

# Combining GIS data sets and Material intensities to estimate Vienna's building stock

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Resources

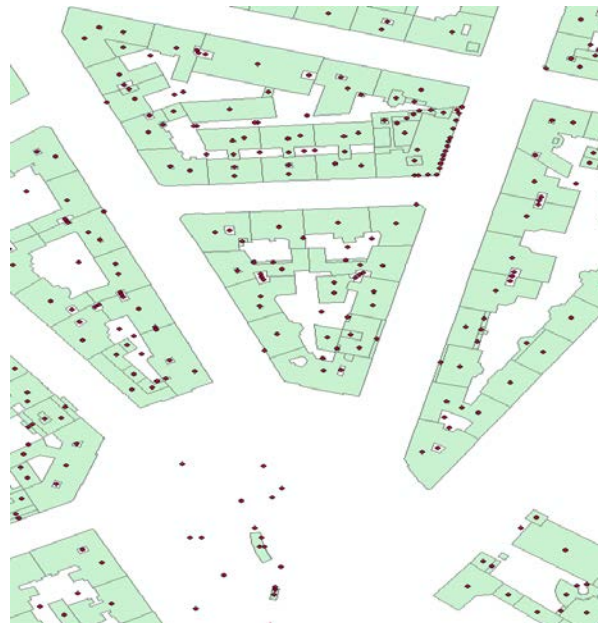
Research Center of Waste and Resource Management

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- Buildings greatly contribute to the material stock in urban systems
- About 20-30% of waste flows nationwide are related to construction and demolition (excavation material excluded)
- High potential to save primary resources and landfill space through recycling
- Knowledge about material stocks and flows in this system are limited



- Investigate the material composition of selected buildings
- Generate specific material intensities [ $\text{kg/m}^3$  GV] for different building types
- Generate building types (construction period/utilization) for the city of Vienna
- Analyse the buildings structure with regard to building types
- Analyse the demolition activity (construction period/utilization)





## Information about the material composition of different building types

### Case studies

- analysis of documents
- on-site investigation

### New buildings

- final bills
- LCA Data
- construction plans

### Demolished buildings

- analysis of construction plans

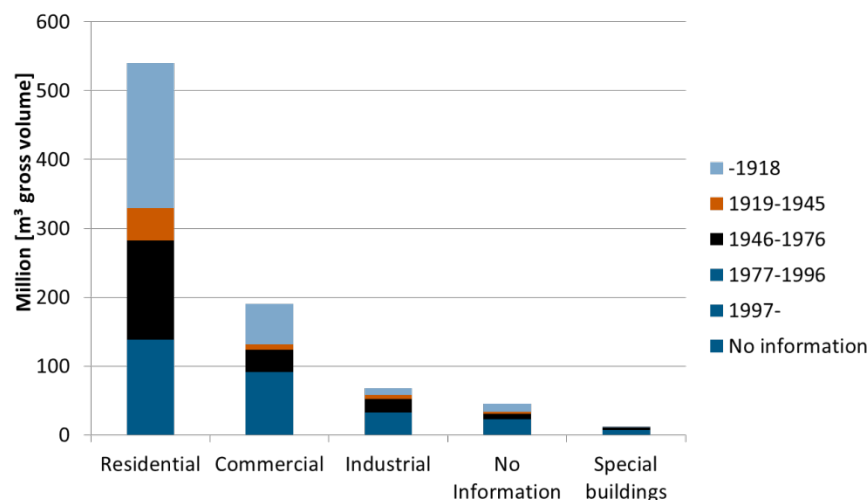
### Literature review

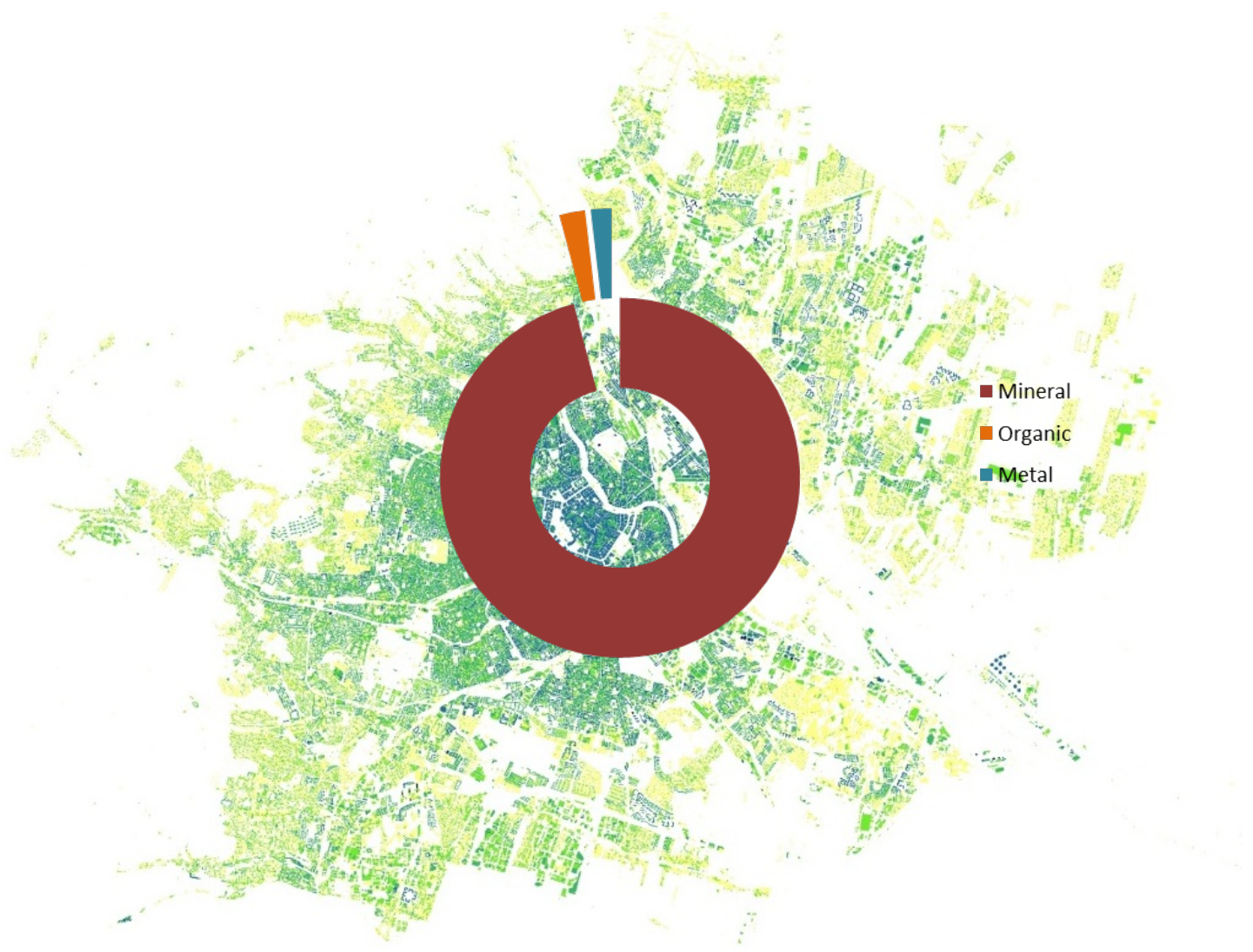
## Information about the building structure (GIS - geographical information system)

Area & height of buildings

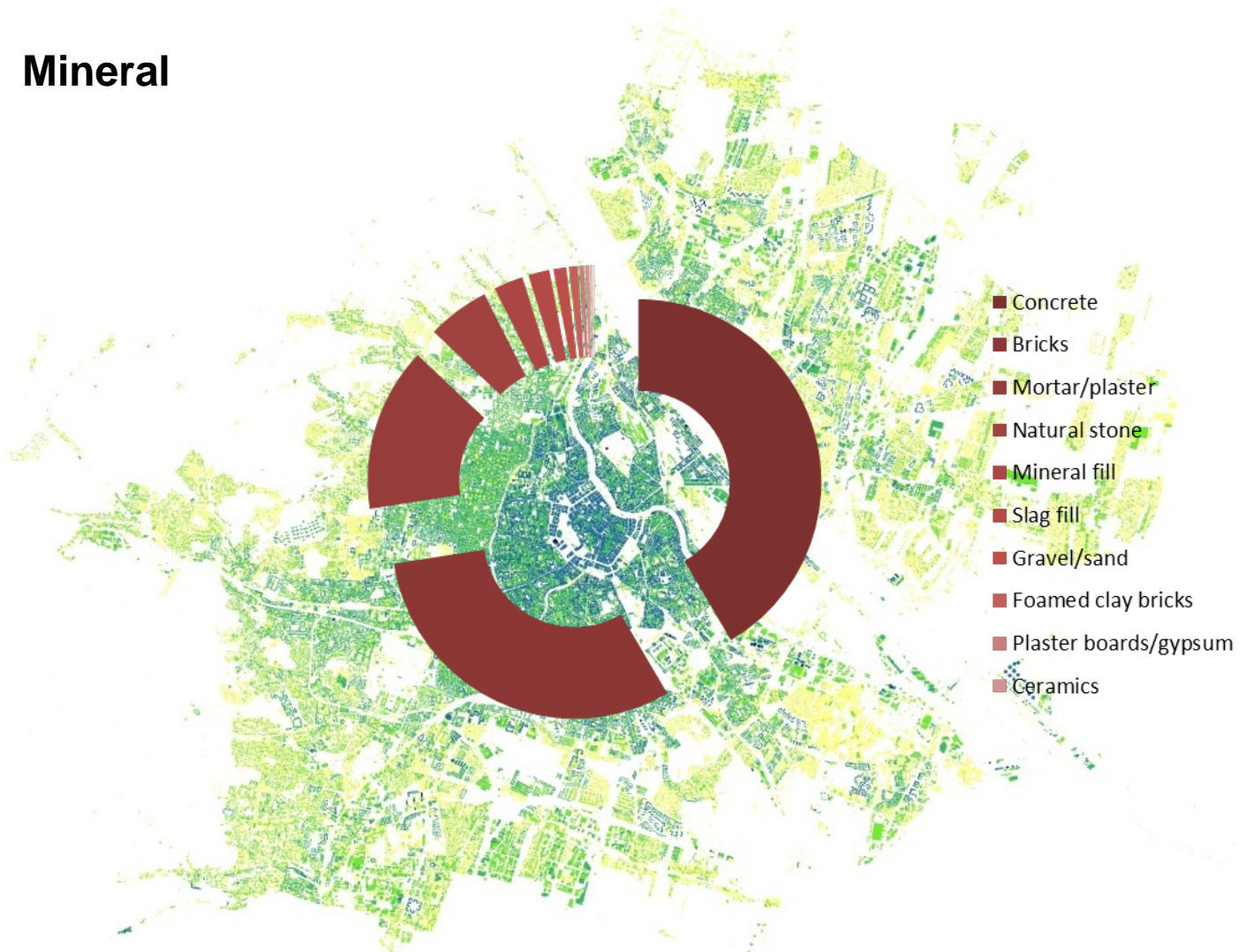
Utilization & construction period of buildings

Period of construction	Utilization	Mineral materials	Organic materials	Metals	Total
-1918	residential	380	17	3	400
	commercial	360	3	3	366
	industrial	270	5	7	282
1919-1945	residential	450	11	6	467
	commercial	270	7	6	283
	industrial	320	30	3	353
1946-1976	residential	420	5	10	435
	commercial	350	6	6	362
	industrial	340	-	13	353
1977-1996	residential	430	7	12	449
	commercial	380	1	13	394
	industrial	170	-	15	185
1997-	residential	450	5	13	468
	commercial	320	6	10	336
	industrial	-	-	-	-



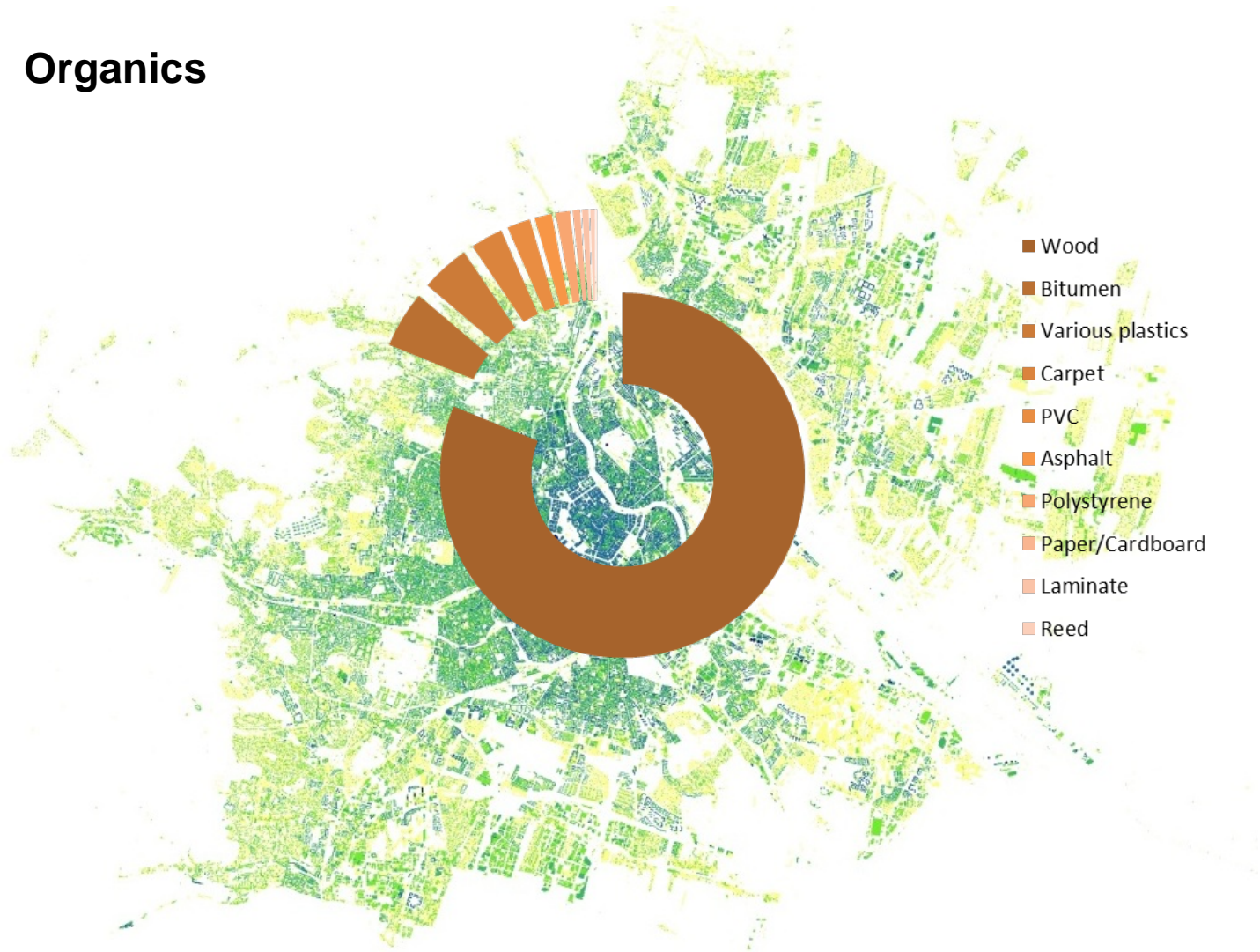


## Mineral

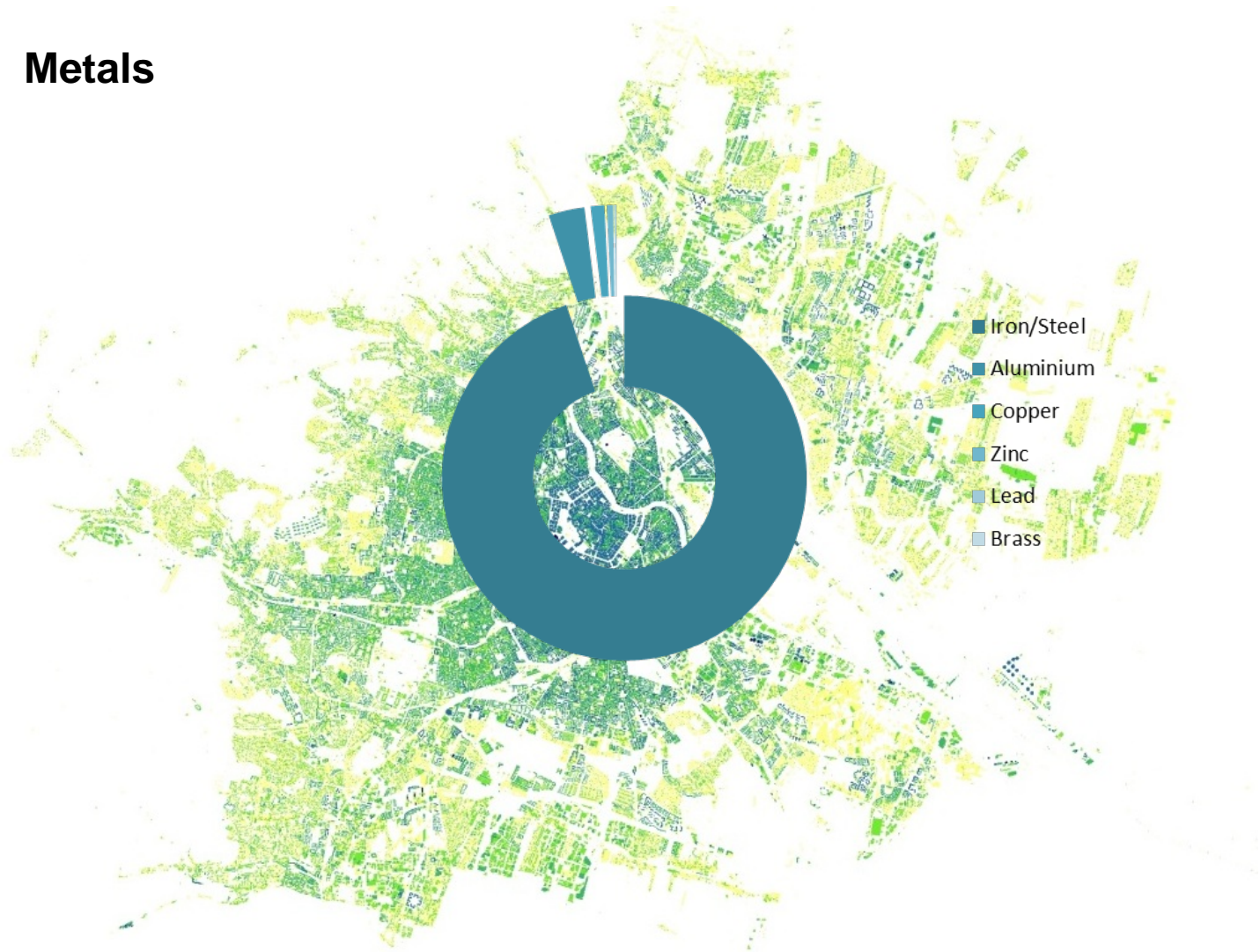




## Organics



## Metals





An aerial photograph of Vienna, Austria, showing the city's layout with green spaces, buildings, and the Danube river. The map is centered on the city and serves as a background for the text.

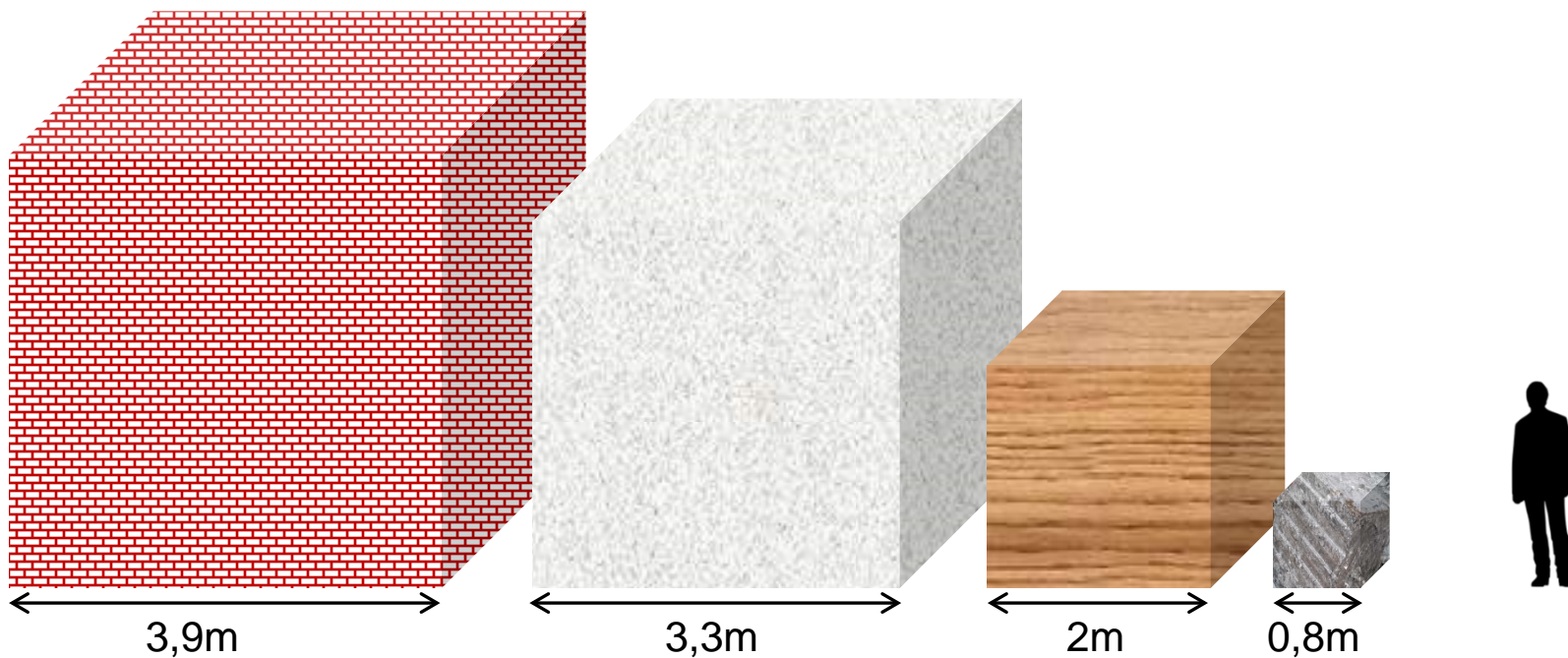
**385.000.000 [t]**  
**210 [t] pp**

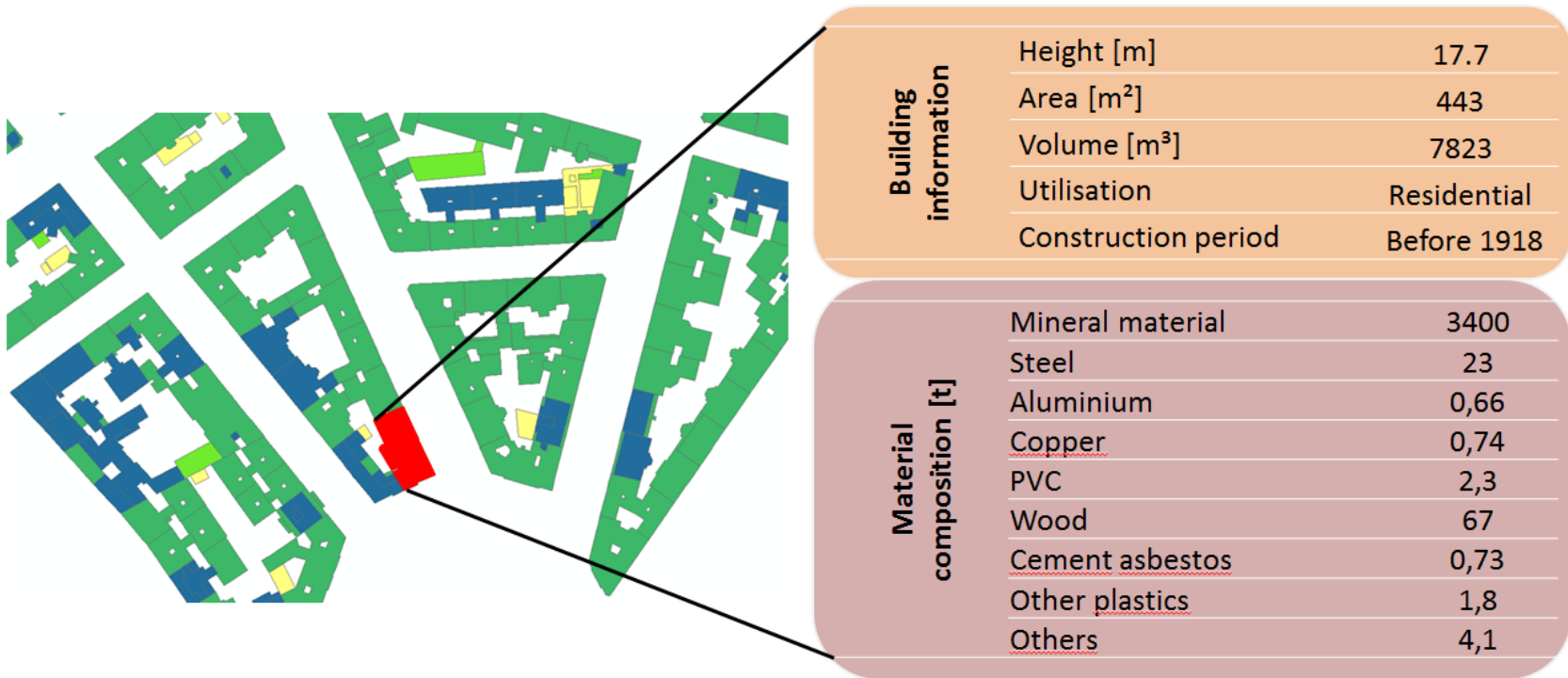
Bricks & Mortar  
93 [t]

Concrete  
85 [t]

Wood  
4 [t]

Steel  
3.7 [t]

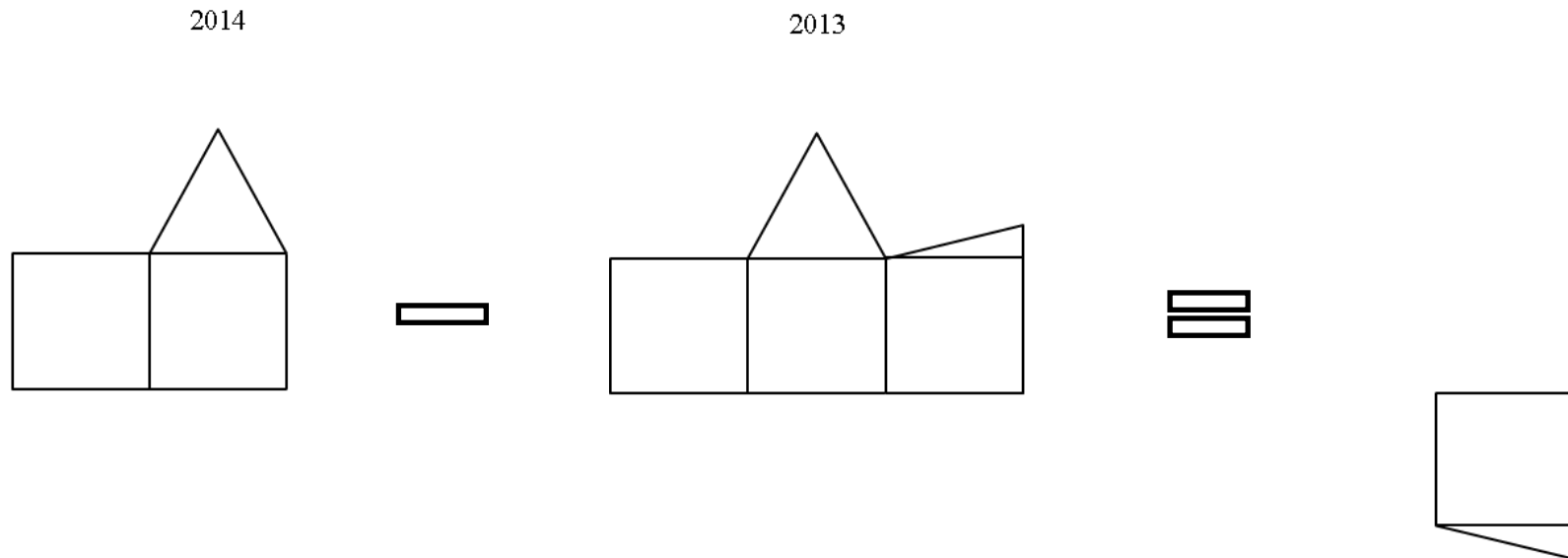


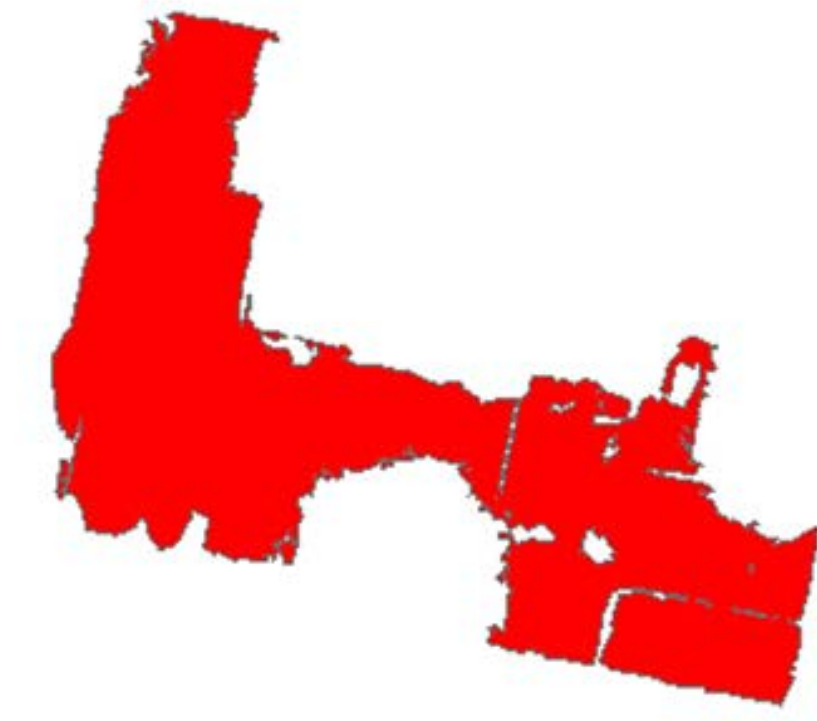


- Resource cadastre
  - Gives information about the total material stock in buildings
  - Combined with data about the demolition activity, current and future waste streams can be estimated



- Based on change detection data from remote sensing image matching
- Height models from orthophotos
- Difference model of height models







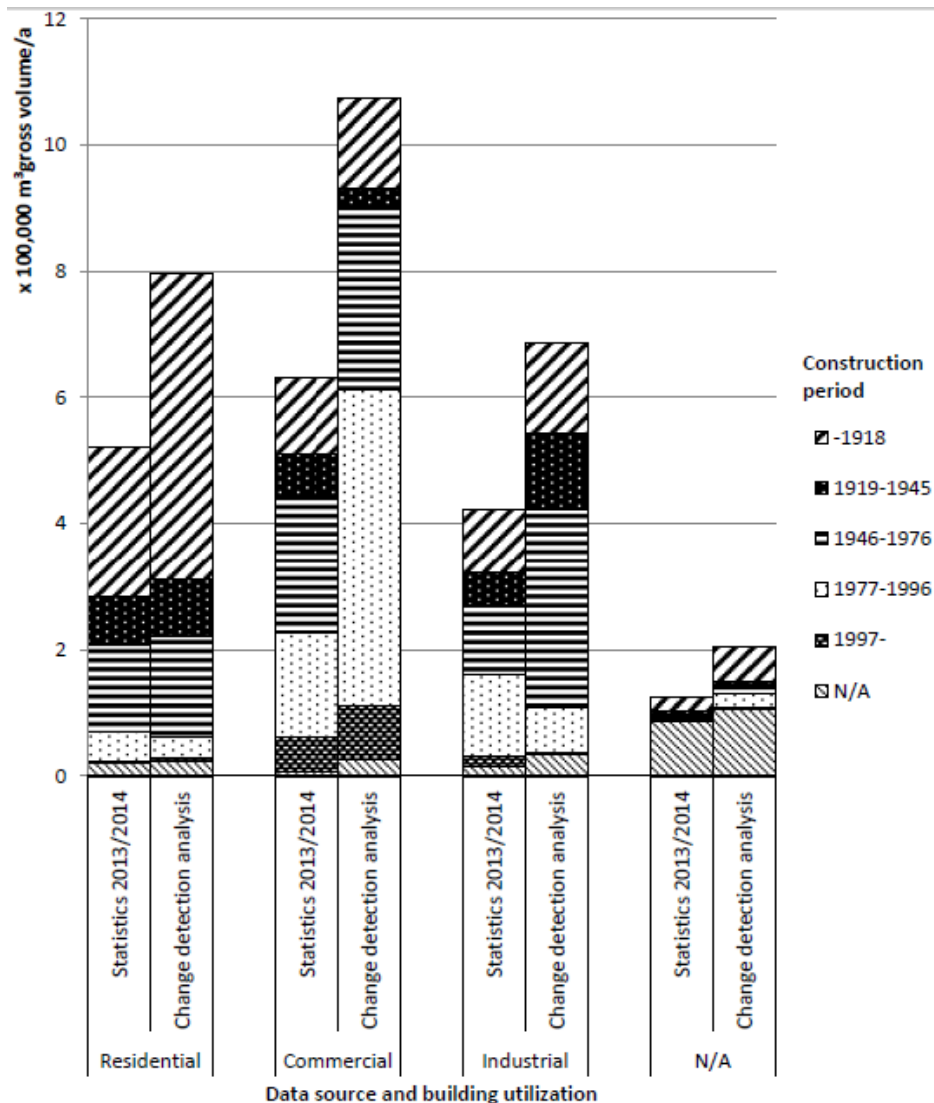






## Two approaches

- Statistical data
- Change detection data





## Publications

- Kleemann, F., Lederer, J., Aschenbrenner, P., Rechberger, H., & Fellner, J. (2016). A method for determining buildings' material composition prior to demolition. *Building Research & Information*, 44(1), 51-62.
- Kleemann, F., Lederer, J., Rechberger, H., Fellner, J., (2016). GIS-based analysis of Vienna's material stock in buildings. *Journal of Industrial Ecology*.
- Kleemann, F., Lehner, H., Szczypińska, A., Lederer, J., Fellner, J. (2016). Using change detection data to assess amount and composition of demolition waste from buildings in Vienna. *Resources Conservation and Recycling*.

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