

ENERGY

GWh

kt CO₂-eq

GHG EMISSIONS

Le métabolisme

urbain de Bruxelles :

Nexus et Hinterlands

ARISTIDE ATHANASSIADIS – 06 JUILLET 2021

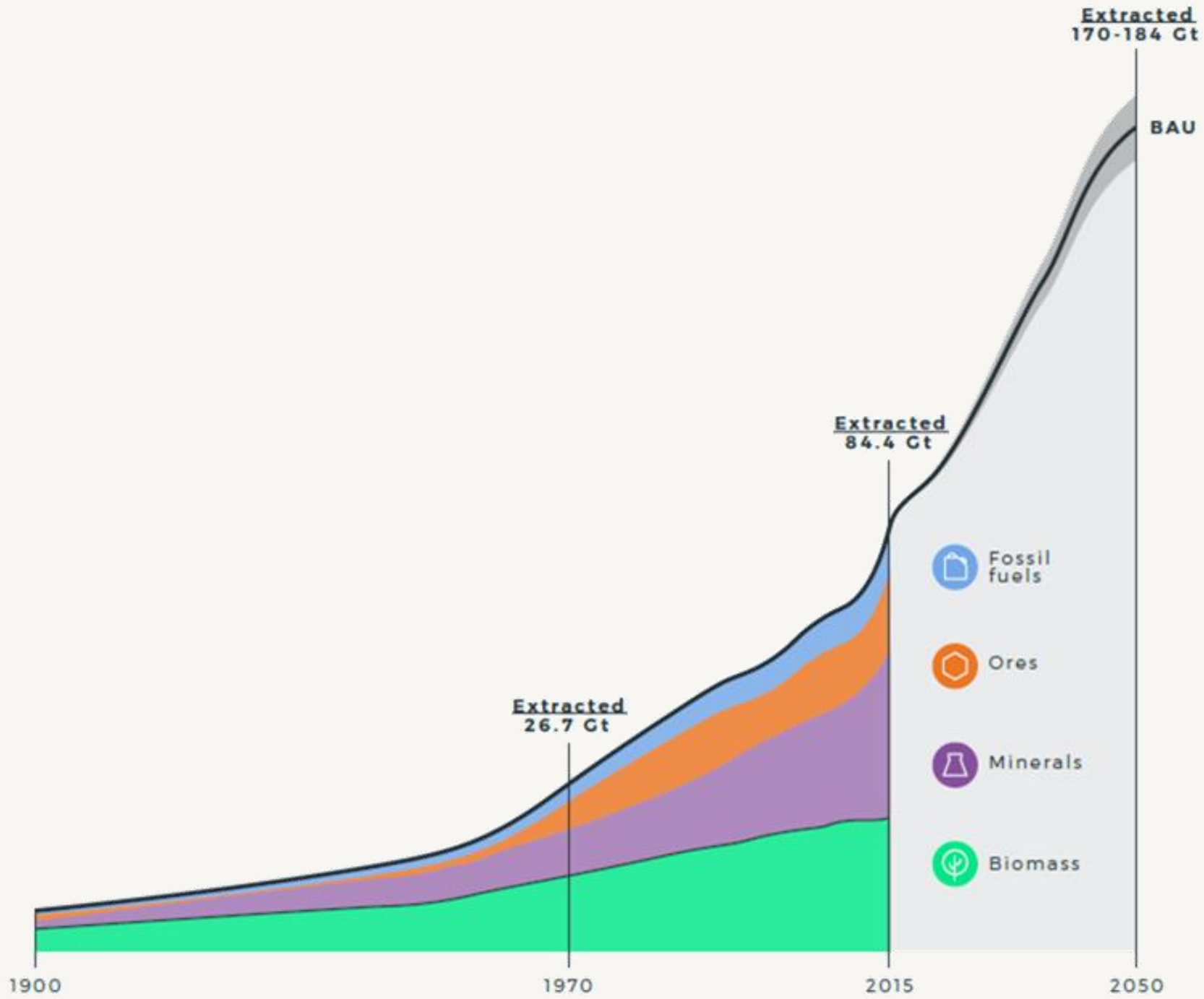
EPFL

www.epfl.ch/labs/herus/

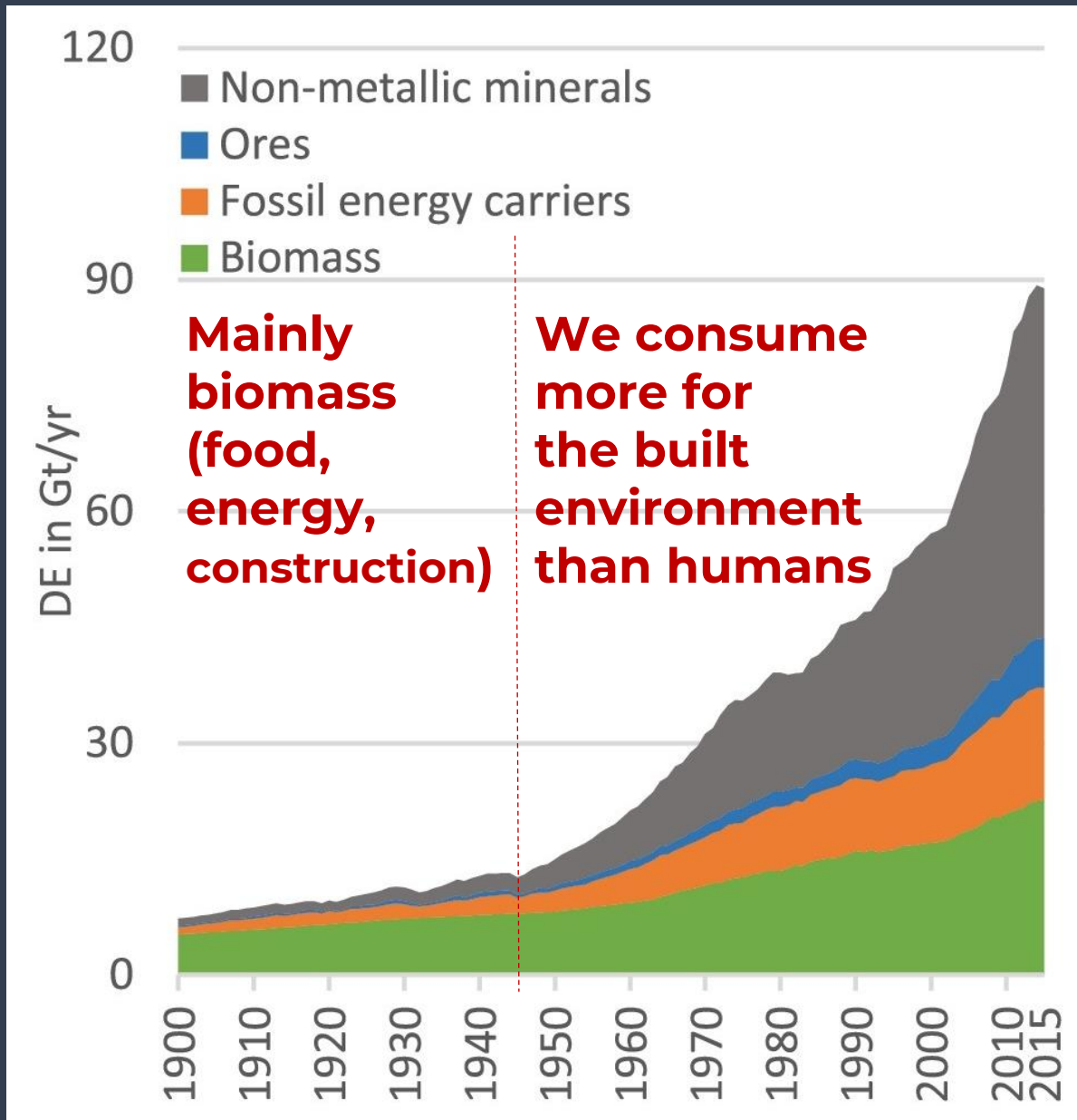


www.metabolismofcities.org

**Un peu de
contexte**

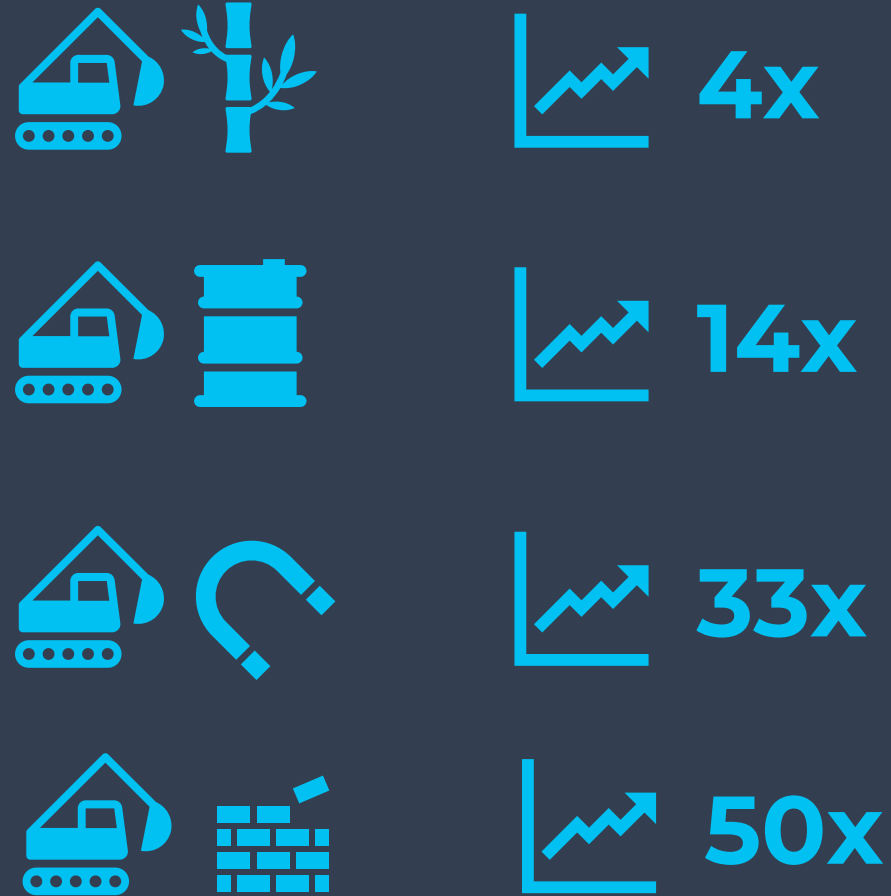


Circle Economy (2018). The Circularity Gap Report



Extraction matérielle

De 1900 to 2015,
Population globale a
augmenté de 4,5x

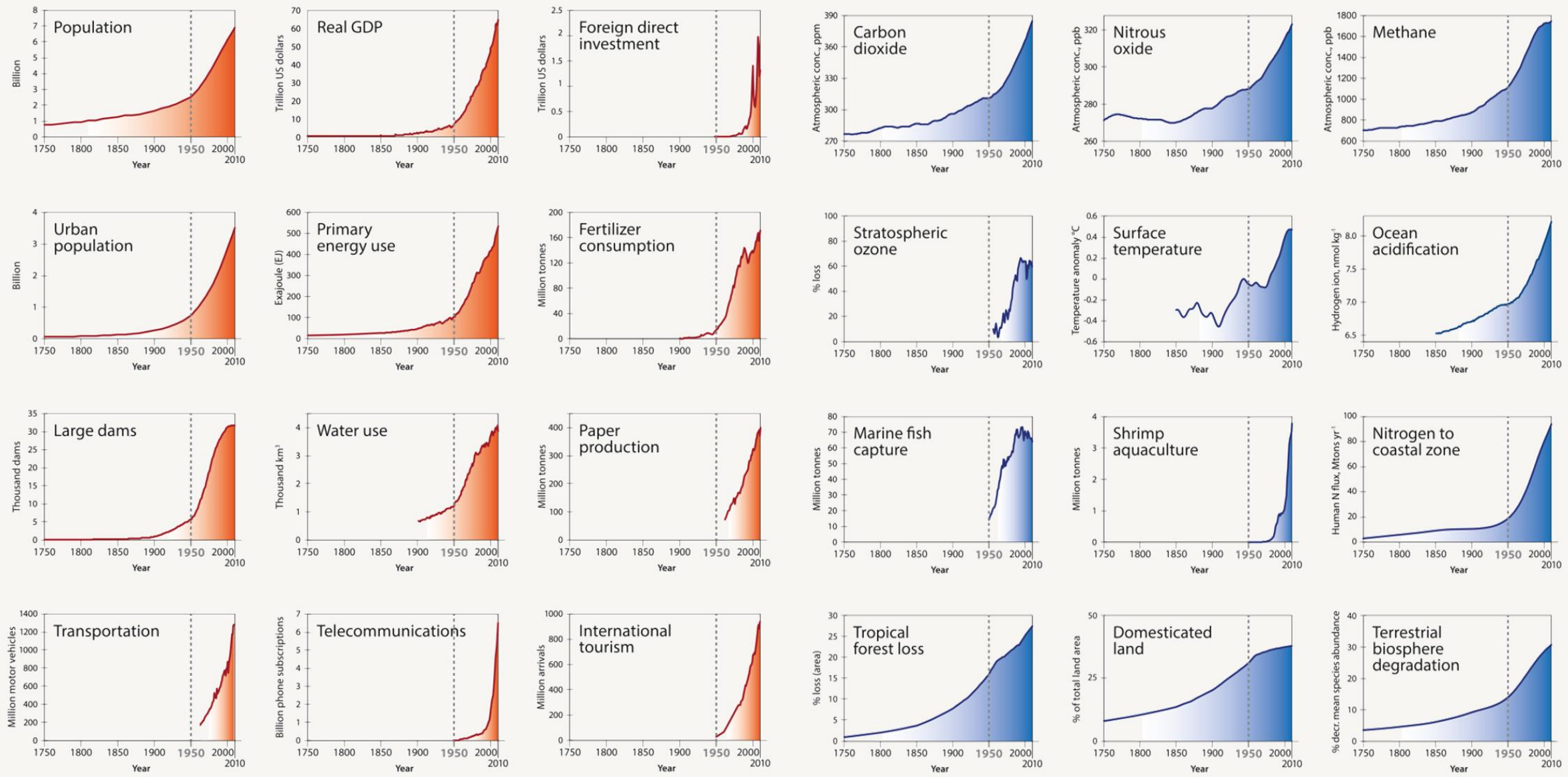


Synthèse

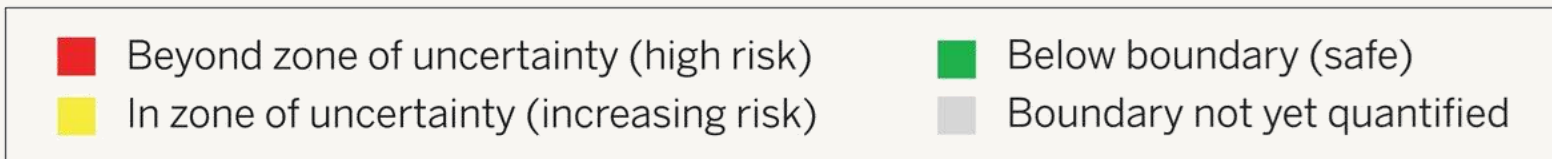
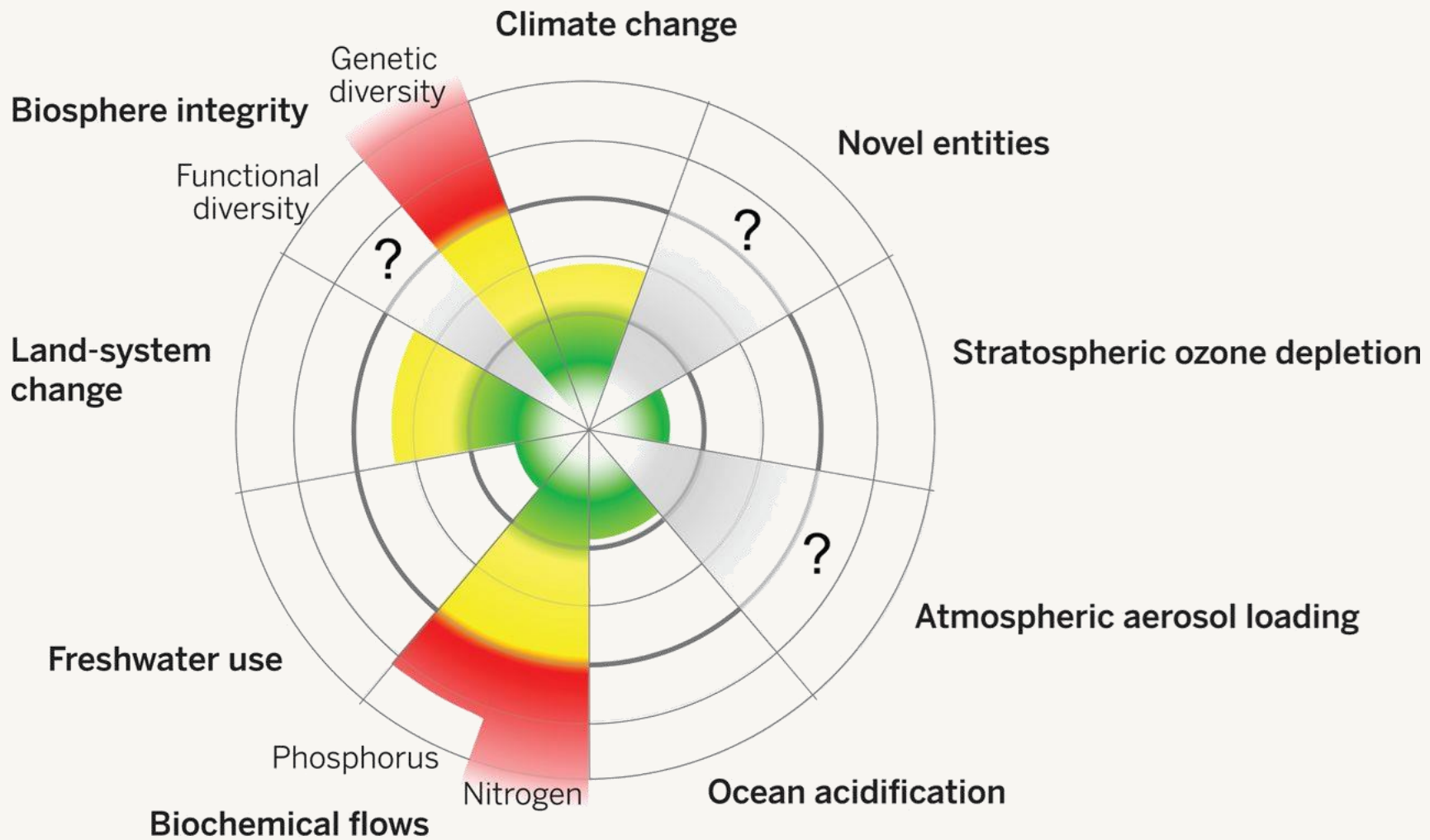
De 1900-2015

- Population Globale : 4.6x
- Population Rurale: 2.6x
- **Population Urbaine : 14x**
- **Consommation Energétique Primaire : 15x/year**
- Consommation d'eau : 6x/year
- **Extraction de matériaux : 12x/year**
- Stocks matériels : 30x
- **Déchets/Flux sortants: 11x/year**
- **CO₂ emissions: 15x/year**

Et alors ?

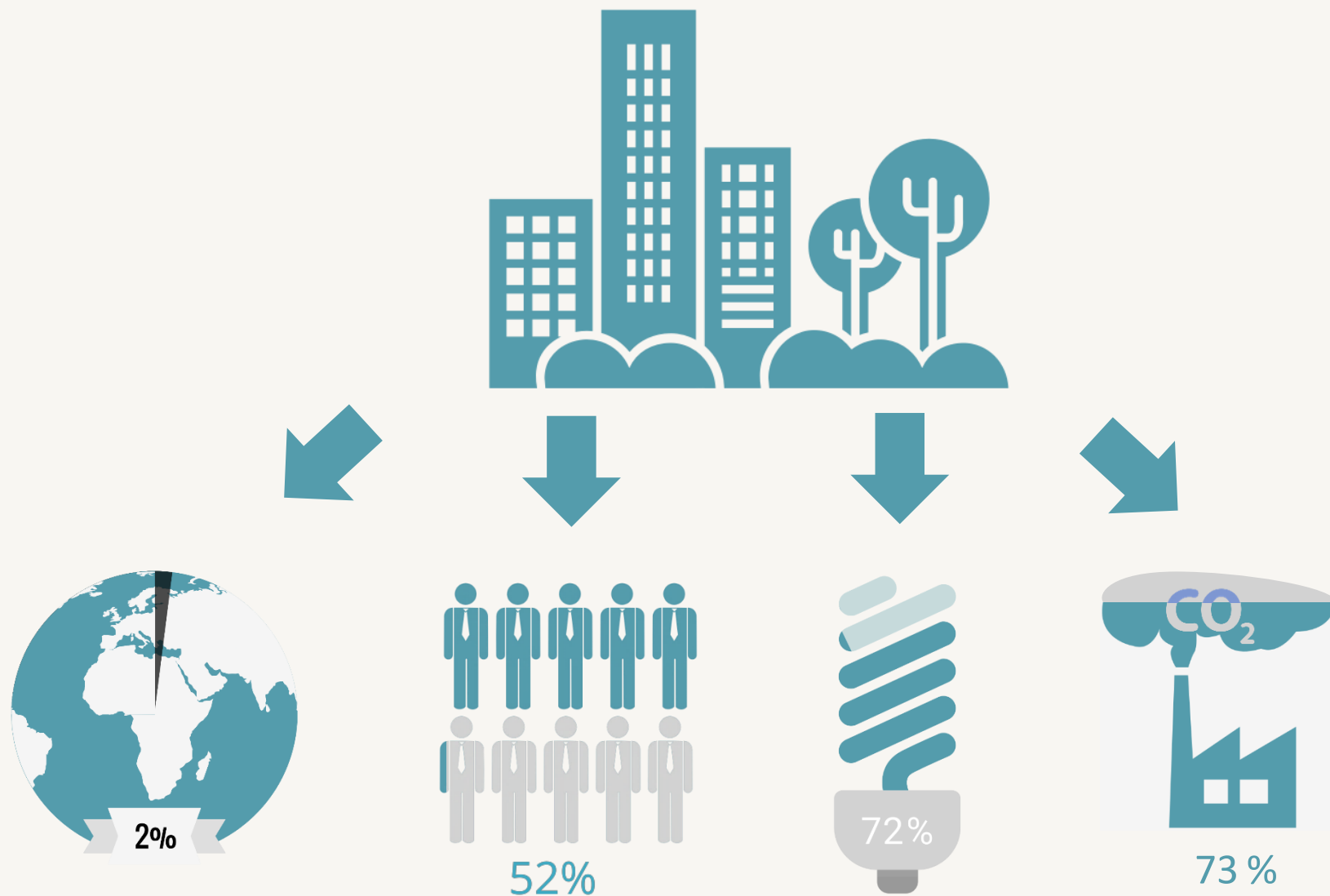


Steffen et al. (2015). The trajectory of the Anthropocene: The Great Acceleration

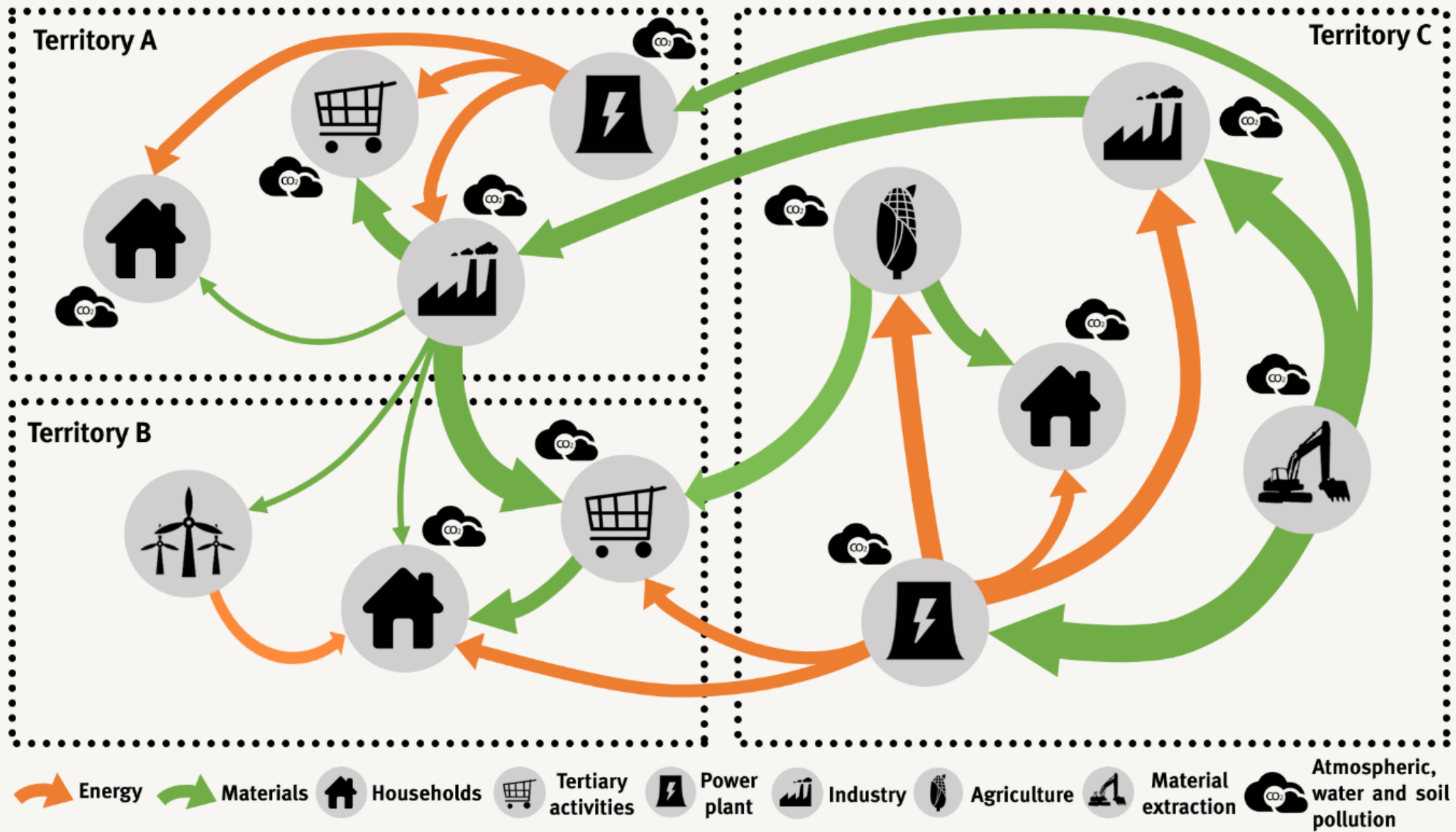


Steffen et al. (2015). Planetary boundaries: Guiding human development on a changing planet

**Les villes comme
un.e enjeu/solution
central.e**



Les villes comme un nœud d'enjeux



Qui est responsable ? Par où commencer ?



Importation de produits finis

**Loin des yeux,
loin du cœur**











**Comment on en
est arriver là ?**



Désolidarisation

Specialisation Emplois **Specialisation Spatiale**

Des villes-territoires sans ressources ?

EROI

Train
Bateau
Avion

Des ressources trop peu chères

Ville résiliente

Ville durable

Ville sobre

Ville circulaire

Ville autosuffisante

Ville décarbonnée

Comment négocier entre tous ces flux/enjeux ?

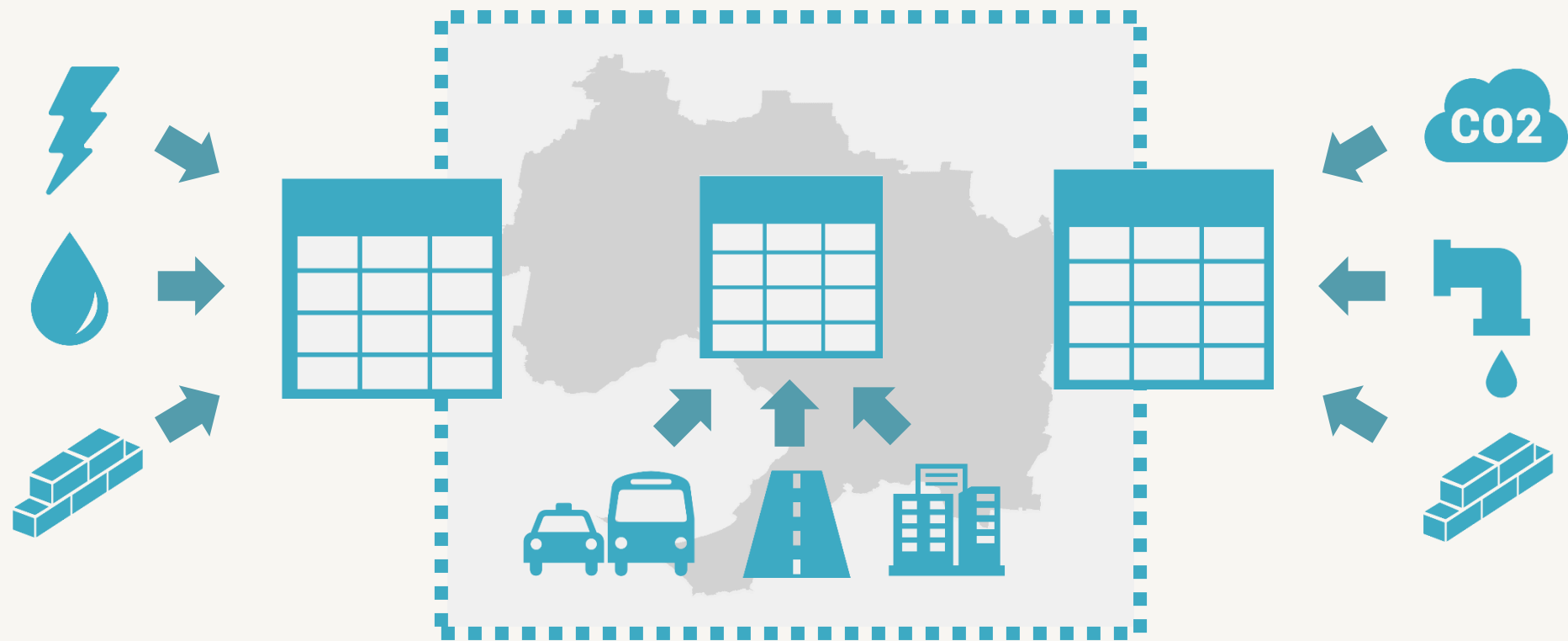
Le métabolisme urbain- une intro



=



Le métabolisme urbain

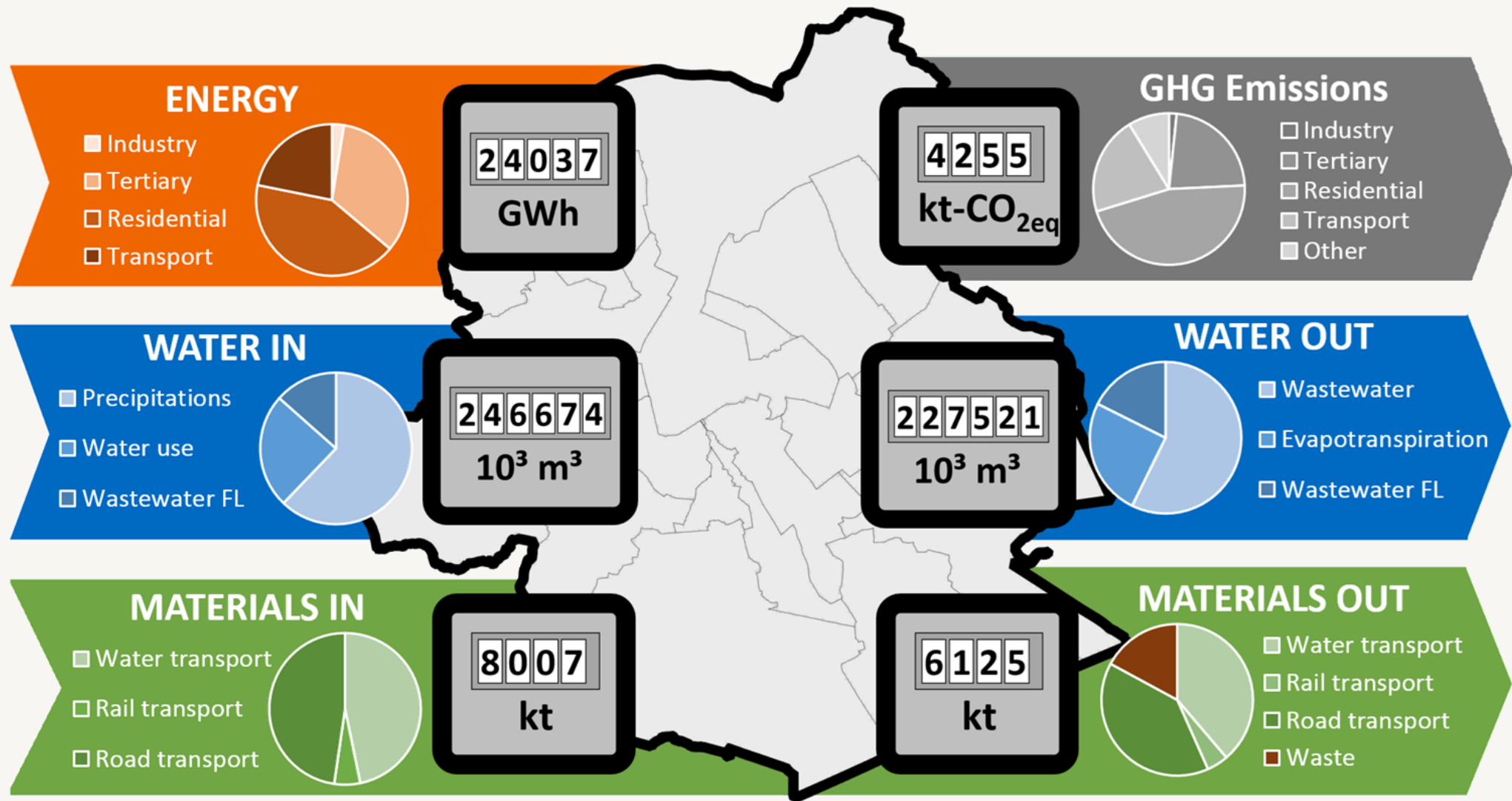


Un domaine d'étude (inconsolidé) étudiant les flux/stocks et les acteurs de villes d'une manière systémique

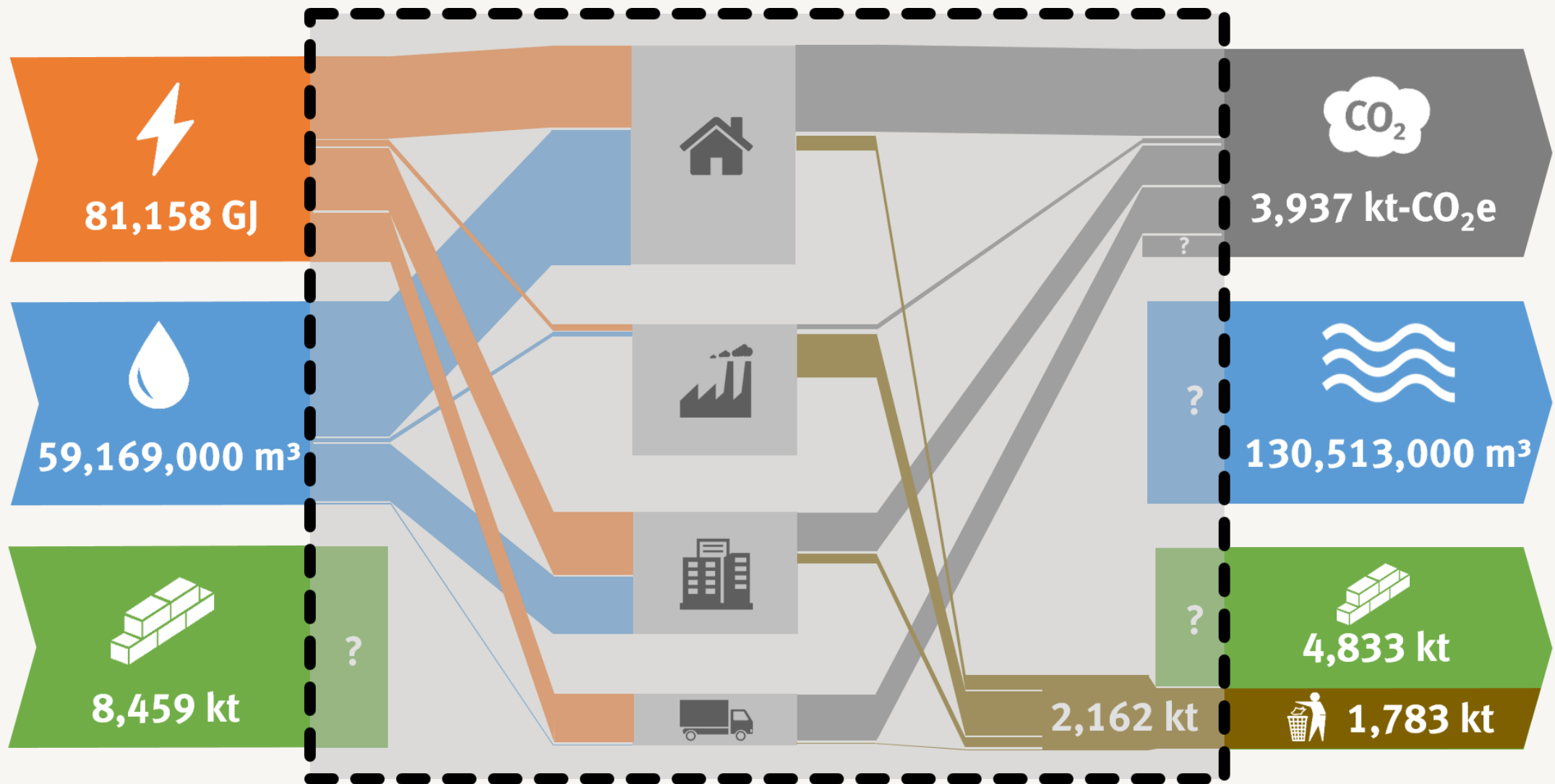
Le métabolisme urbain de Bruxelles



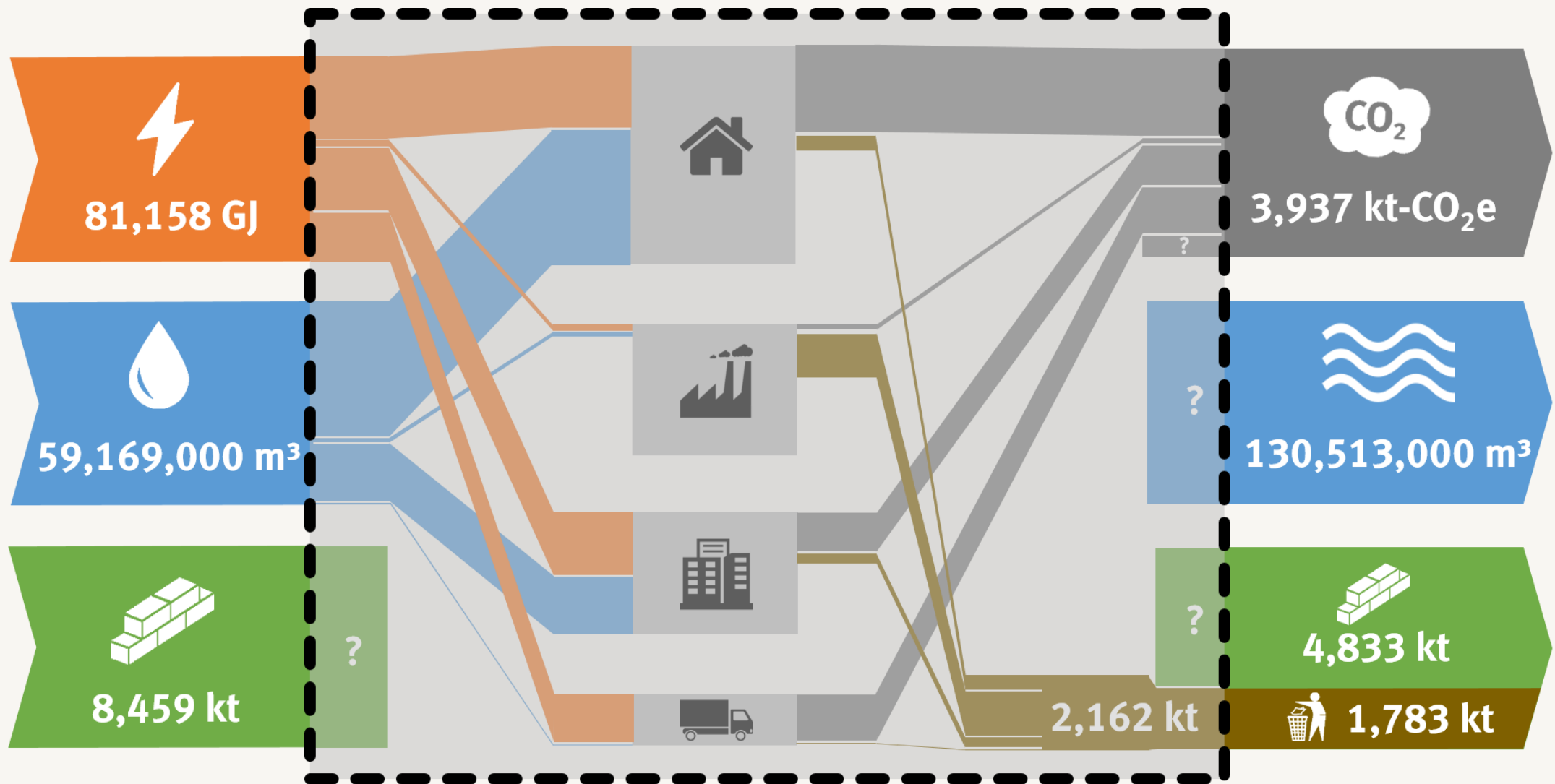
En théorie



En pratique (<3% local)



En pratique



FEW quasi inexistant localement

Quels nexus ?



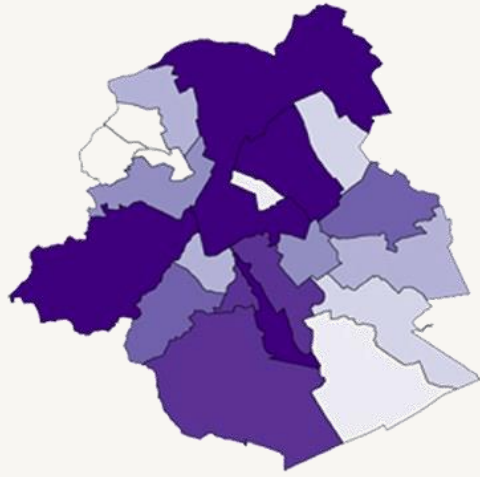
NEXUS ENTRE FLUX



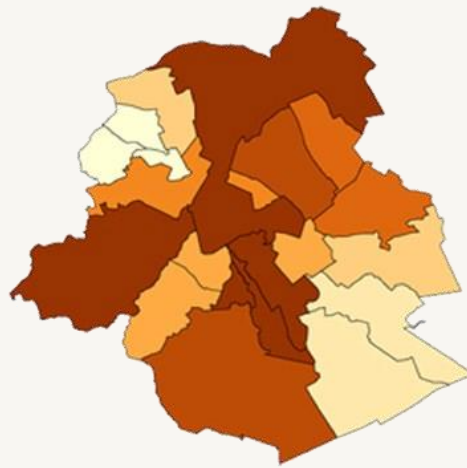
NEXUS FLUX ET STOCKS



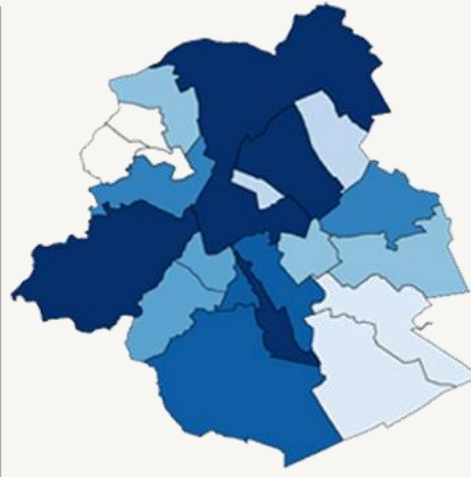
**NEXUS ENTRE
INFRASTRUCTURES**



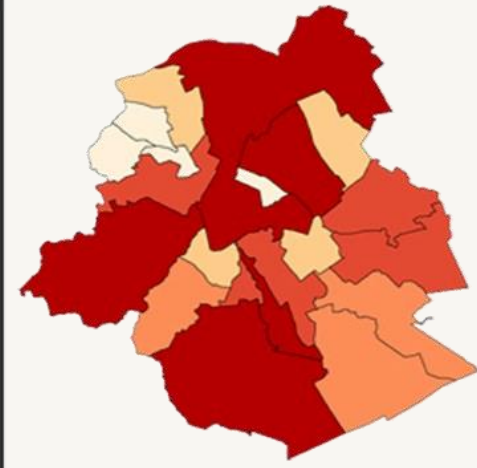
Gas consumption



Electricity consumption



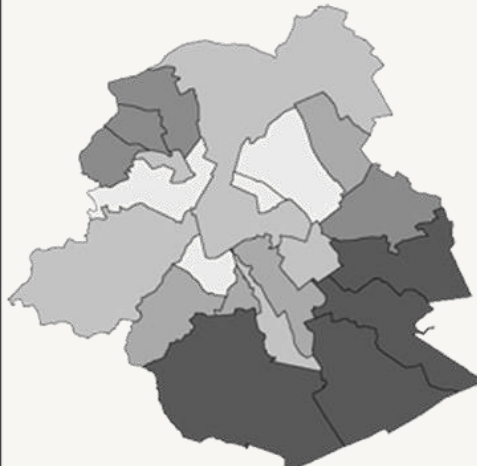
Water consumption



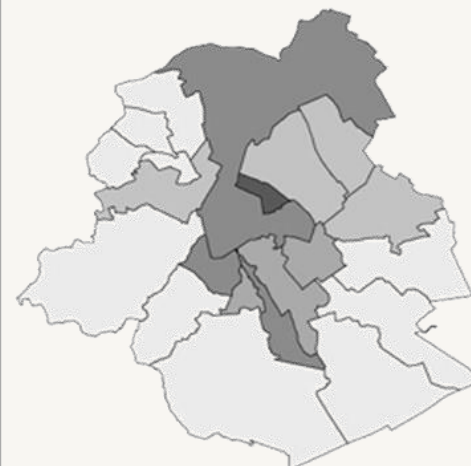
Material stock



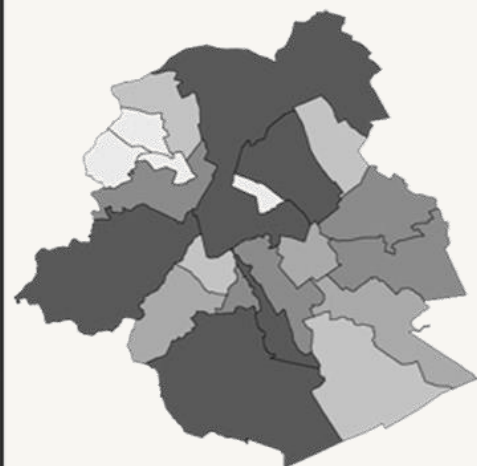
Density



Average income

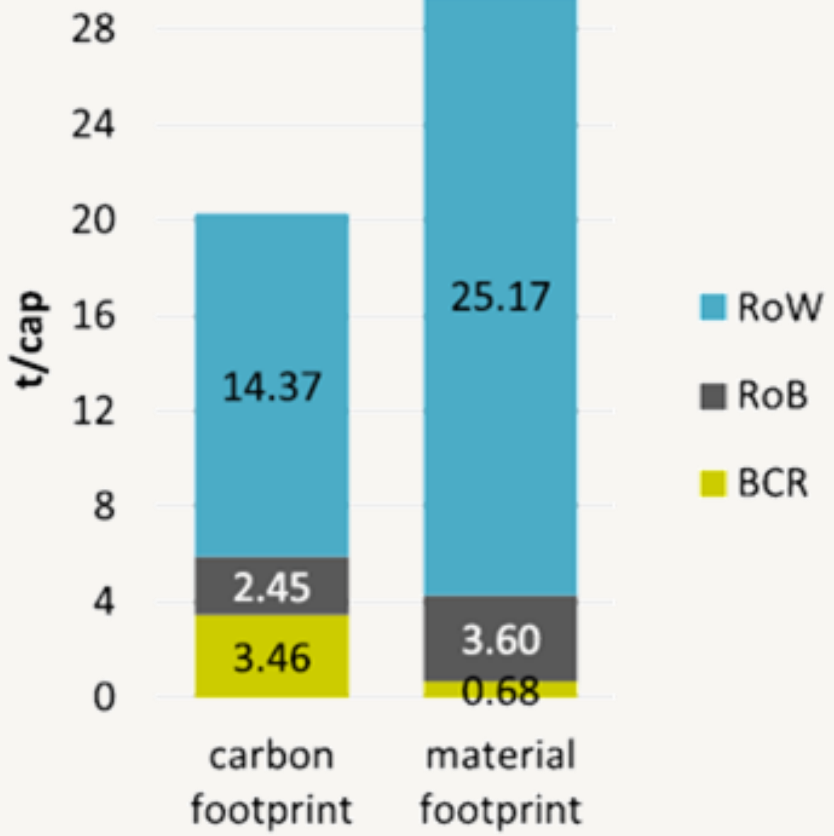
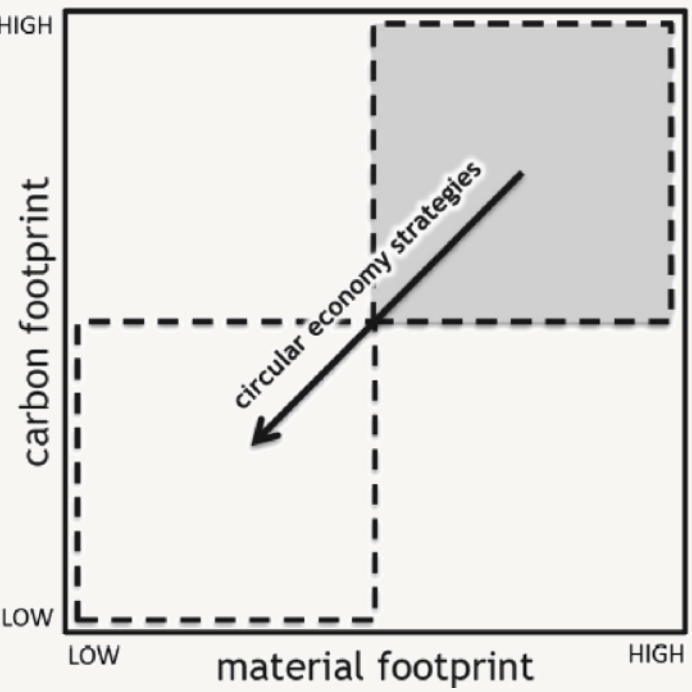


Density of office space

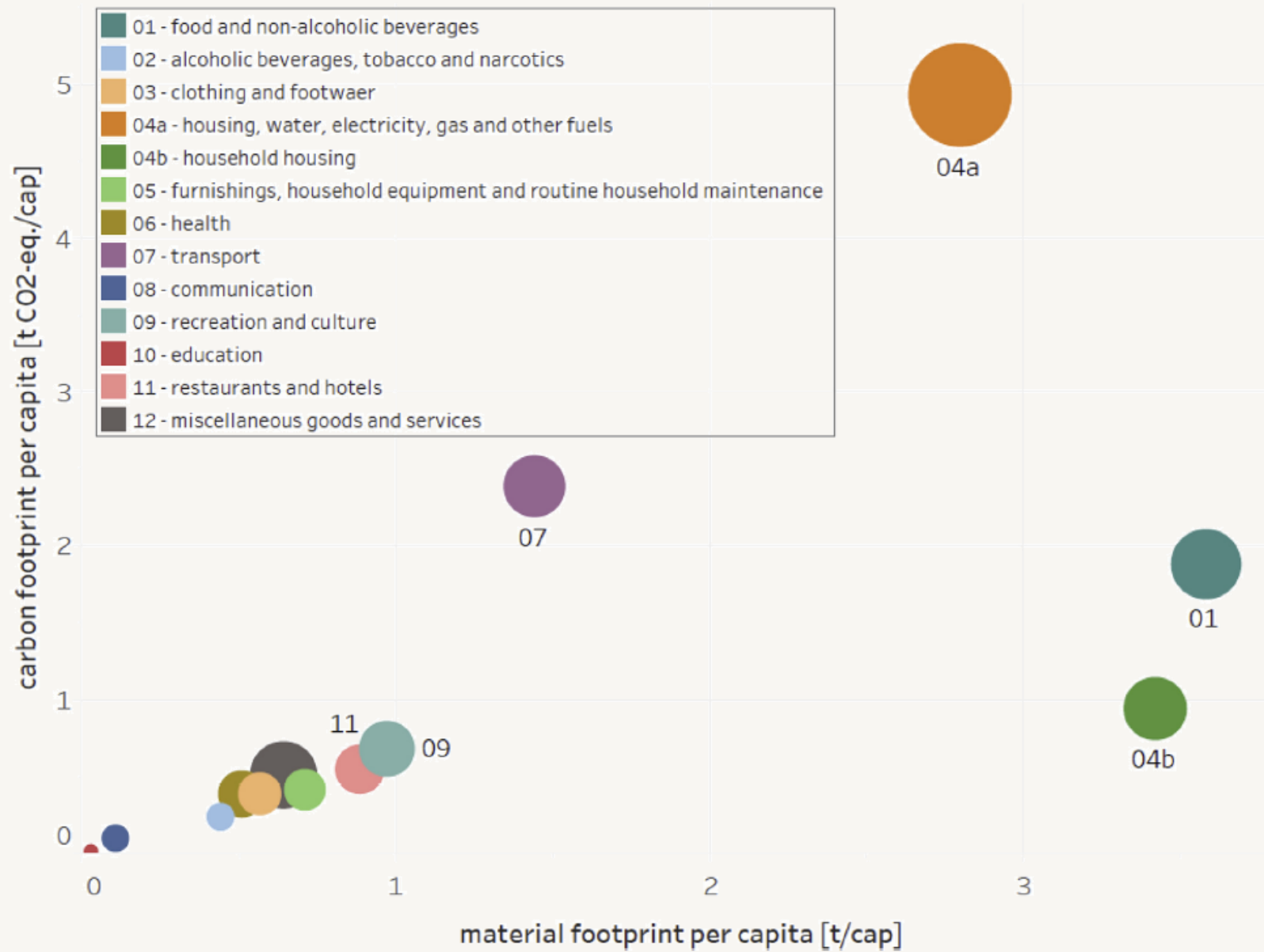


Number of buildings

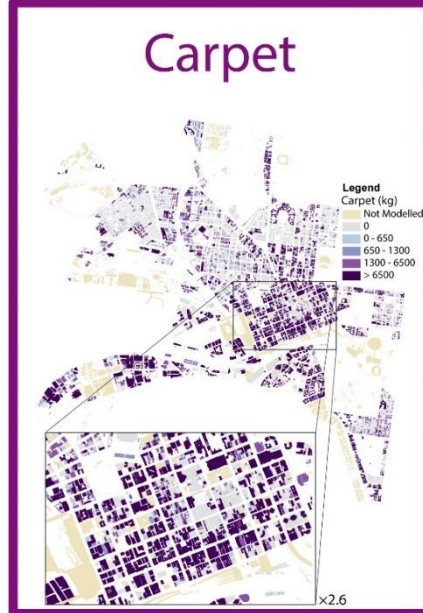
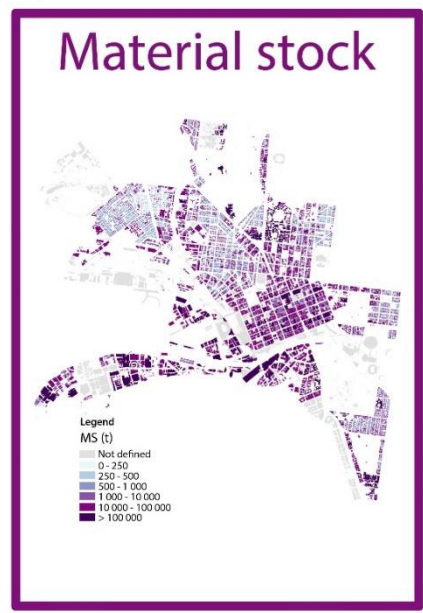
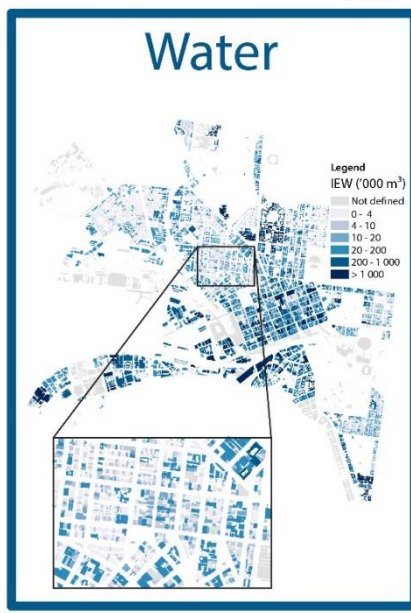
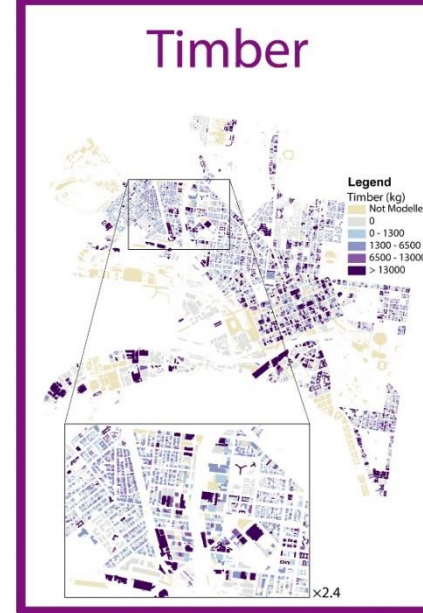
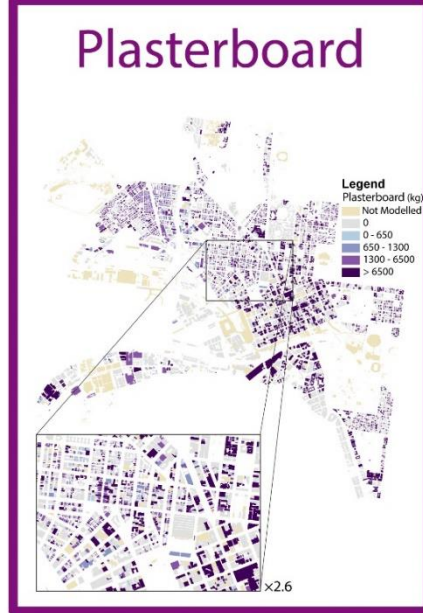
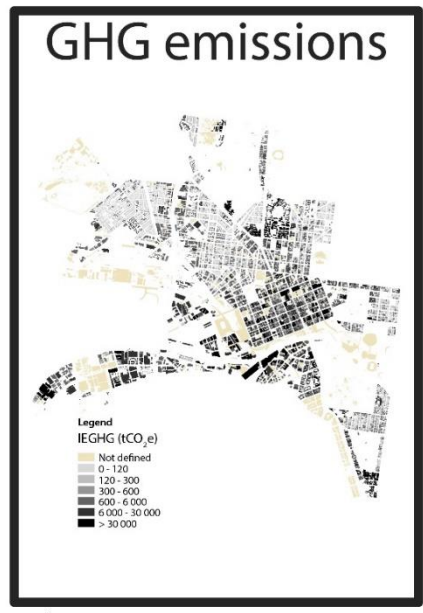
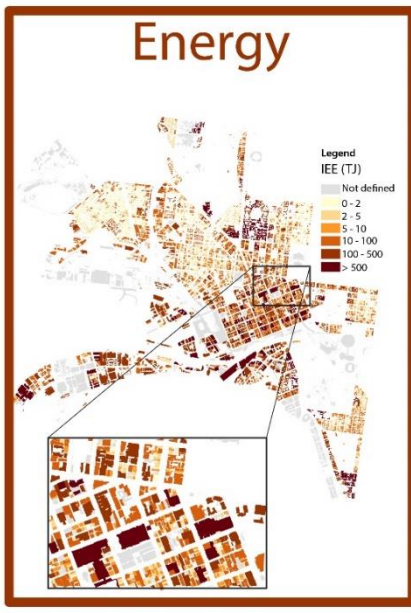
Nexus flux ?



Circulaire et durable ?



Circulaire et durable ?



Explorer la mine urbaine

Stephan, A. and A. Athanassiadis. 2017. Quantifying and mapping embodied environmental requirements of urban building stocks. *Building and Environment* 114: 187-202.

Stephan, A. and A. Athanassiadis. 2018. Towards a more circular construction sector: Estimating and spatialising current and future non-structural material replacement flows to maintain urban building stocks. *Resources, Conservation and Recycling* 129: 248-262.

1 km²



1 547 000 000 kg



10 000 000 GJ



17 700 000 m³

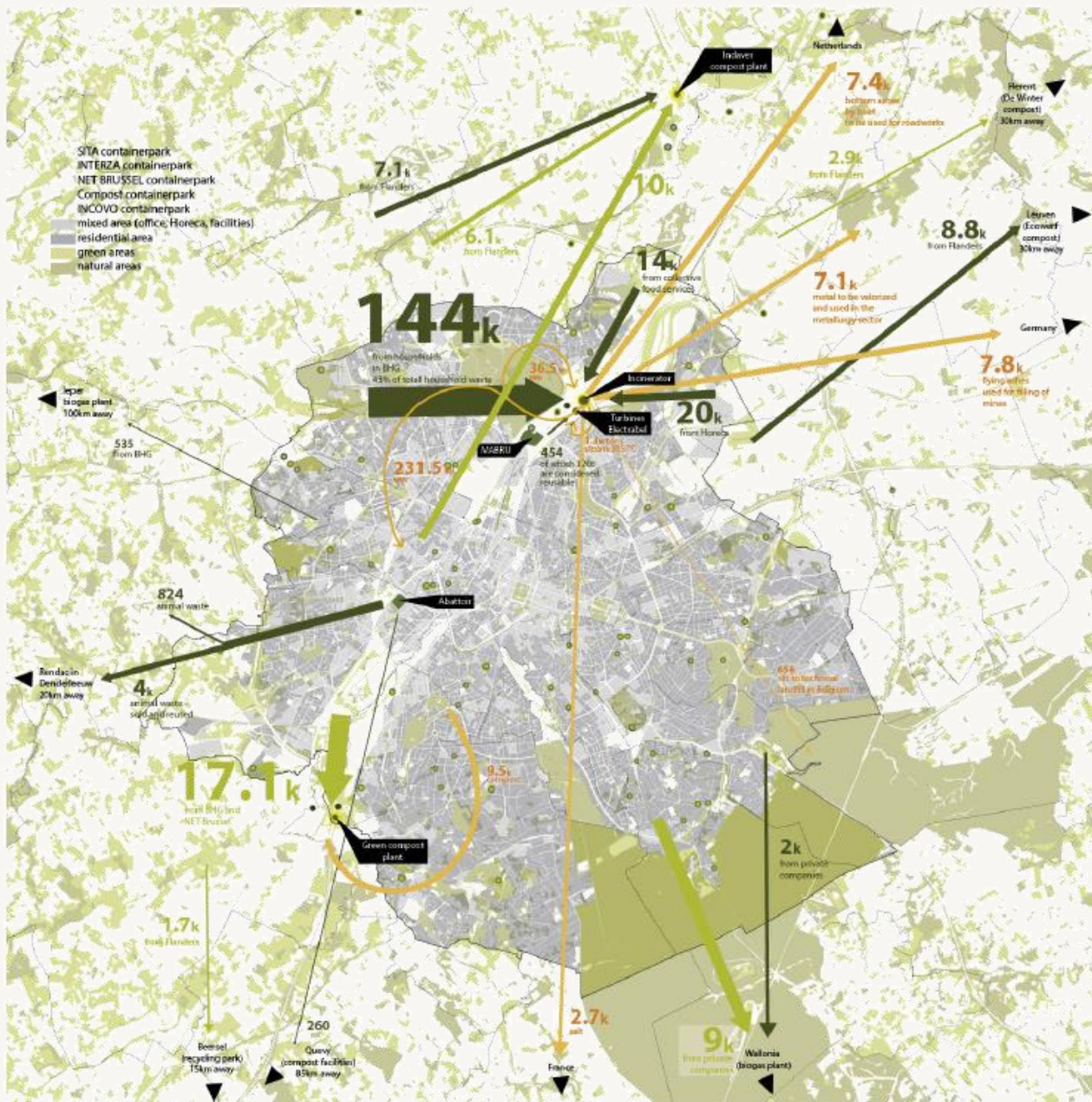


605 000 000 kgCO₂e

Stephan, A. and A. Athanassiadis. 2017. Quantifying and mapping embodied environmental requirements of urban building stocks. *Building and Environment* 114: 187-202.

Stephan, A. and A. Athanassiadis. 2018. Towards a more circular construction sector: Estimating and spatialising current and future non-structural material replacement flows to maintain urban building stocks. *Resources, Conservation and Recycling* 129: 248-262.

Explorer la mine urbaine – et ses impacts

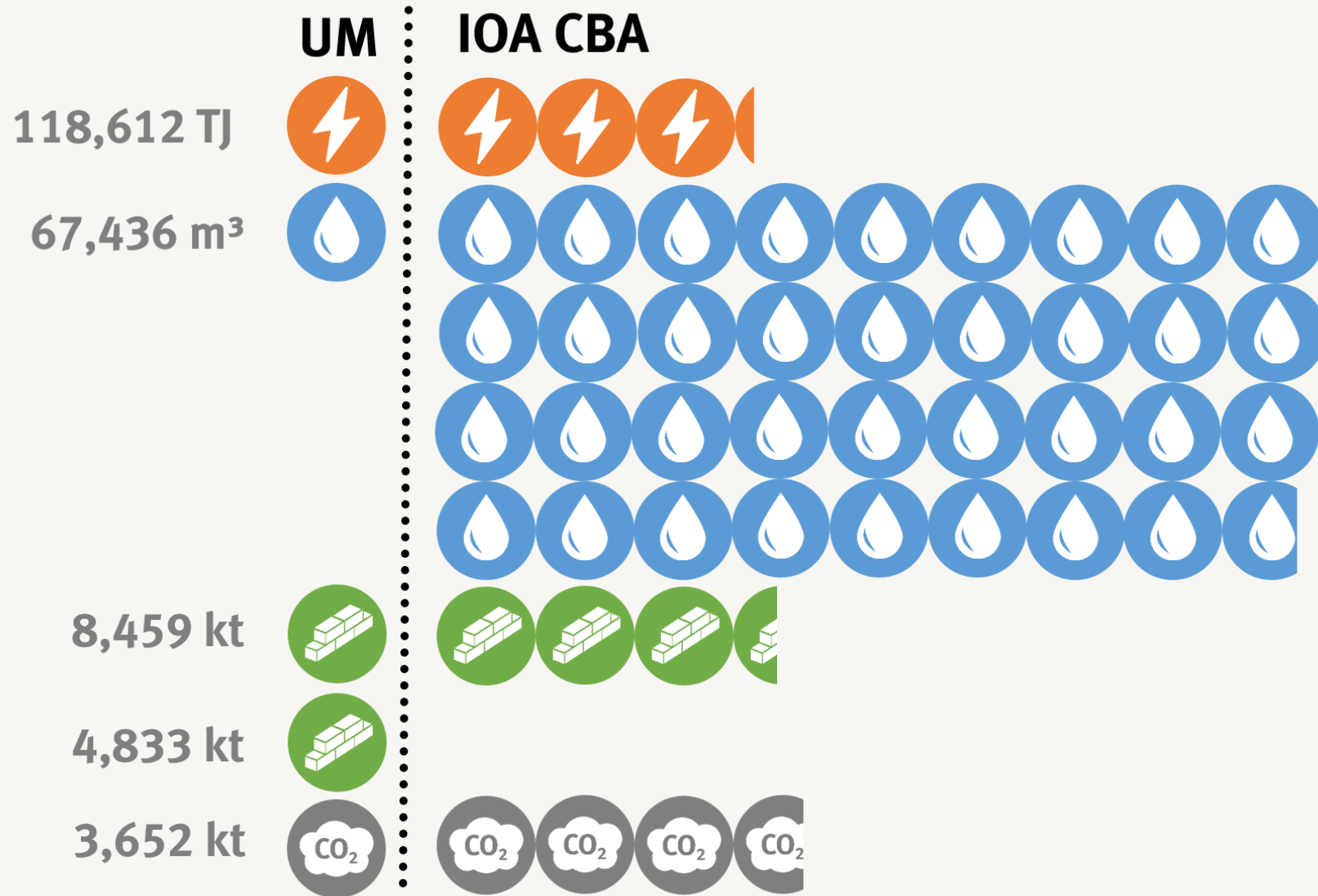


- tons/year of food waste
- tons/year garden waste
- tons/year processed waste

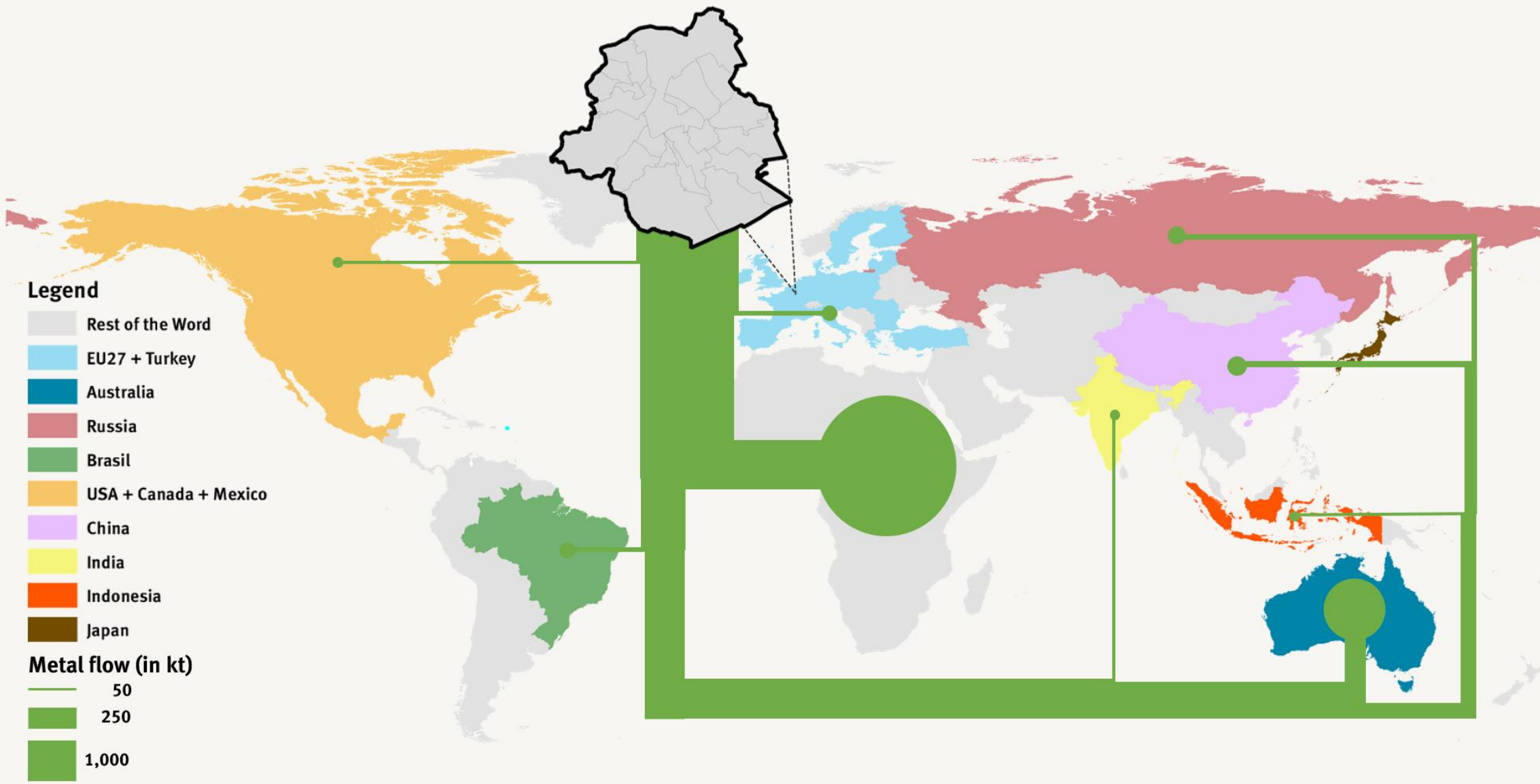
- SITA containerpark
- INTERZA containerpark
- NET BRUSSEL containerpark
- Compost containerpark
- INCOVO containerpark
- mixed area (office, Horeca, facilities)
- residential area
- green areas
- natural areas

Nexus flux-infrastructures (eaux usées/biodéchets) ?

Quels hinterlands ?



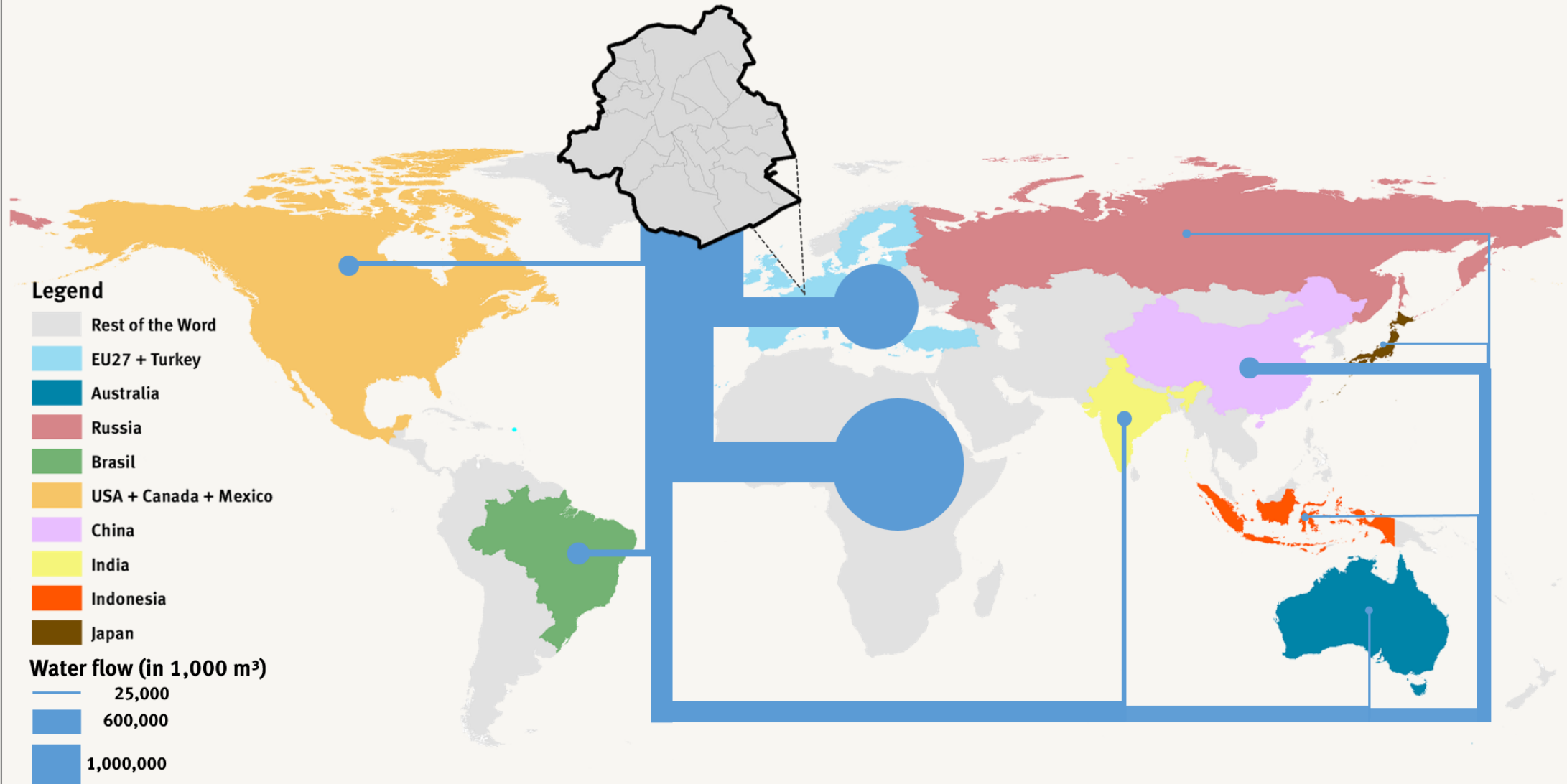
Effets/impacts indirects des villes



Impossible d'être circulaire

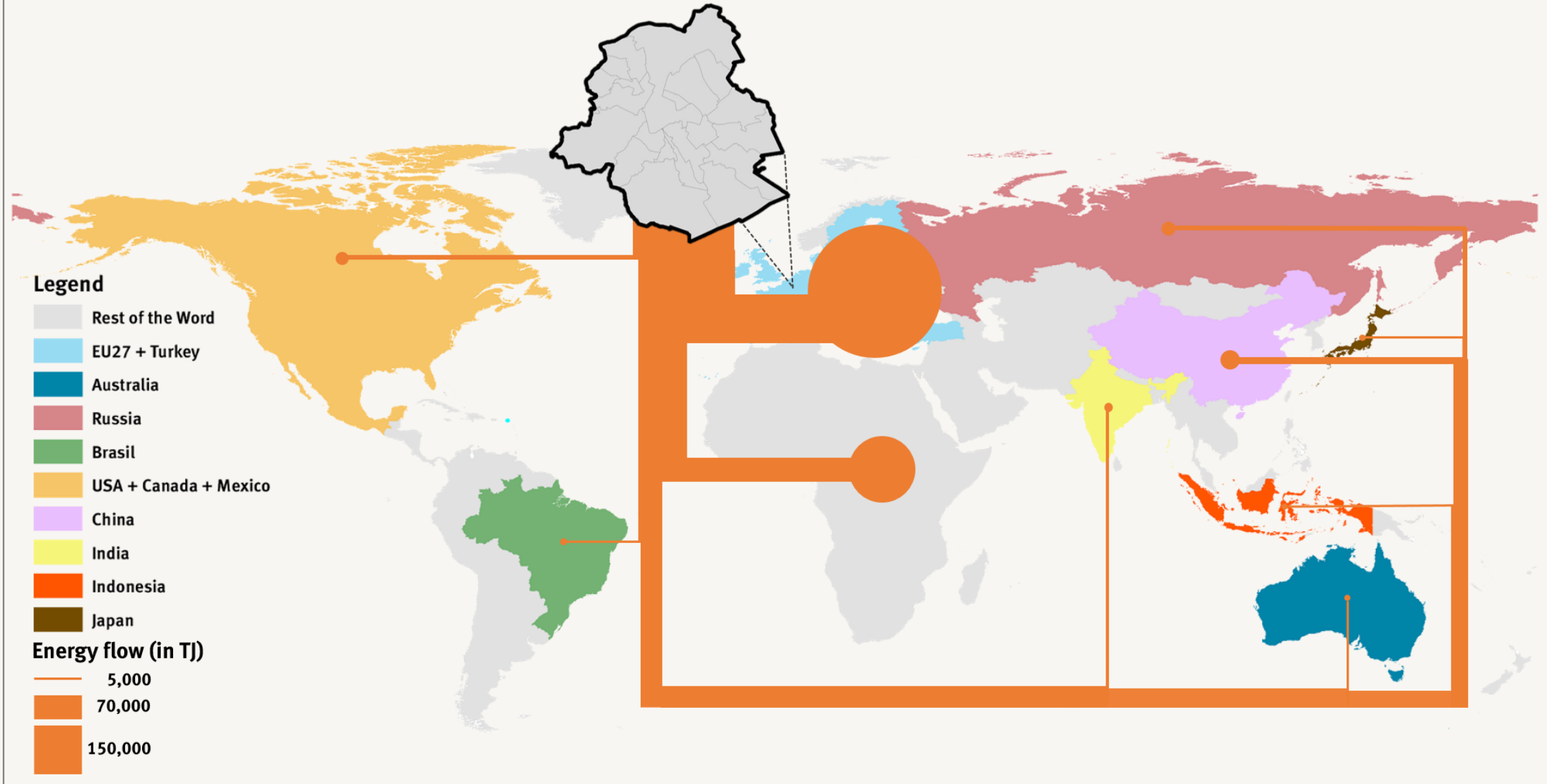
Athanassiadis, A., M. Christis, P. Bouillard, A. Vercalsteren, R. H. Crawford, and A. Z. Khan. 2018. Comparing a territorial-based and a consumption-based approach to assess the local and global environmental performance of cities. *Journal of Cleaner Production* 173: 112-123.

Embodied water use in Brussels final demand



Impossible d'être circulaire?

Embodied gross energy use in Brussels final demand



Impossible d'être circulaire?

**Des politiques locales
pour un métabolisme
urbain mondialisé ?**

PROGRAMME RÉGIONAL EN ÉCONOMIE CIRCULAIRE
2016 – 2020

*Mobiliser les ressources et minimiser les richesses perdues :
Pour une économie régionale innovante*



Mars 2016

MAIRIE DE PARIS

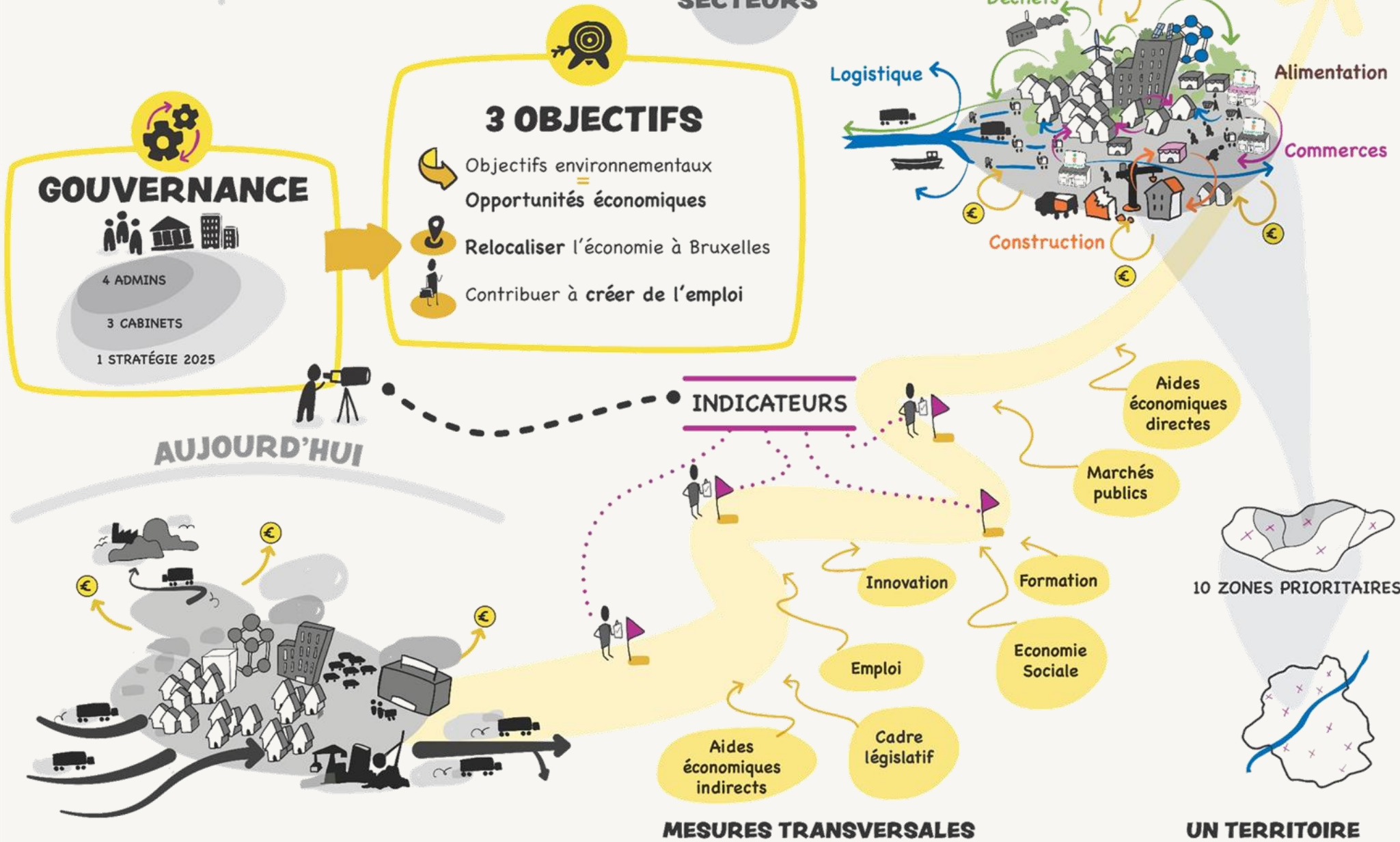


LWARB
London Waste and Recycling Board



© Circular London

Outil d'analyse pour l'économie circulaire





Circular Economy Plan of Paris

Comment avancer ?



SPATIALISER LES FLUX



**SUIVRE LES CHAINES DE
VALEURS (ACTEURS-FLUX)**



PENSER SYSTEME

Comment avancer?

Quelques outils

<https://data.metabolismofcities.org/>

THE METABOLISM OF CITIES DATA HUB

Cities Data layers Library Community About Account

Metabolism of Cities Data Hub

The Metabolism of Cities Data Hub serves as a central repository for a wide variety of information pertaining to urban metabolism in cities around the world. Whether you are looking for resources on a city's infrastructure, stocks and flows, biophysical characteristics, or more, the Data Hub's well-defined structure allows users to easily search through available information. As an ongoing project, this tool is continuously improved through crowdsourcing uploads of new data and information sources. Contribute to this ongoing project, fulfill your information needs, and explore what the Data Hub has to offer!




Phases

- 1 Data collection** (Green bar)
- 2 Data processing** (Blue bar)
- 3 Data analysis** (Yellow bar)

In the **Data collection** phase, we focus on gathering datasets, geospatial information, government reports, academic work, and other contextual and supporting material to provide a strong baseline before starting to work with the data.

[Learn more →](#)

Current progress

City	Documents	Context	Biophysical characteristics	Infrastructure	Stocks and flows	Data collection completion
 Glasgow	1 documents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2% data collection completion
 Lausanne	177 documents	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	83% data collection completion
 Lisbon	12 documents	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8% data collection completion

[View all cities \(94\)](#) [View progress](#)



90+ cities



1790 datasets



827 maps



200+ people

Metabolism of Cities Data Hub

Geneva

Context Biophysical Infrastructure Stocks and flows Browse library Community



ID	924777
Type	Dataset
Year	2019
Author(s)	OCSTAT - Genève
Tags	4.12. Flows: Energy
Language	French
License	CC BY 4.0
Download	https://www.ge.ch/s...
Uploaded by	Nicole Sophie Wiedmann
Processed by	Nicole Sophie Wiedmann

Edit Chart editor

RESET processing

This means that the file can be processed again. Existing reference spaces and associated info will be lost!

Delete

Back

Consommation d'électricité du réseau genevois, selon le genre d'utilisation, depuis 1984

Electric consumption in Canton Geneva by economic sector and public usage.

Remarks:

- The districts served by the Services industriels de Genève (SIG) do not correspond exactly to the territory of the Canton;
- CERN electric consumption is not accounted;
- The General Classification of Economic Activities (NOGA) was revised in 2002 and 2008 limiting the comparison of results between years;
- Before 2008, street lighting only. From 2008, street lighting and light signage included.

Attachment(s)

- T_08_03_2_01.xls (93.0 KB)
- T_08_03_2_01_processed.xls (96.5 KB)

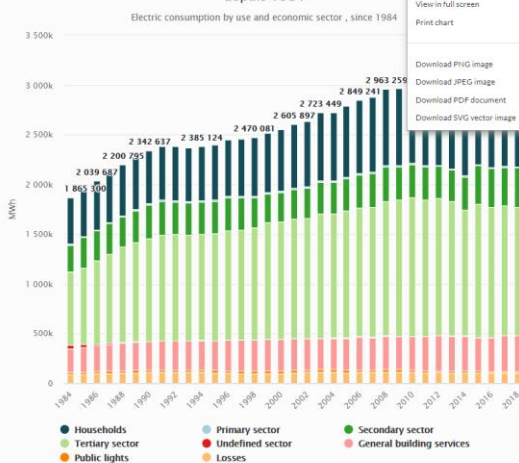
Associated space

Geneva

Data

Bar Column Drilldown Line Area Pic Table

Consommation d'électricité du réseau genevois, selon le genre d'utilisation, depuis 1984

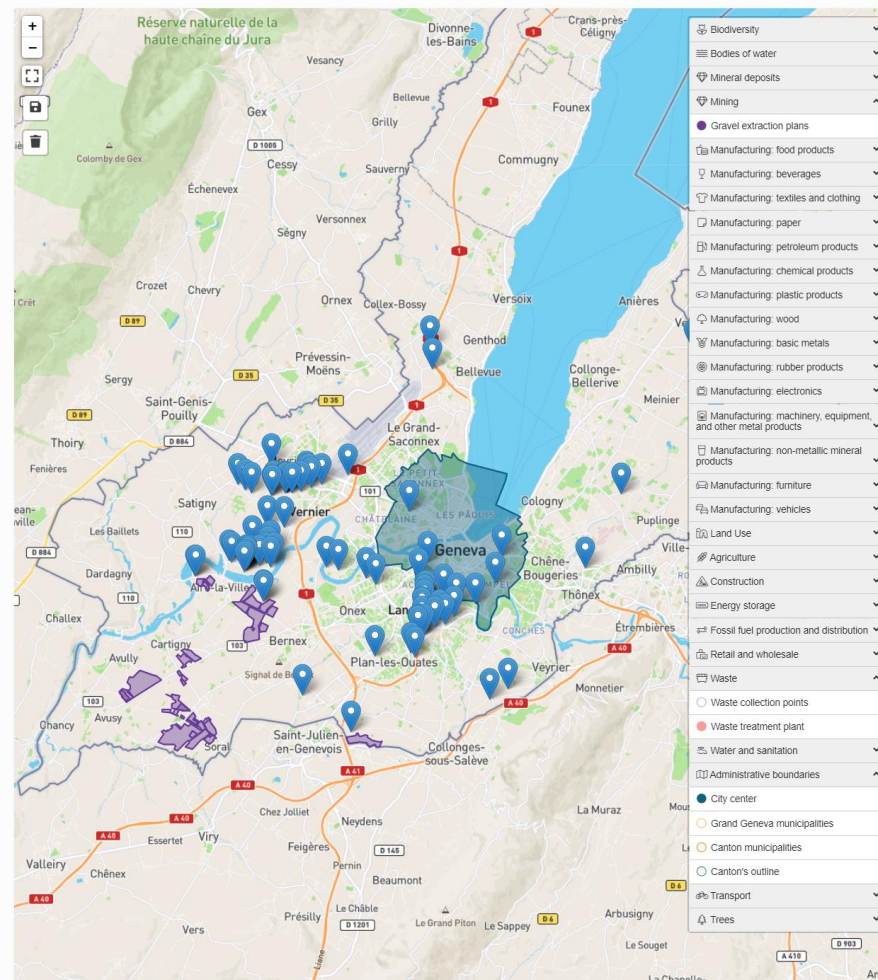


Geneva

Context Biophysical Infrastructure Stocks and flows Browse library Community

Master map | Geneva

Maps / Master map



<https://data.metabolismofcities.org/>

Melbourne

[Overview](#) [Data](#) [Compare areas](#) [Modeller](#) [Archetypes](#) [Stories](#)

Dataset

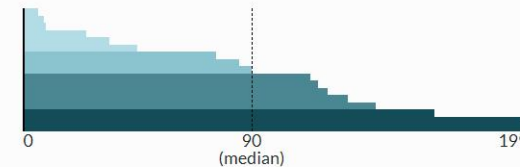
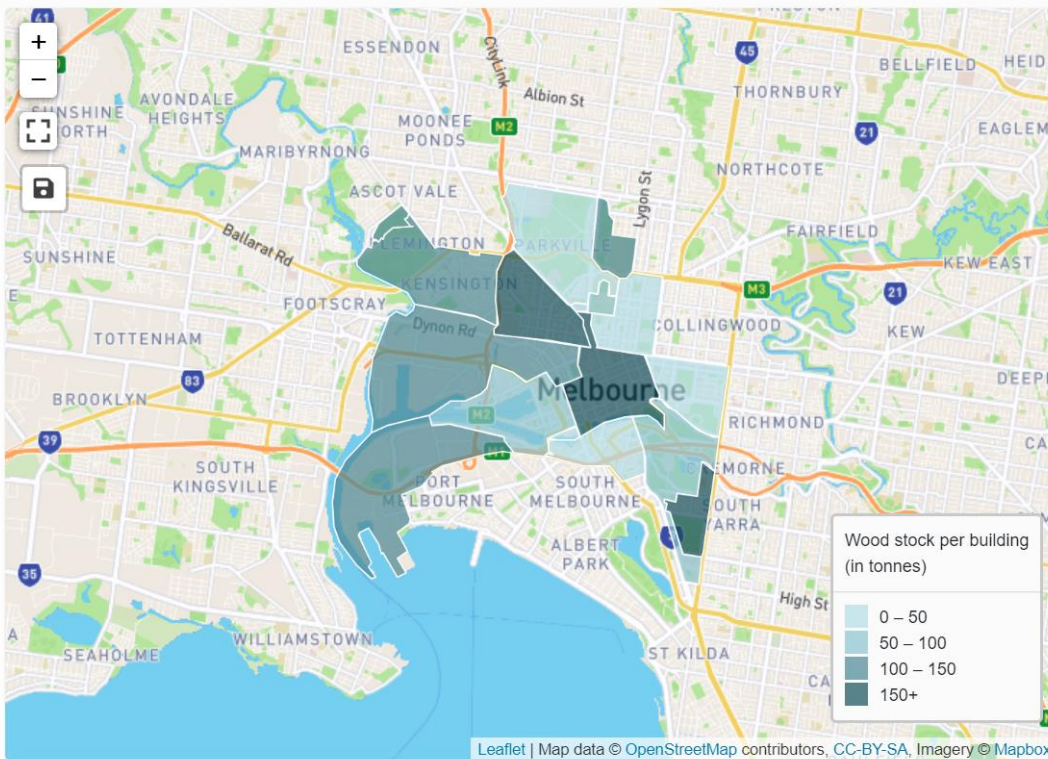
Wood stock ▾

Area

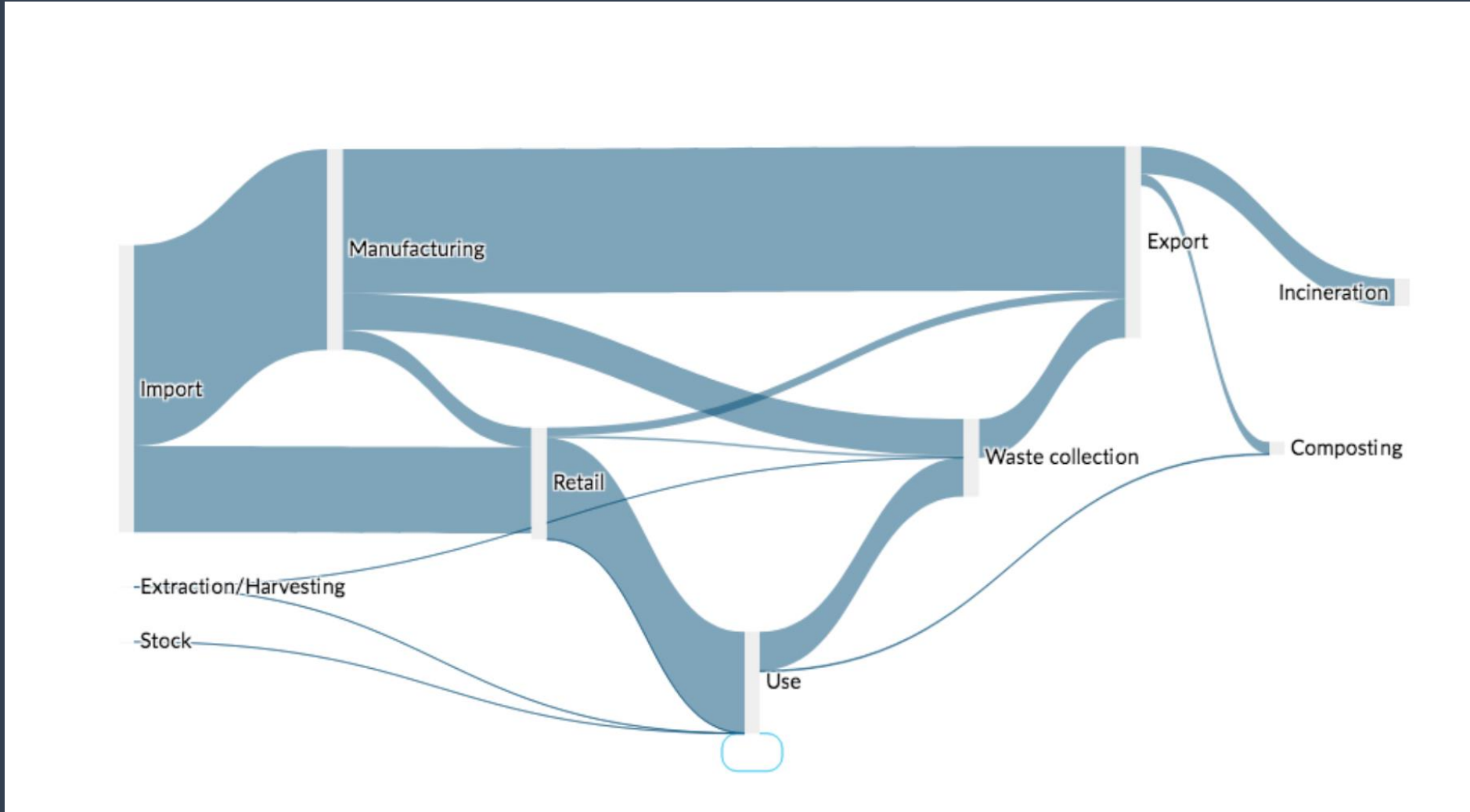
Blocks for Census of Land Use and Employm... ▾

Detail level

City-wide ▾



3000.0	199
3002.0	34
3003.0	116
3004.0	76
3005.0	9
3006.0	8
3008.0	90
3010.0	85
3031.0	128
3032.0	139
3050.0	25
3051.0	197
3052.0	45
3053.0	6



Sector-wide circularity assessment



ARISTIDE ATHANASSIADIS – 06 JUILLET 2021



CIRCULAR METABOLISM PODCAST



METABOLISM OF CITIES



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