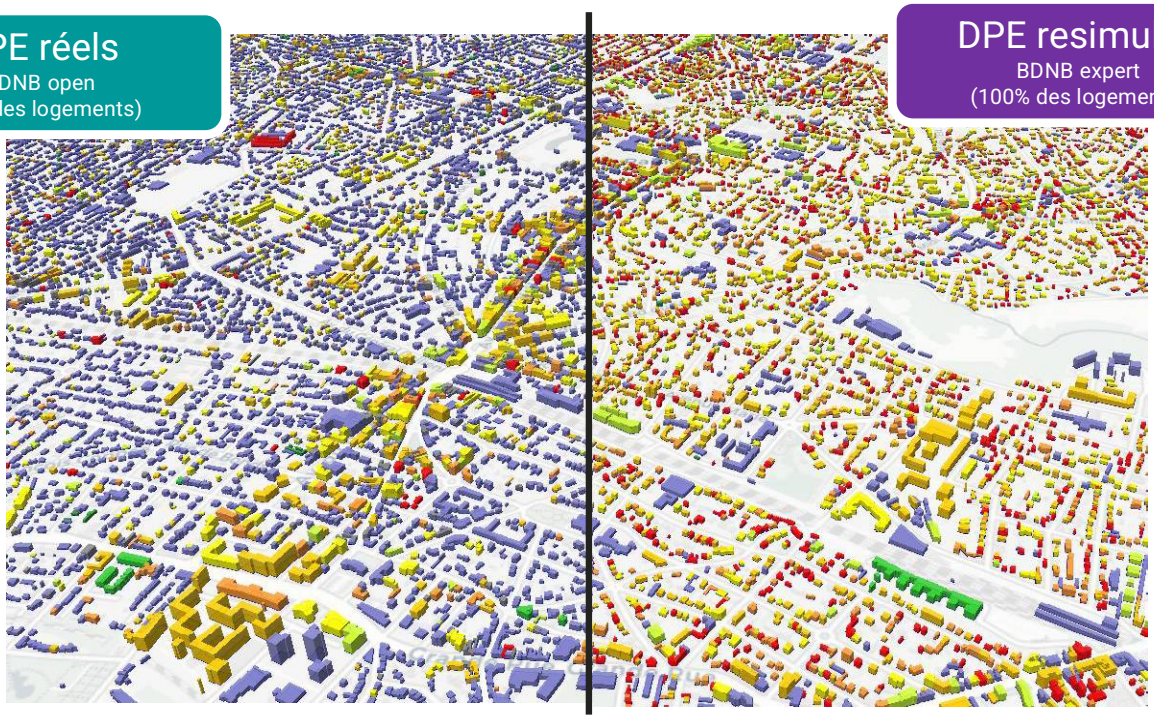


BDNB : examples of uses

Simulating Energy Performance certificates

DPE réels
BDNB open
(20% des logements)

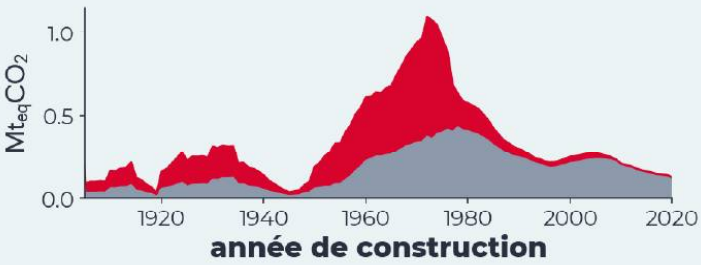
DPE resimulés
BDNB expert
(100% des logements)

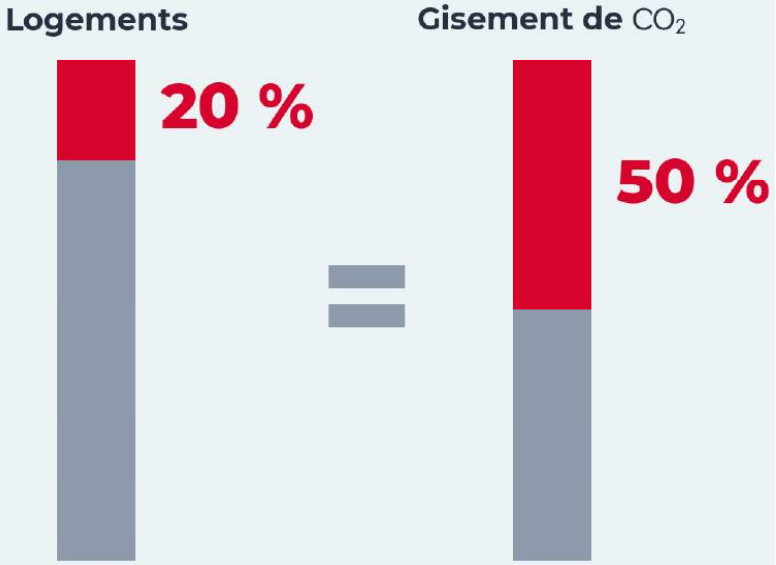


/

Analysing CO2 emission reduction potential

Gisement de CO_2 en exploitation de la rénovation globale du parc *





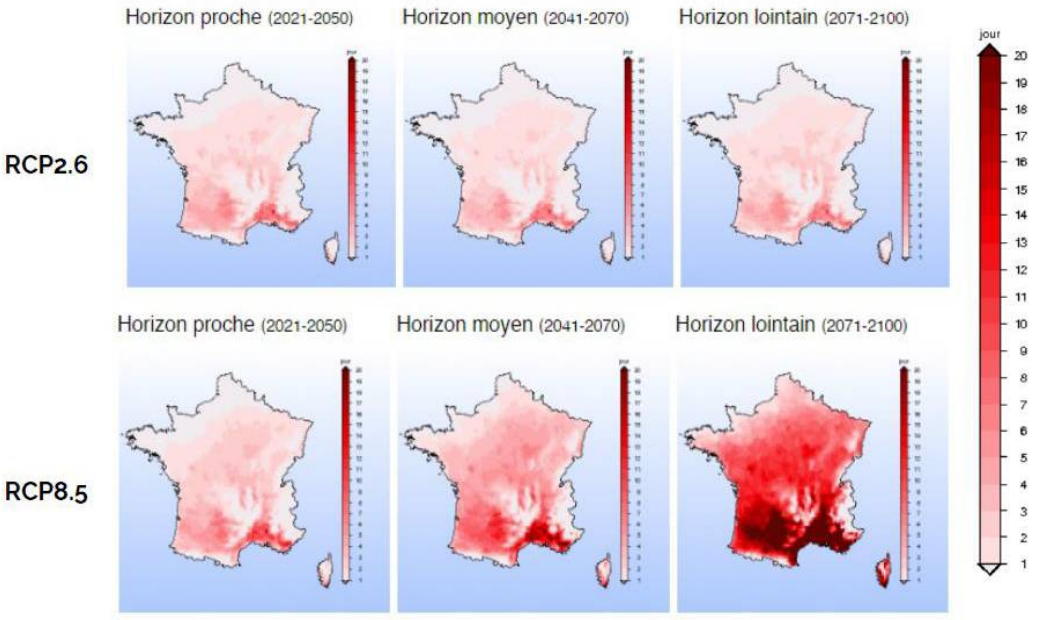
* Estimations basées sur une hypothèse de rénovation globale (isolation, changement de chauffage...). Méthode d'évaluation basée sur la méthode DPE arrêté 2021. Périmètre : 5 postes règlementaires : chauffage, ECS, ventilation, refroidissement, éclairage.

Sources : BDNB 2022-10.b, Fichiers Fonciers 2022, ©BDTOPO 2022, ADEME DPE 2022

BDNB and the vulnerability to heatwaves

Some context about heatwaves in France

NUMBER OF DAYS ABOVE 35 °C



Some context about heatwaves in France

Public Health Bulletin : Summer 2022

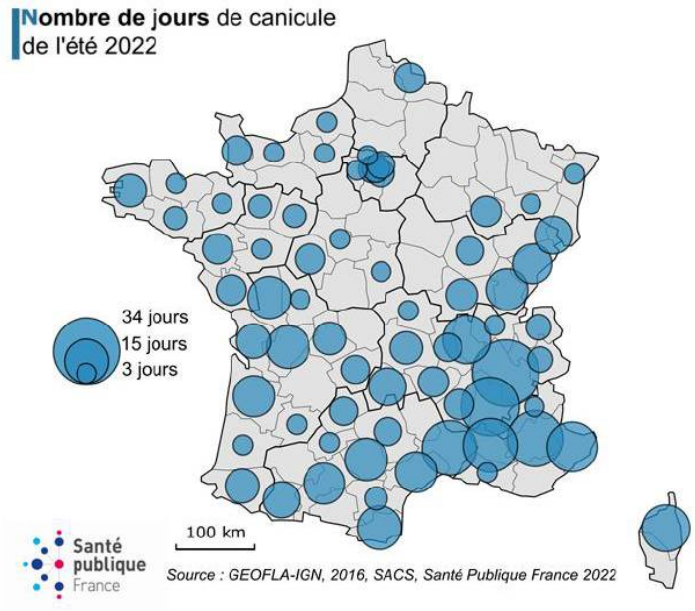
> 2022 : 2nd warmest summer since 1900, after 2003

> 3 heatwaves over the summer

> 10 420 additionnal deaths (+6,1%) (partly due to heat), with mortality peaks during the heatwaves (+16,7%)

> Summer 2003 heatwave : 15 000 additionnal deaths

NUMBER OF DAYS OF HEATWAVE, SUMMER 2022



The development of air conditioning

THE RAPID INCREASE OF AIR CONDITIONING SYSTEMS

> 25 % equipement rate in housing (2020)
> From 14% in 2016
> 55% in 2050 ? (prospective scenario by RTE, french power grid manager)

IMPACT ON ENERGY CONSUMPTION

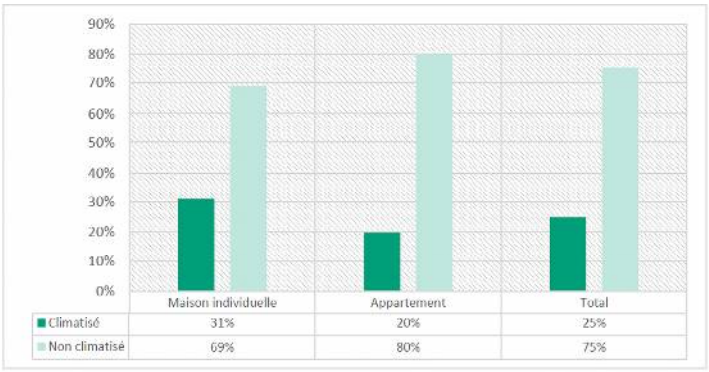
> Energy consumption. From 6 TWh in 2020 to 14 TWh in 2050. Significant impact on peak (prospective, RTE)

IMPACT OF REFRIGERANT GASES

> Refrigerant gases with high Global Warmth Potential (GWP). Europe : FGAS regulation driving GWP down

CHALLENGE : OPTIMIZE PASSIVE COOLING STRATEGIES

EQUIPMENT RATE OF AIR CONDITIONING IN FRANCE



INCREASING SALES OF AIR CONDITIONING SYSTEMS

Figure 12 : les statistiques de ventes des adhérents d'UNICLIMA (2004 -2015 – en milliers)

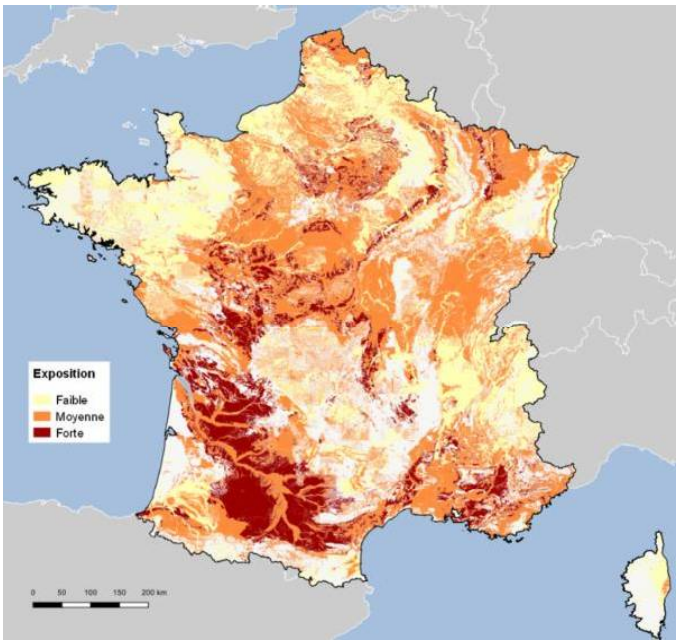
Impact of droughts on buildings

Impact of droughts on buildings

> Shrinking and swelling of argile soils

> Summer 2022 : historical records of dry soils

> 2,5 Md€ of damage in 2022, as reported by insurers



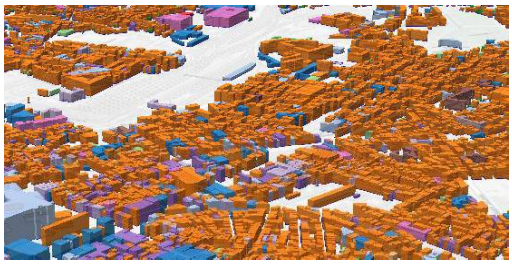
BDND and summer thermal comfort

Two ongoing streams of work

- Summer thermal comfort indicator
- Urban Heat Island (UHI) Indicator

Summer thermal comfort indicator

By the end of 2023, add a **new summer thermal comfort indicator**



> In the BDNB

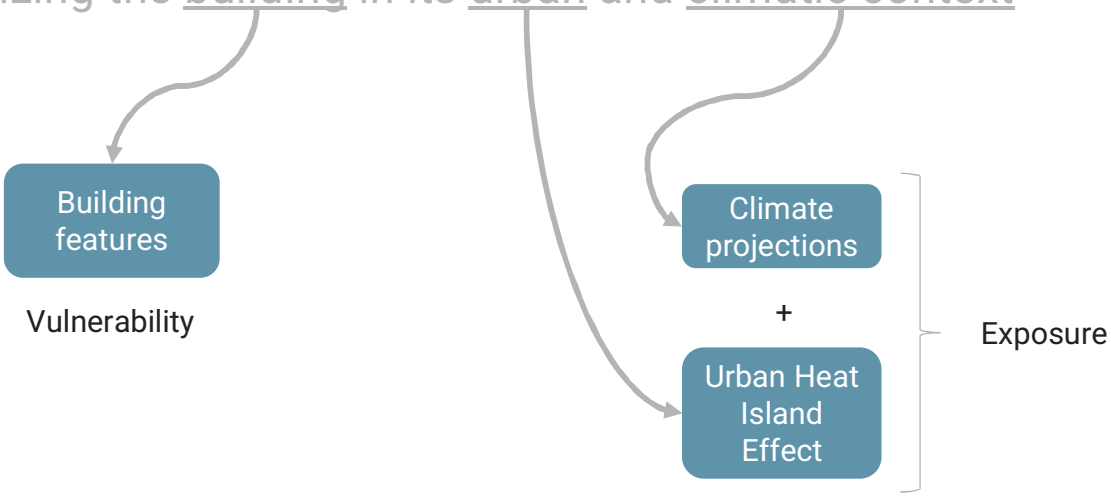
Go-rénove « particuliers»

Gorenove.fr

> In the Go-Rénove platform

Summer thermal comfort : a 3-in-1 indicator

Characterizing the building in its urban and climatic context



From climatic context to thermal comfort

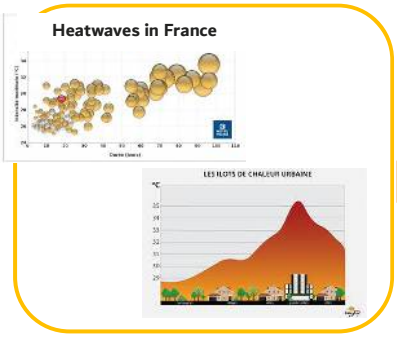
Exposure + Vulnerability = Risk

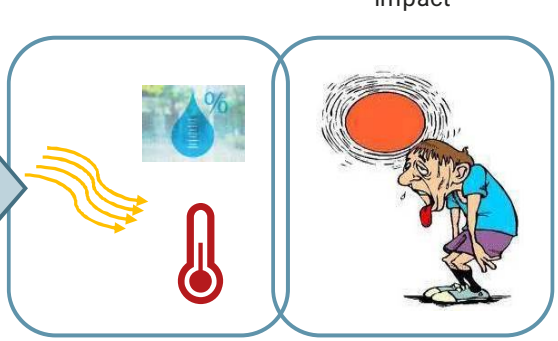
Climatic and urban context

Building features

Indoor environment

Comfort, physiological impact





fTMY

CSTB Dimosim

Comfeth CSTB

TRNSYS 18

Mathis - TRNSYS

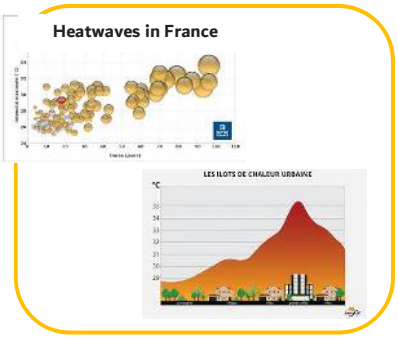
NHTM

PULSE Pioneering Human Lab for Sensory Evaluation

Summer thermal comfort indicator

Evaluate the exposure of each building

Climatic and urban context



- Select climate scenarios and models
- Select typical and extreme events
- Add UHI effect

Summer thermal comfort indicator

Characterize each building for summer comfort

Building features

- Select typical buildings representative of the national building stock
- Thermal simulation of the typical buildings
- Simplify and extropolate : create metamodels

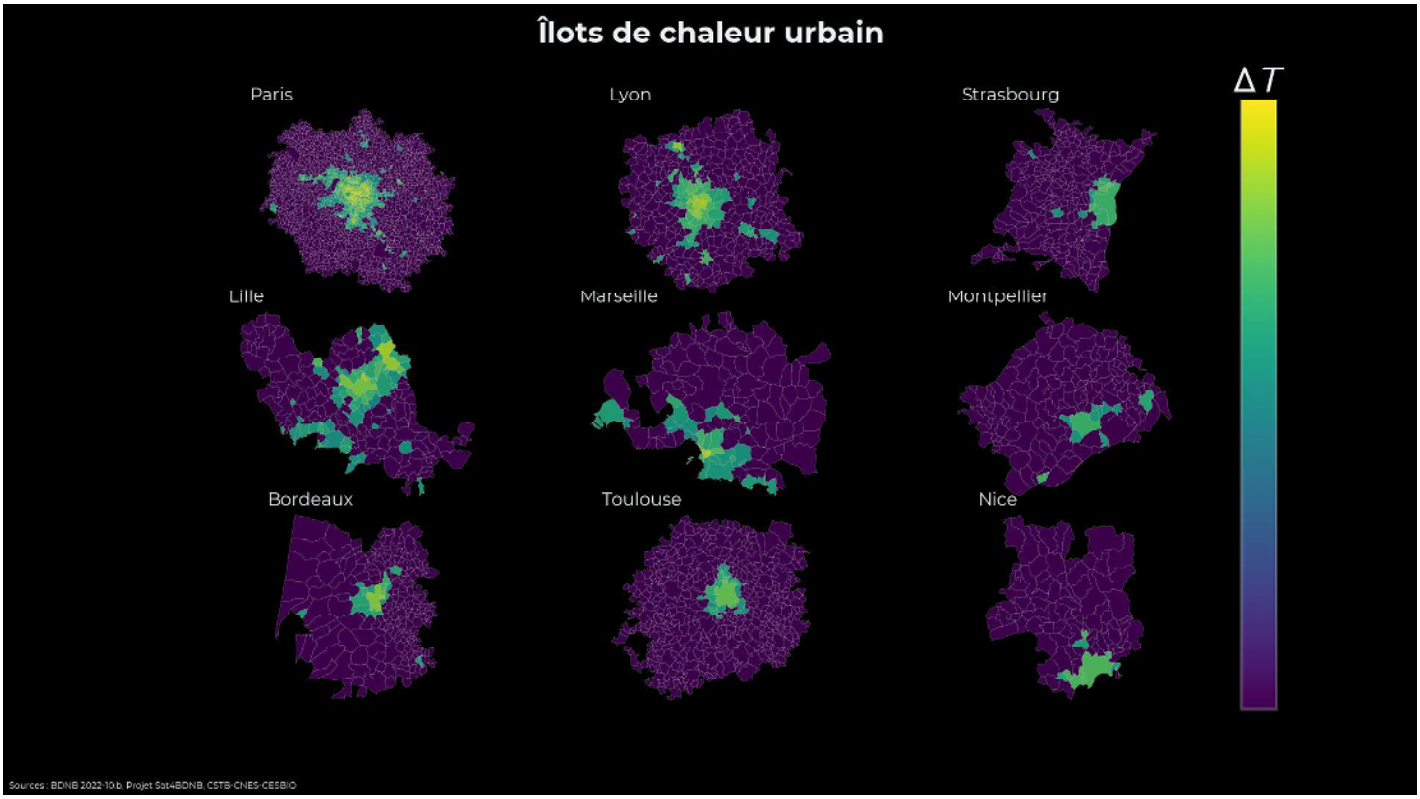
BDNB and summer thermal comfort

Two ongoing streams of work

Summer thermal comfort indicator

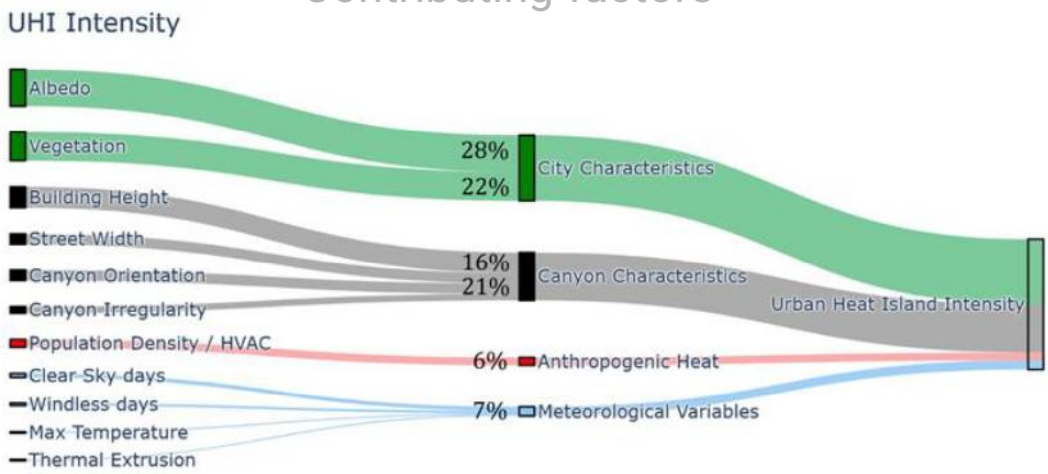
Urban Heat Island (UHI) Indicator

Mapping Urban Heat Island (UHI) intensity



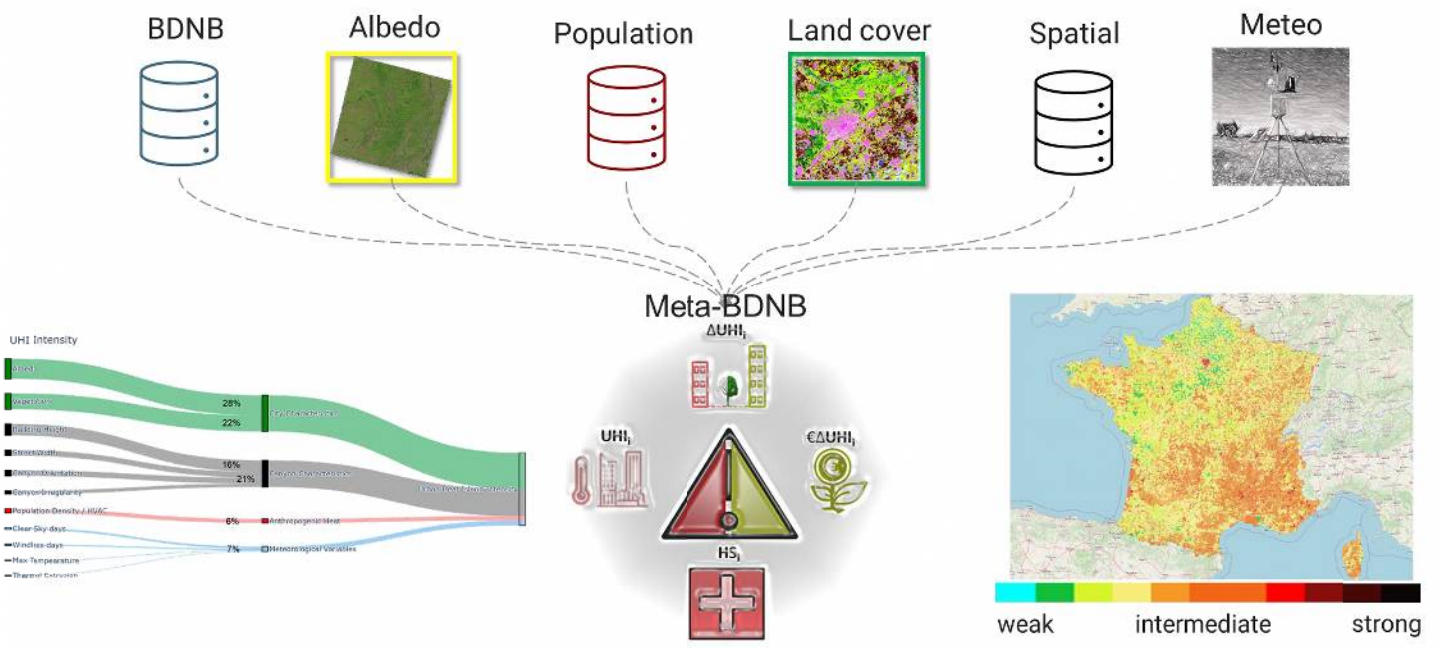
Mapping Urban Heat Island (UHI) intensity

Contributing factors*



*Nature Scientific Reports
Sangiorgio, Fiorito, Santamouris, 2020
https://doi.org/10.1038/s41598-020-75018-4

Mapping Urban Heat Island (UHI) intensity



Mapping Urban Heat Island (UHI) intensity

Scale of analysis

> Distric scale (~ 2000 inhabitants) : INSEE (french statistical office) IRIS perimeters (statistical perimeters)

Data sources for characterizing the different parameters

DEMOGRAPHIC AND SOCIOECONOMIC DATA

> Population density : FILOSOFI database (french statistical office and tax authorities)

CITY CHARACTERISTICS

> Albedo : LandSat-8 multispectral image data (30-meter spatial resolution)
> Ubran greenery : high-resolution multispectral image data derived from the Sentinel-2 mission program. (provided by Pôle Theia and COPERNICUS program)

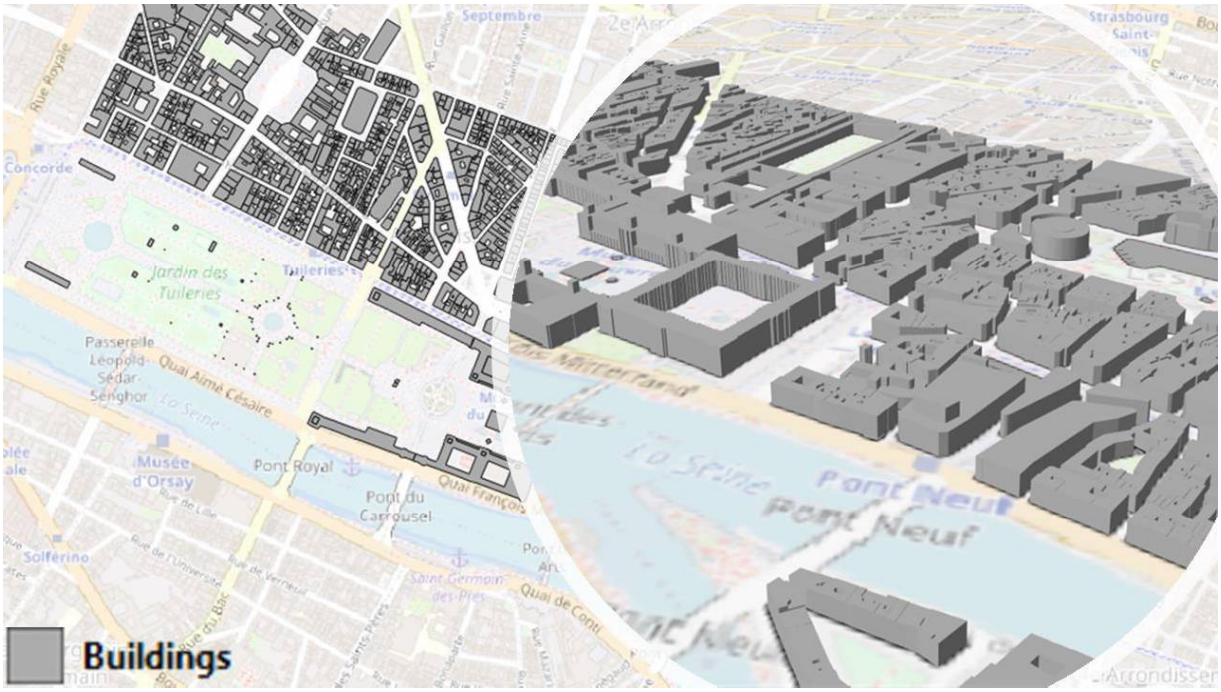
CITY CANYON CHARACTERISTICS

> IGN BD TOPO : 3D vector description of the territory, infrastructures and buildings

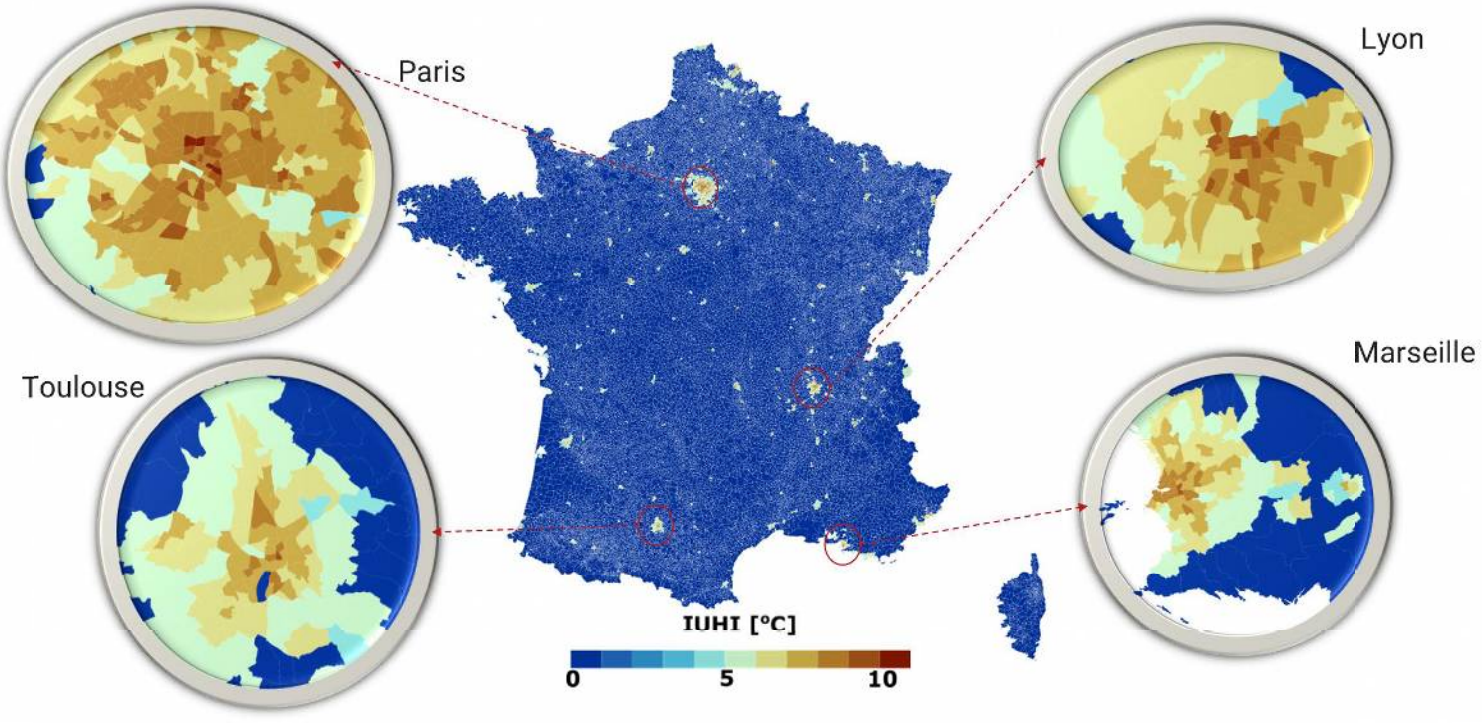
METEOROLOGICAL VARIABLES

> Selection of 229 Typycal meteorological years (TMY) from several public sources

Mapping Urban Heat Island (UHI) intensity

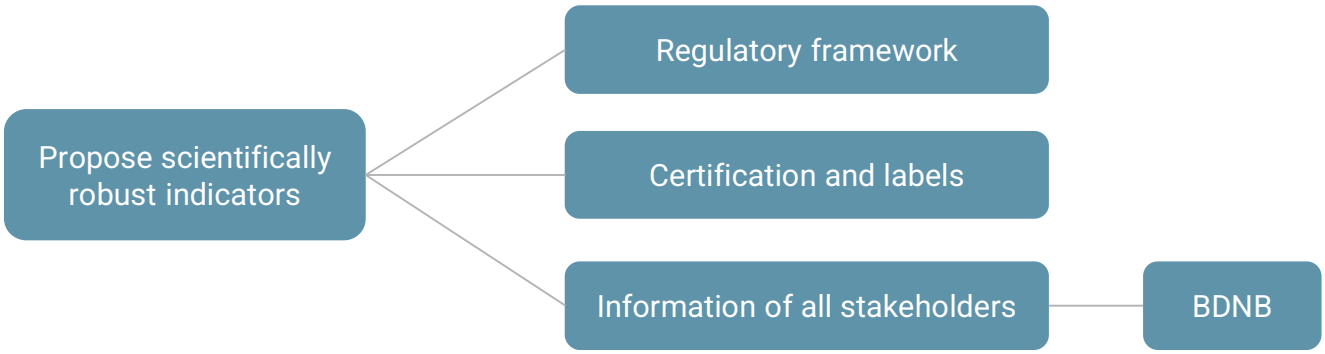


Mapping Urban Heat Island (UHI) intensity



Overview : CSTB contribution on summer comfort indicators

Indicators : information, incentives, rules



Thank you for your attention