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6th ISUFitaly International Conference | Bologna, 8-10 June 2022

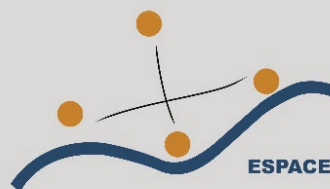
MORPHOLOGY AND URBAN DESIGN

new strategies for a changing society

Multiple Fabric Assessment and the Italian tradition of Urban Morphology

Giovanni FUSCO, Alessandro ARALDI

UMR ESPACE, CNRS, Université Côte d'Azur, France



Identifying and Characterizing Morphotypes in a Metropolitan Area

The **Urban Fabric / Urban Tissue** = the finest scale of analysis of urban form (urban fragment).

Classical schools of urban morphology (Italy, France, UK): typical relations between elements of urban form revealing an urban culture → defining **Morphotypes**

Focus of traditional urban morphology:

1. identification of urban fabric components (streets, buildings, parcels)
2. their geometrical description
3. analysis of their compositional relations to define typical forms of the urban fabric
4. study of the historic process behind the observed forms

.... A manual, expert-based procedure on a small part of urban space.

Research questions : What are the morphotypes in a vast metropolitan area?
How they relate to each other?
How are they organized in space?



Specificities of the MFA protocol

Multiple Fabric Assessment (MFA) a new computer-based protocol to detect and describe morphotypes

2016-2020 : Development of first version (applications French Riviera, Brussels, Marseille, Izmir, Osaka)

2021-2022 : Development of a new version (to be applied to the whole of France)

Main philosophy: analytical approach in line with the concept of **urban fabric** in Urban Morphology.

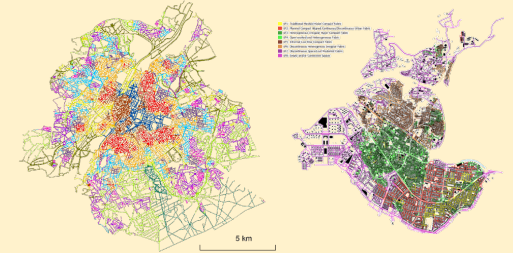
No configurational approach (like Space Syntax), but geometrical and compositional description of Built Fabric, Plot Fabric and Street Network, taking into consideration the contribution of the building types.

From manual calculations → to a computational geoprocessing

From expert-based detection → to a bottom-up inferential procedure

From planner's point of view → to pedestrian point of view (the urban fabric observed from the street)

From Small scale → to a Large scale



... historical processes lie outside of MFA

Before MFA: identifying Building Types

The **Typo-Morphological nexus**, a fundamental contribution of the Italian school of Urban Morphology



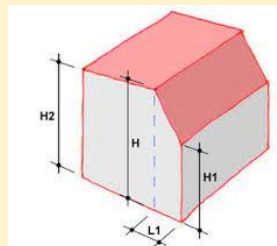
Case Scheer (2016) *“a building type is an abstraction, a pattern, where we observe **formal similarities** between one building and another even though the buildings may have different architectural expressions. [] buildings might **share many common formal characteristics**, but are very different in color, materials, style, and expressiveness.”*



Factors of building typology:

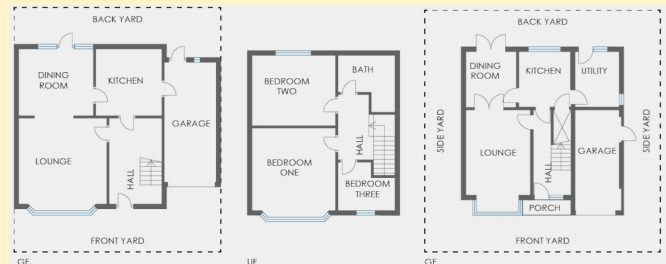
External envelope

(shape, foot-print, height, etc.)



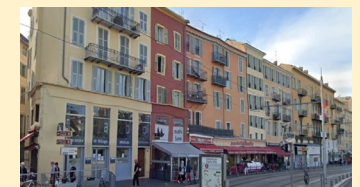
Internal organization

(distribution of housing units and rooms, bearing structure, etc.)



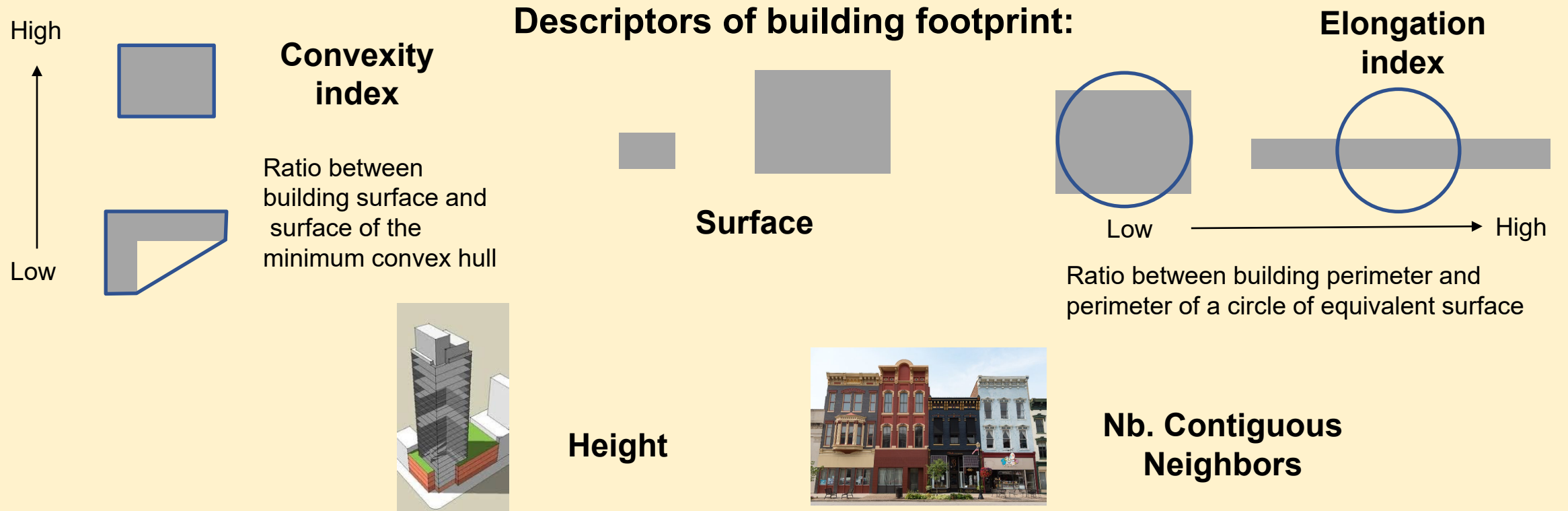
style

(material and design of façade and roof, colors, etc.)



Building descriptors

Goal: typology of ordinary buildings → filtering out specialized buildings

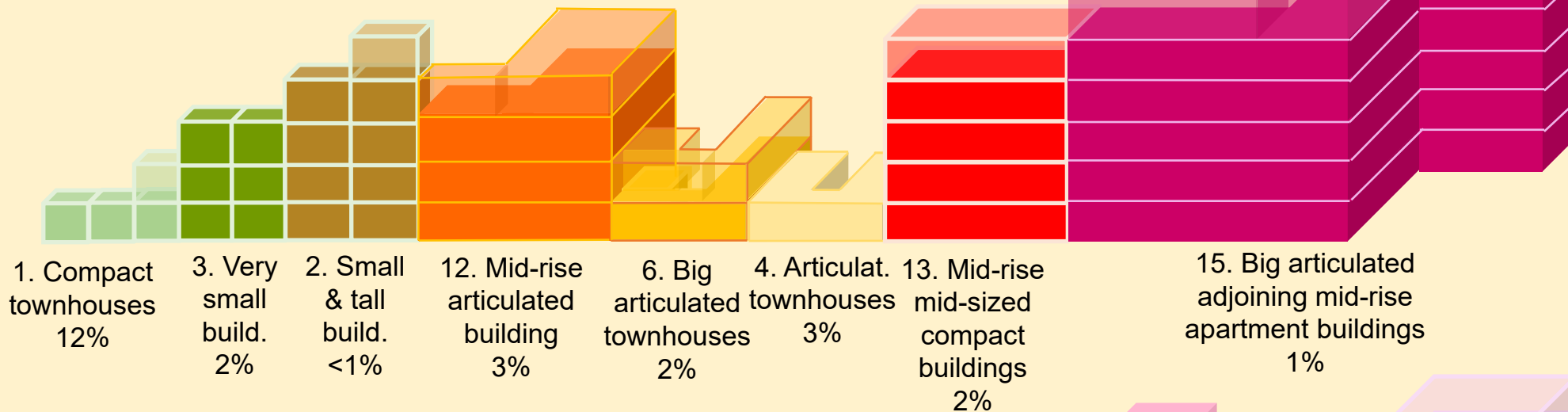


Minimal set of descriptors of the external envelopes from a simplified 3D DB (LOD0+ CityGML).
IGB TOPO DB: 30,000,000 million buildings in France

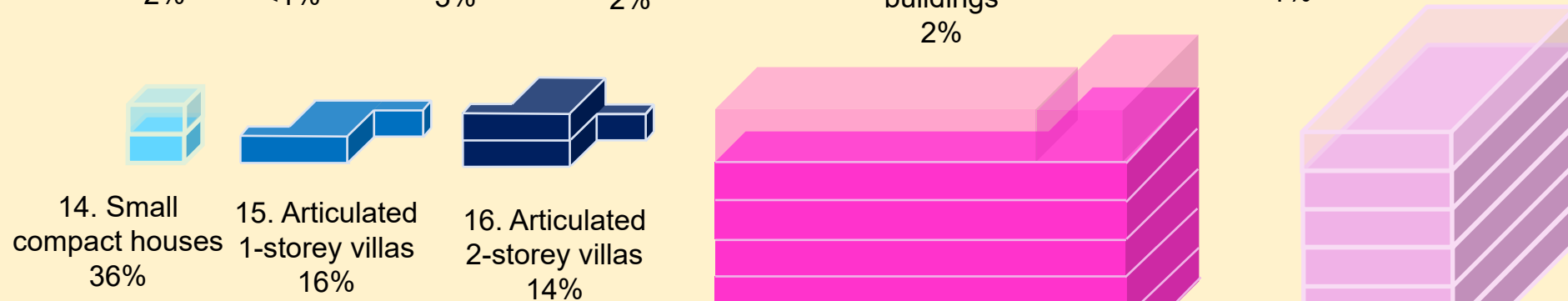
Variable segmentation → Bayesian clustering models → Consensus Clustering

16 Ordinary building types in France

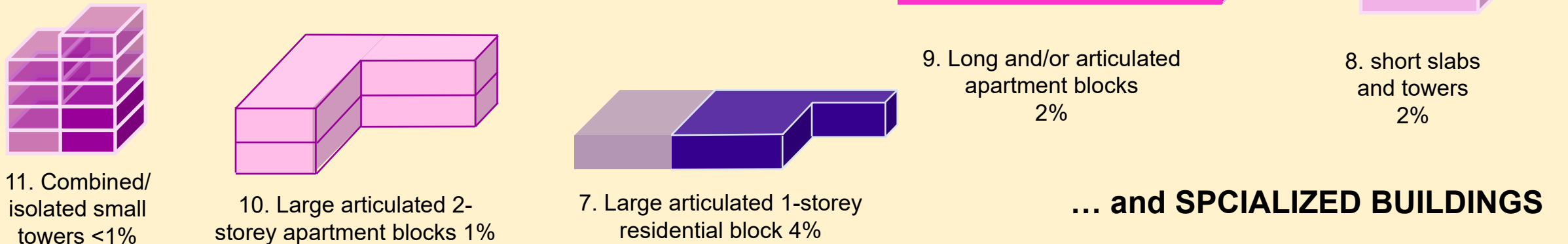
ADJOINING:



ISOLATED:

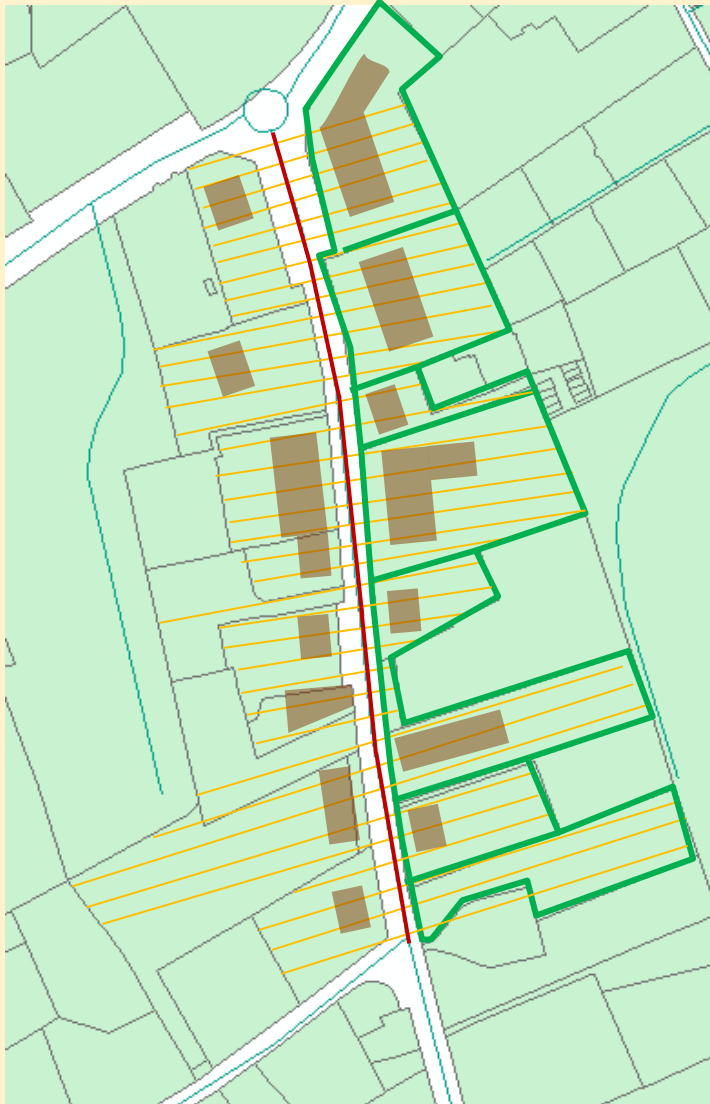


ISOLATED/ADJOINING:



... and **SPECIALIZED BUILDINGS**

Proximity band as approximation of the pertinent strip



Starting point: the **street segment**.

Morphometric characterization of its proximity band (pertinent strip)

Caniggia – Maffei : *“Builders and townsmen are aware of the preeminence of built-up routes over blocks, at least until a drop in the aggregate’s components end up by prevailing”*.

Castex – Depaule – Panerai : block structures are in their turn progressively lost in modernist and suburban developments.

Every 3 m **perpendicular sightline** to intercept plot boundaries, building footprint, building façade.

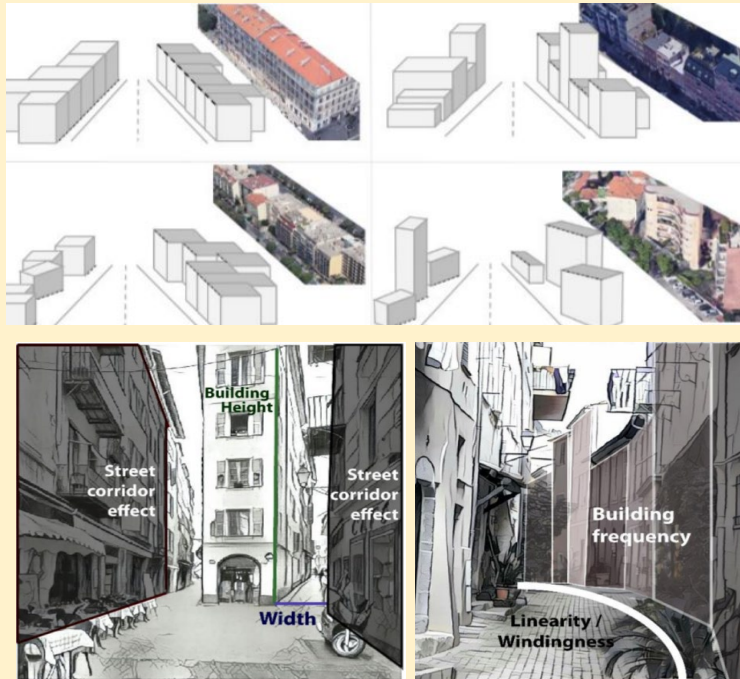
Morphometric measurements to describe the **skeletal streetscape** (Aultman-Hall and Harvey 2016) :

- Plot depth
- Presence of building types (within 50 m)
- Proximity band coverage ratio
- Parallel façades (within 15 m)
- Open space ratio (from façade to façade)
- Building height
- Build. Height / Street Width ratio
- Street straightness/windingness
- Street acclivity
- Tangential depth of view along the street
- ...

Multiple Fabric Assessment

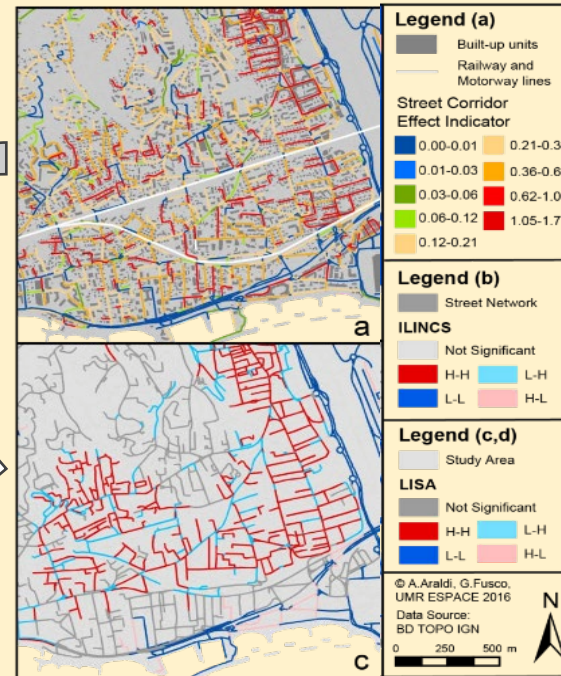
MFA: A 3-step procedure

1. Description of skeletal streetscape



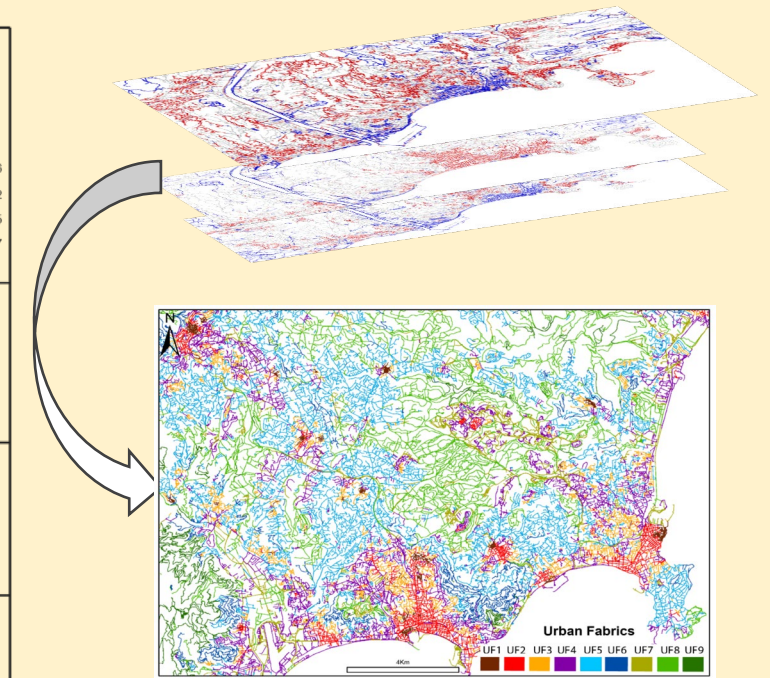
Street-based morphometrics through geoprocessing

2. Identification of spatial patterns on the street network



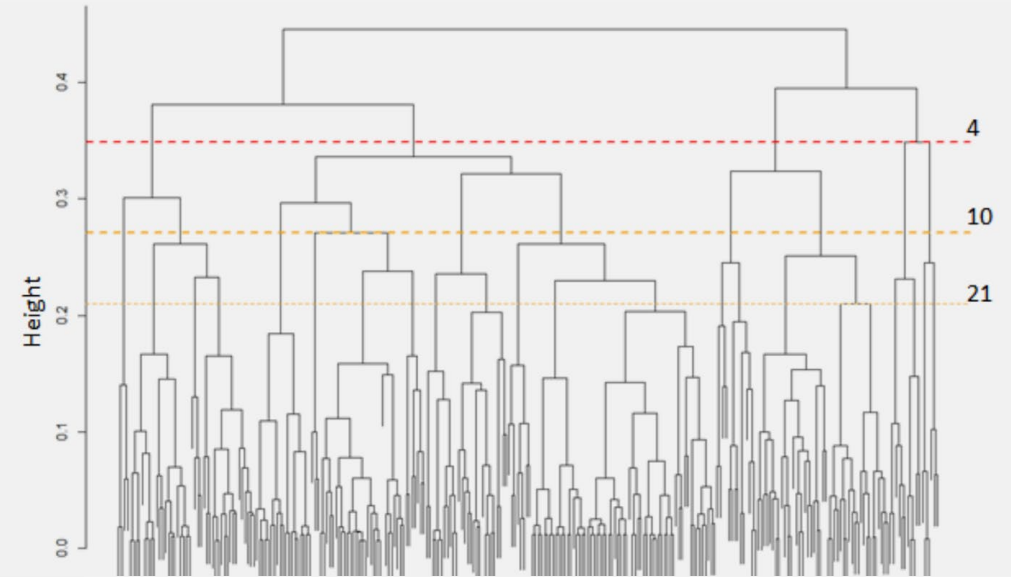
Network-based geostatistics

3. Spatial co-occurrence of morphological pattern



Artificial Intelligence (Unsupervised Bayesian Clustering + HCA)

From the best models to the nested Morphotypes



Hierarchical consensus clustering
combining the 5 best models



Understanding of how
morphotypes relate among them
in terms of morphometric similarity

Compact old city/village



Discontinuous expansion of faubourg/hamlet



Modern discontinuous non-aligned fabric



Continuous faubourg/hamlet



Modern fabric with aligned buildings



Fragmented discontinuous fabric



Specialized space



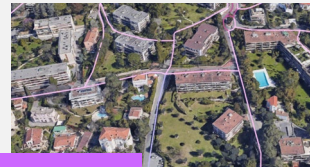
Classical compact grid-based city



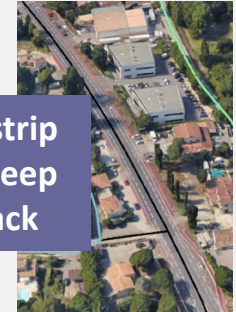
Compact heterogeneous city



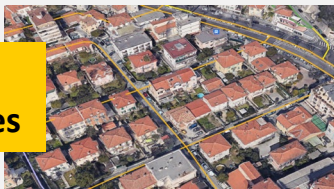
Discontinuous fabric of buildings and houses



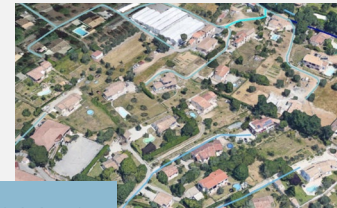
Road strip with deep setback



Densified urban subdivision of houses



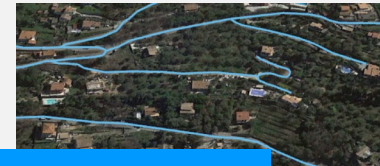
Heterogeneous suburban fringe



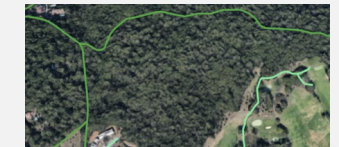
Homogeneous suburban subdivision



Scattered ex-urban housing on the hills



Connections in undeveloped space



Urban subdivision of aligned houses



Urban parcs / agriculture



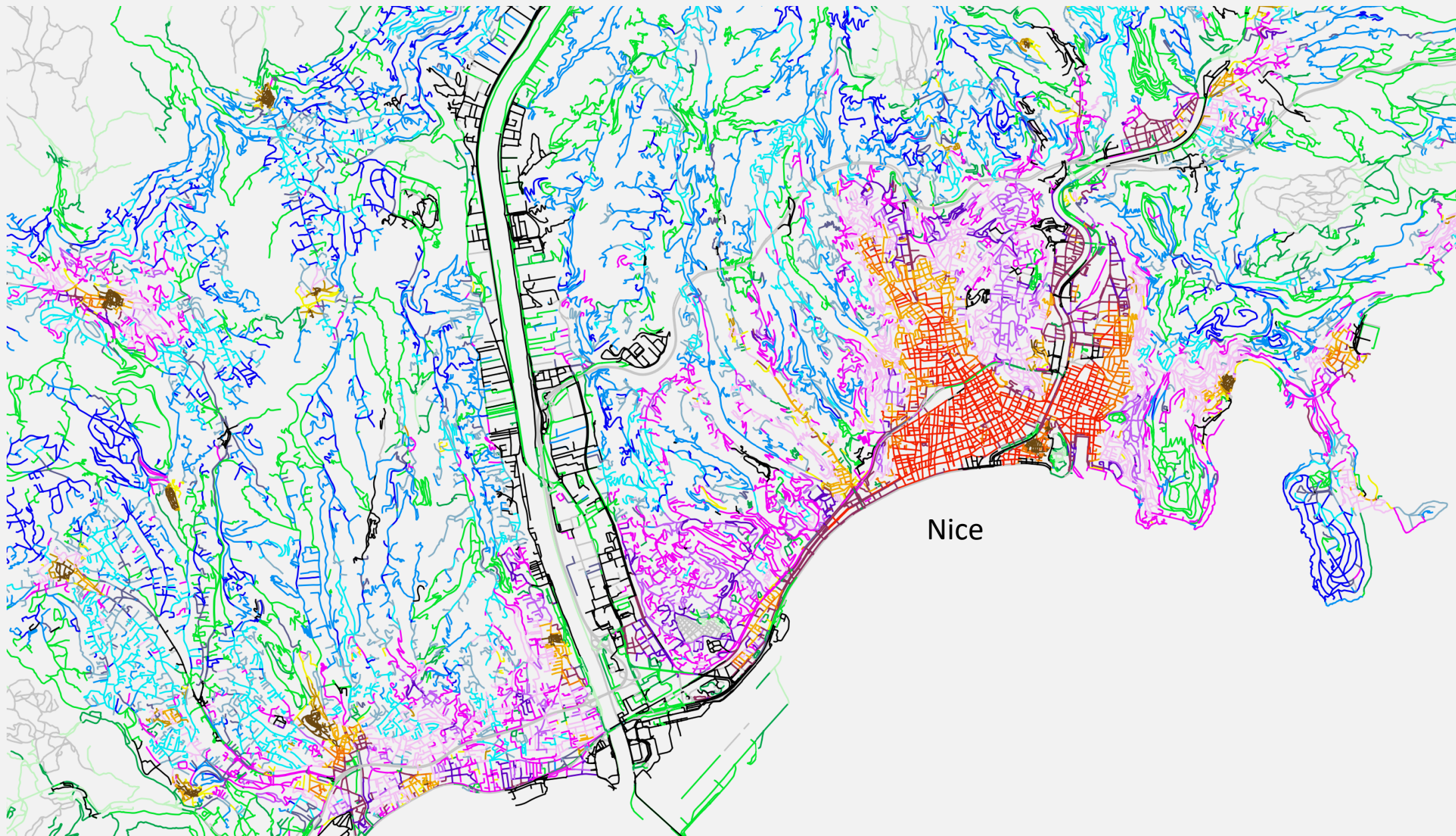
20 Morphotypes on the French Riviera

Suburban fabric of free-standing villas

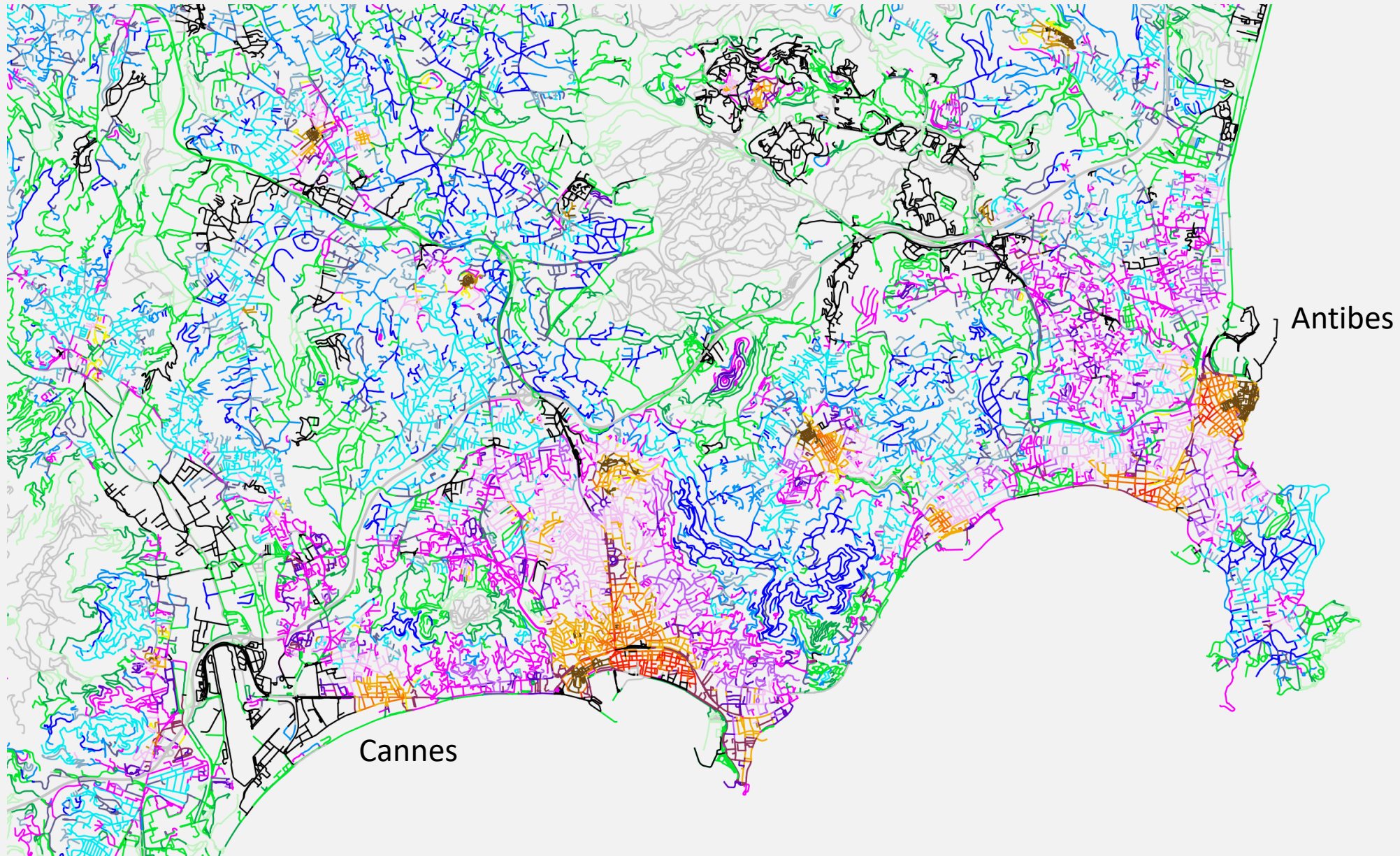


Interface with undeveloped space

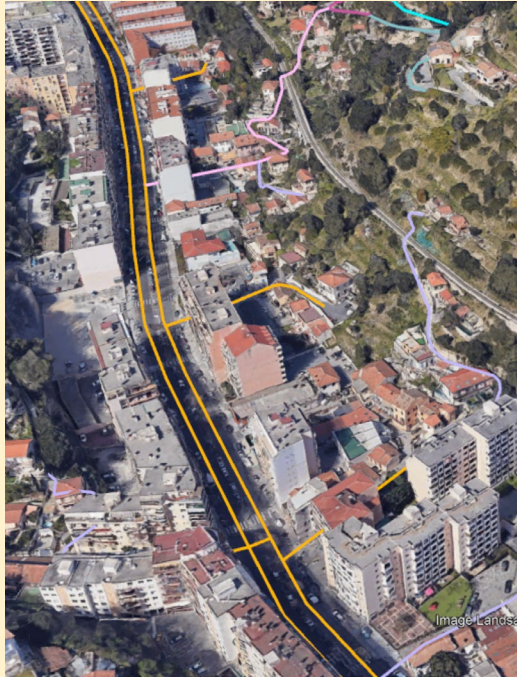
Spatializing morphotypes on the French Riviera



Spatializing morphotypes on the French Riviera



Matrix route vs. Road strip



Densified continuous faubourg
(La Madeleine, Nice)



Discontinuous faubourg
extension (D2204, Drap)



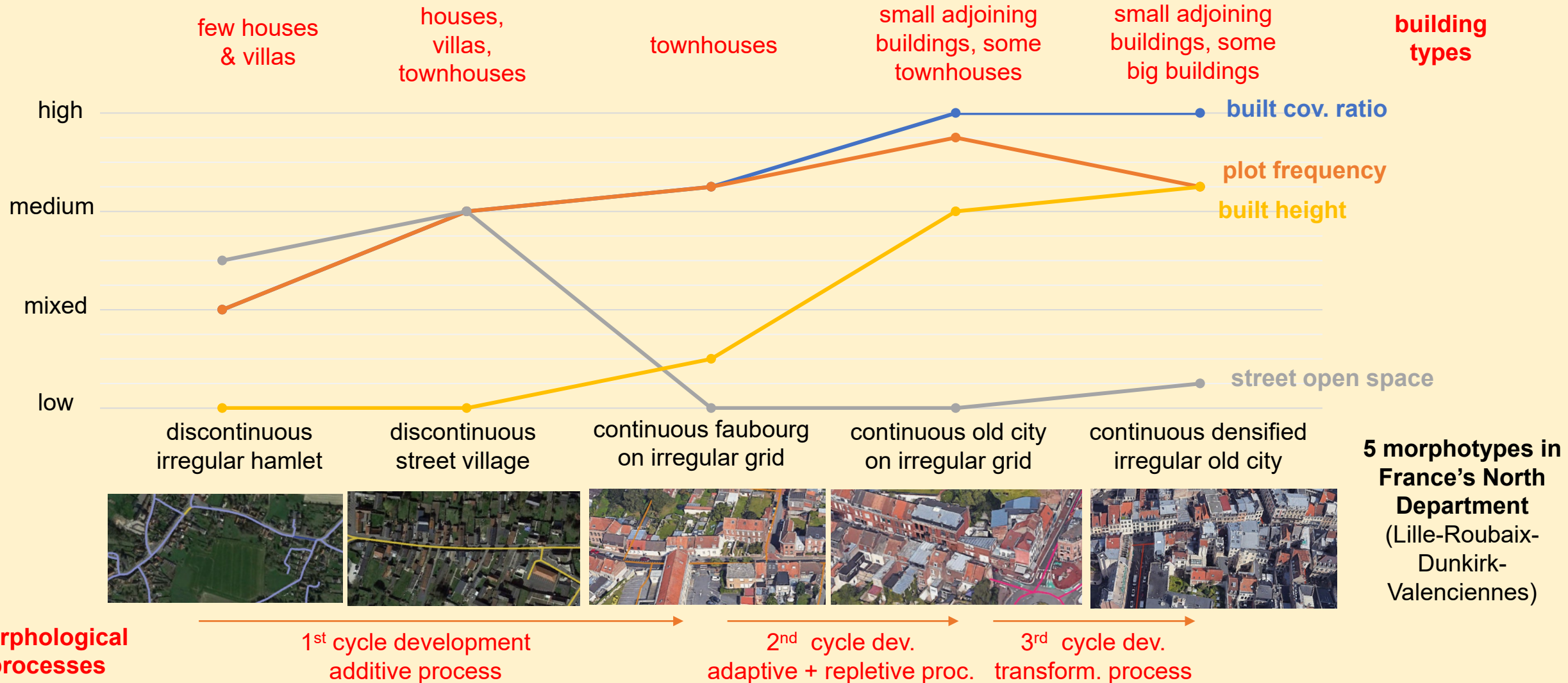
Road Strip with deep setback
(D436, Cagnes)

preexisting element, channel of flow,
attractor and organizer of buildings

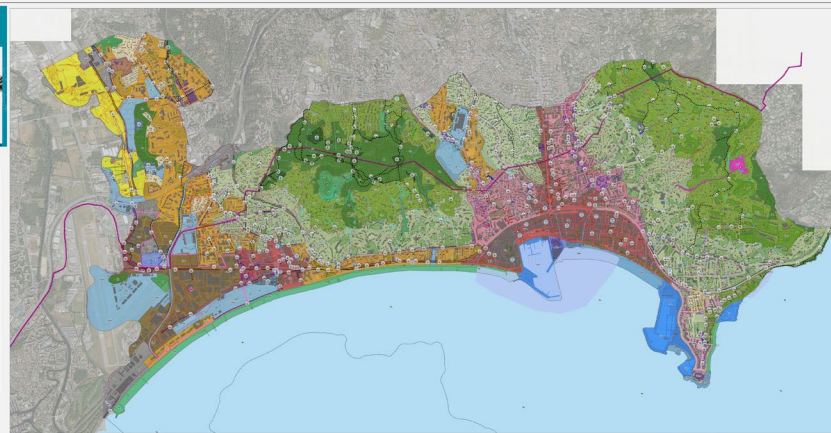
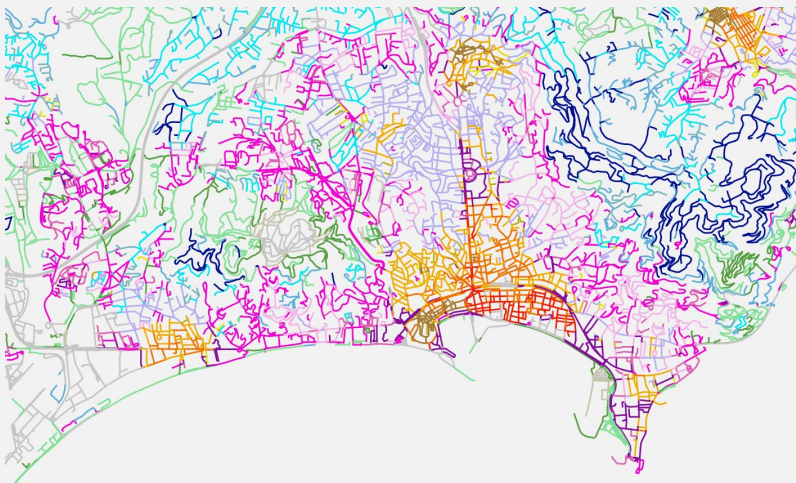
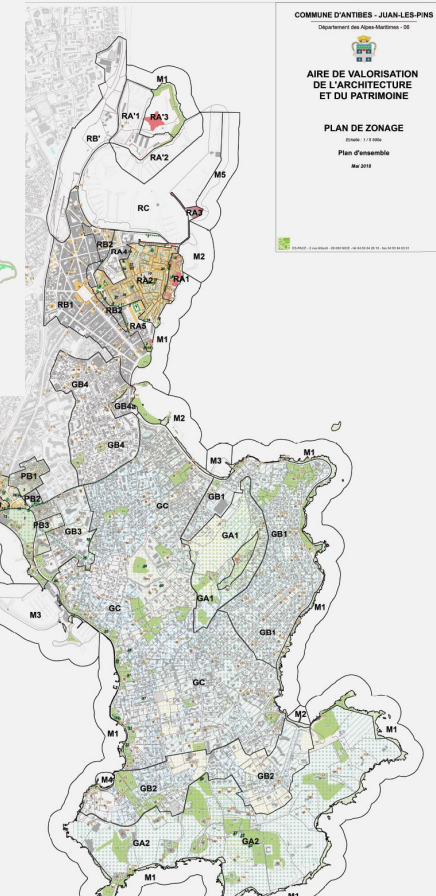
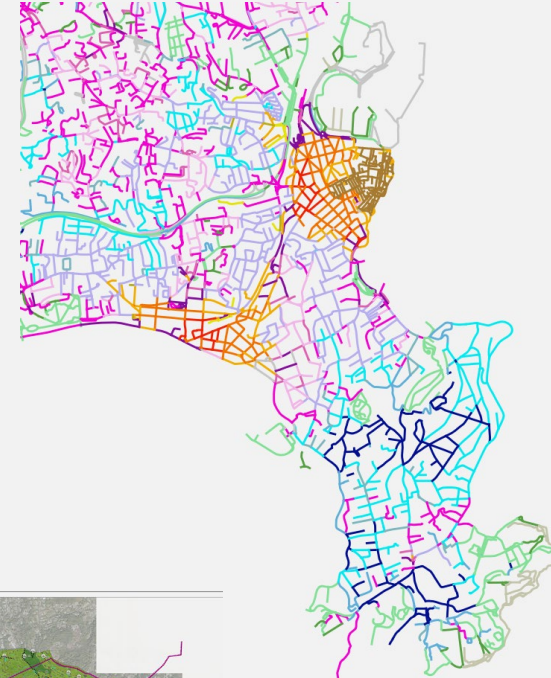
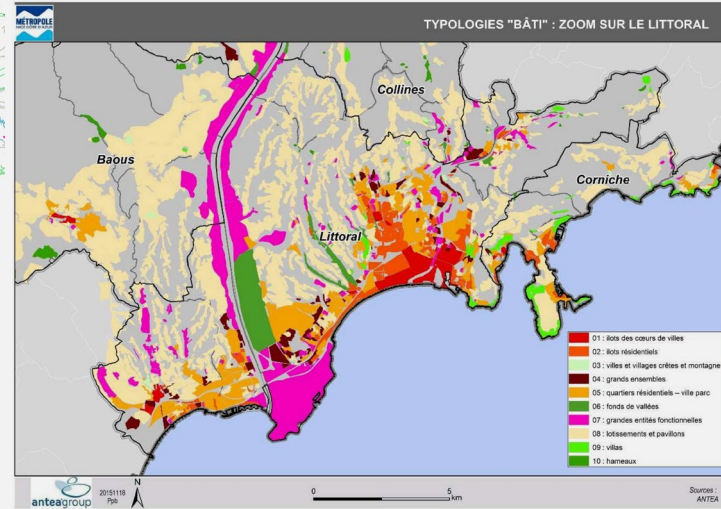
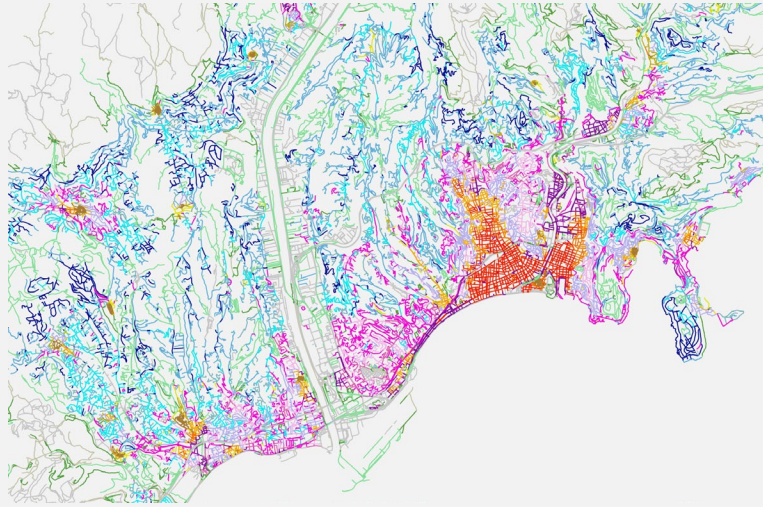
channel of flow,
“repulsor” of buildings

Observing the Morphological Process

Synchronic analysis → impossibility to trace the morphological trajectory of a given urban fabric
 ... but we can observe UF at different stages within a given morphological process

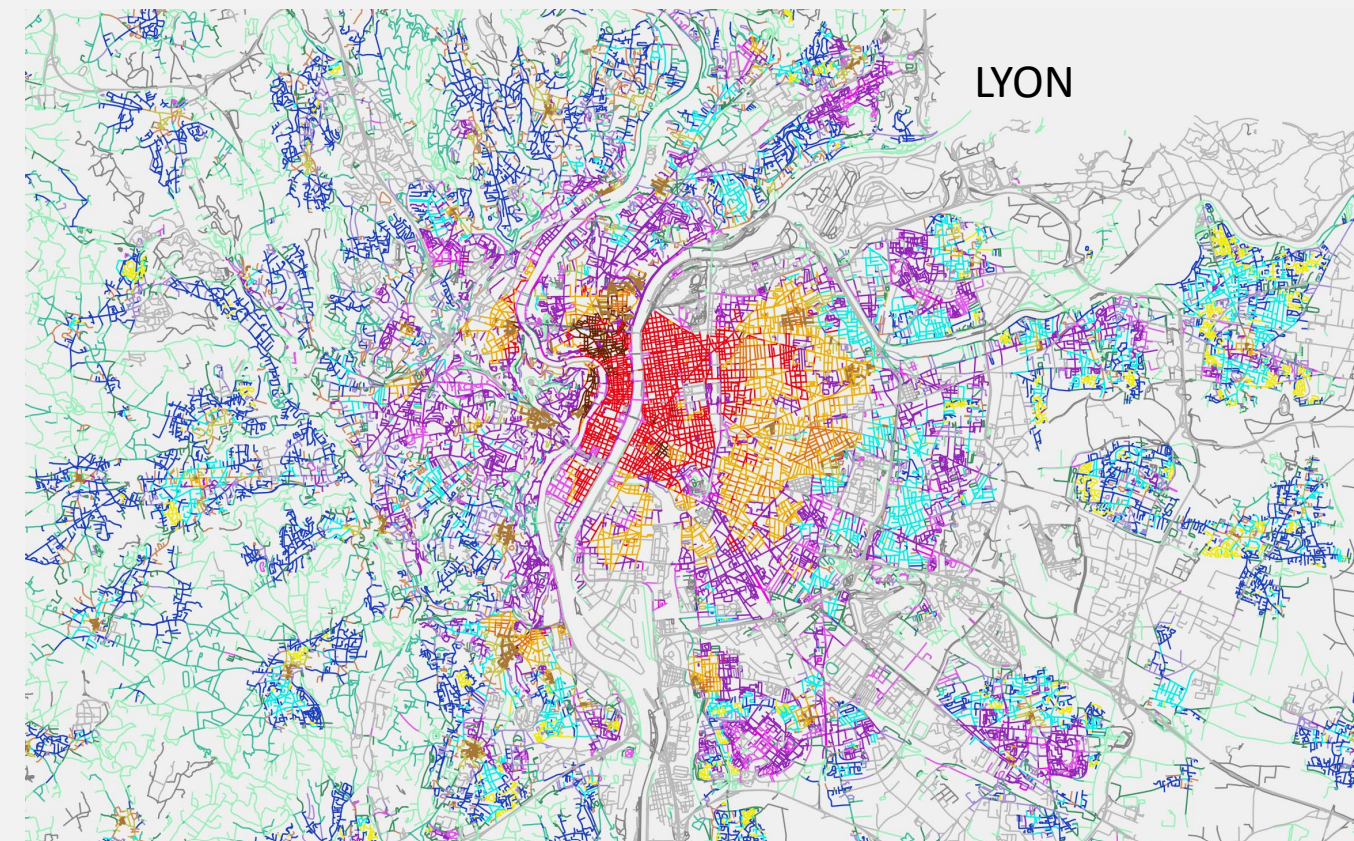


Perspective: Planning within known morphotypes

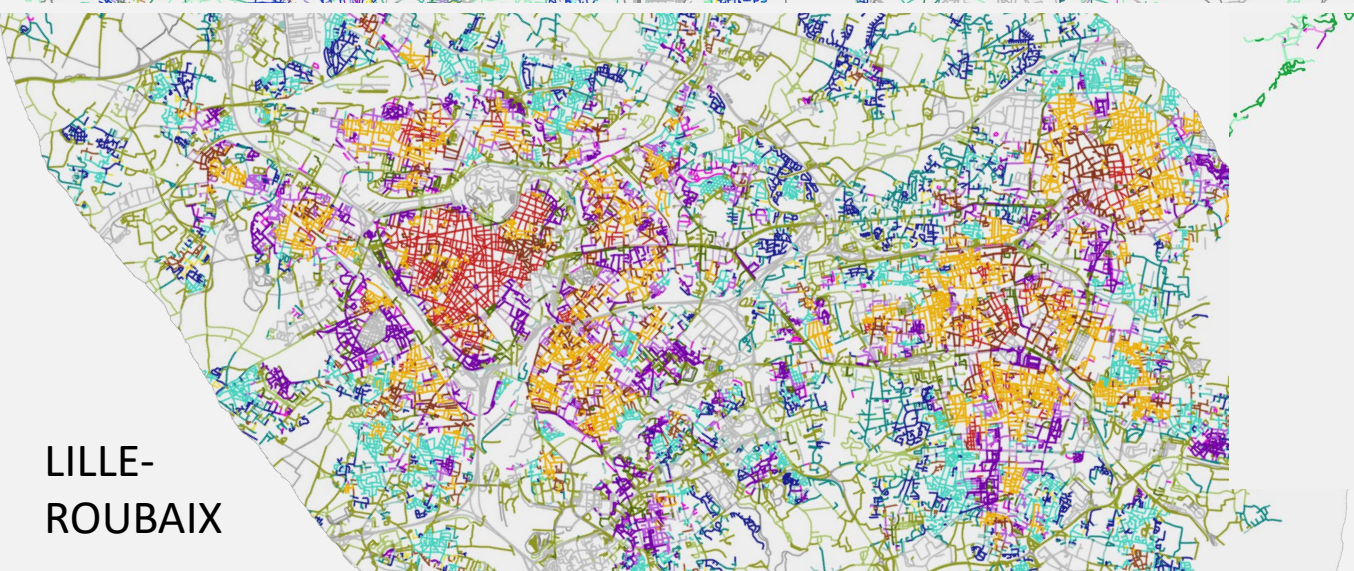


Towards a Morphological Atlas of France

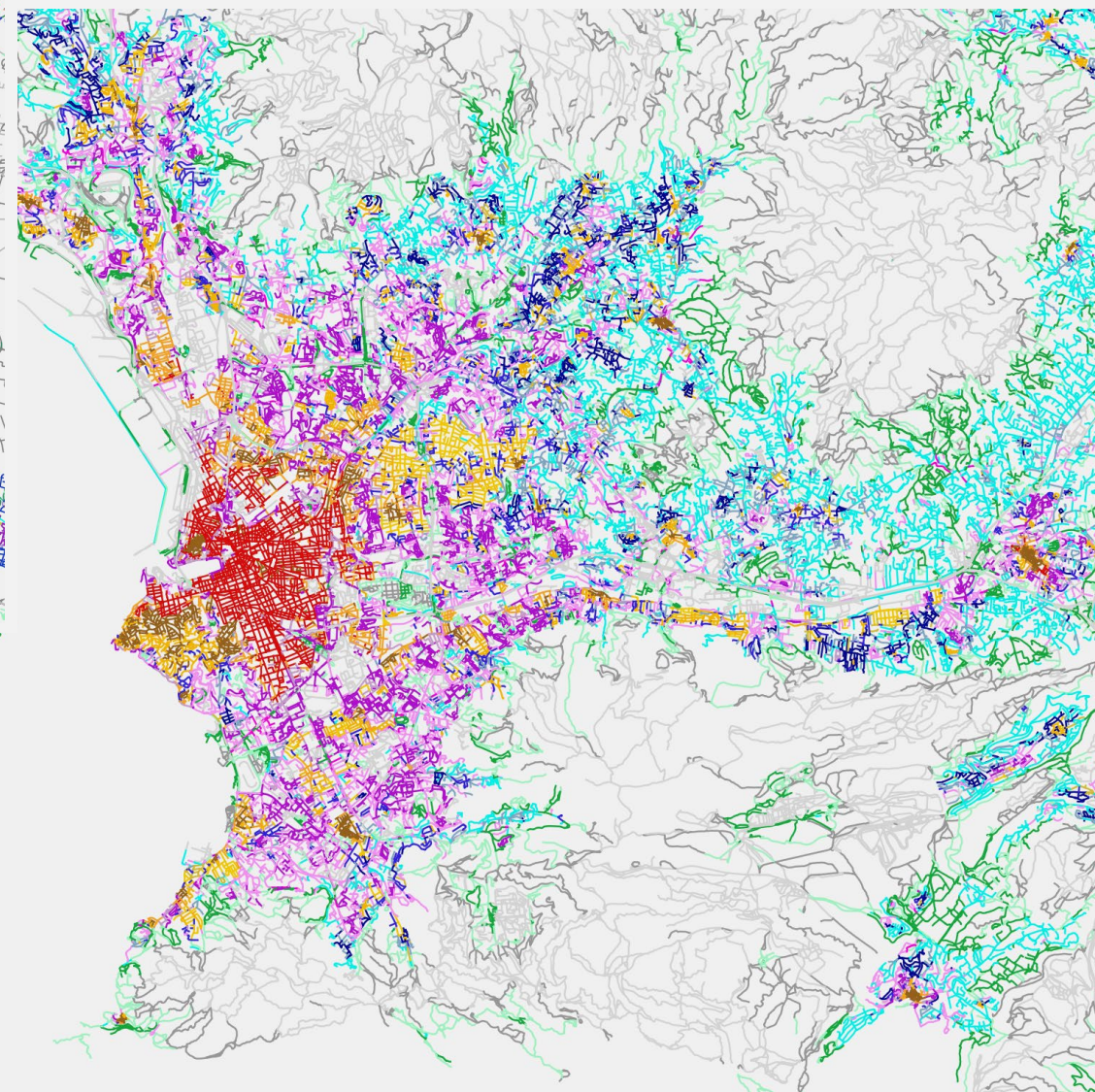
LYON



LILLE-
ROUBAIX



MARSEILLE



Conclusions

MFA and the Urban Morphology schools :

- Urban Fabric as typical relations between elements of urban form (streets, buildings, parcels)
- The Typo-morphological nexus
- The primacy of the street and its pertinent strip in defining the urban fabric
- Seeing morphotypes as phases within the morphological process
- Understanding the spatial logics of morphological regions within a metropolitan area
- Bridging morphological mapping and understanding with the planning process

Thanks for your attention

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