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The application of Evidence-Based Design and Planning in Data Challenging Contexts.

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TWIN2EXPAND

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101078890

UK Research and Innovation

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Introduction: the TWIN2EXPAND project

Session 10

TWIN2EXPAND

Results of the **TWIN2EXPAND project** which aims to support capacity building and research excellence in the field of **evidence-based design and planning (EBDP).**

Spatial models, tools and methods to assess the social-economic performance of cities have been **proven effective** in producing reliable results in **data-rich contexts**.

Challenges emerge in contexts such as Cyprus, **where built environment data availability and quality**, as well as **institutional capacity**, **are limited** – these challenges are shared by many countries worldwide.

The project used a workflow (CitySeer) to create spatial models, **automating the retrieval, cleaning and analysis of open-source data**.

These **models** were **validated mathematically** against well-established manually edited model **and applied in real-world projects** to establish their capability to respond to practice-relevant questions.

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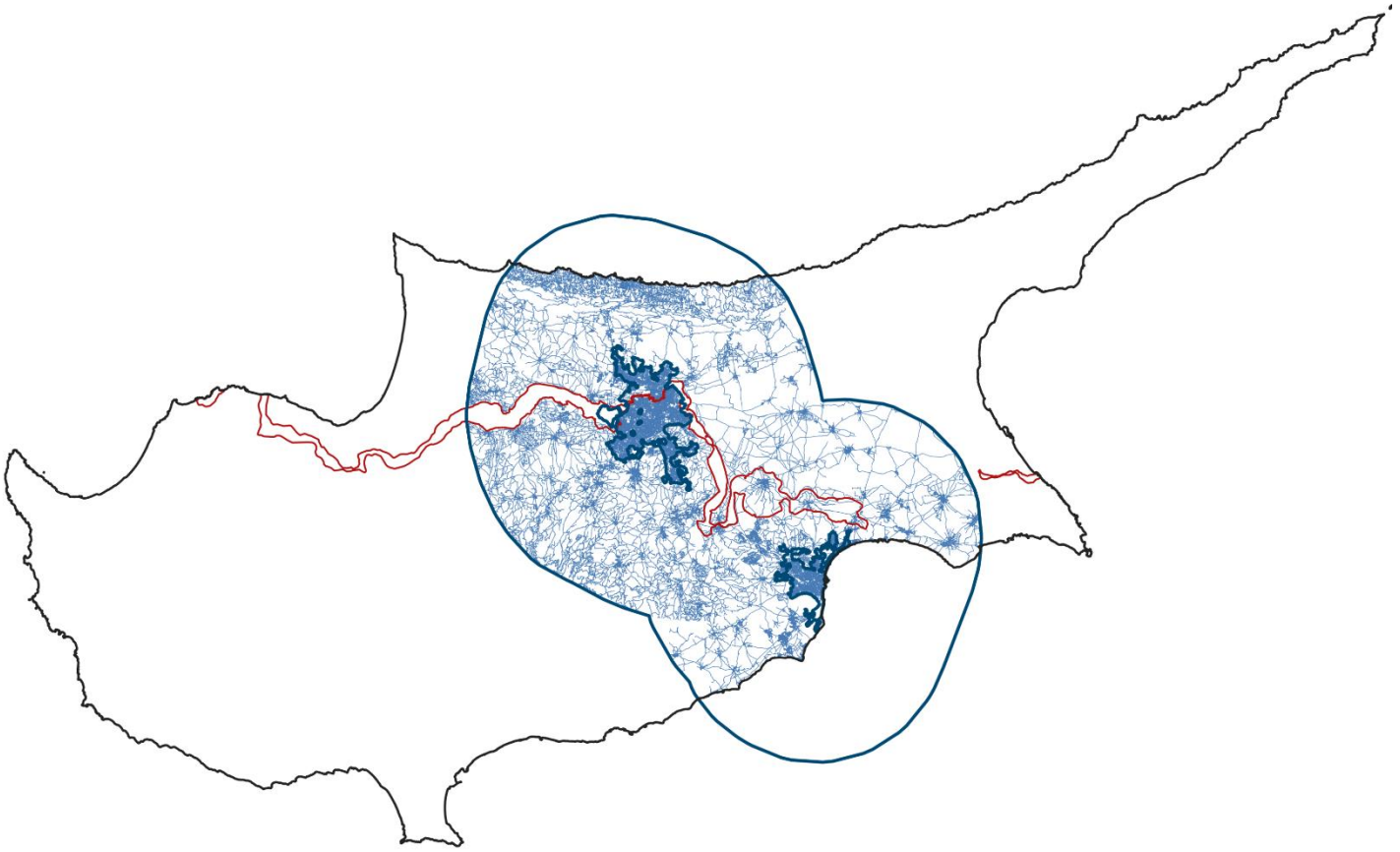
Motivation: challenges for EBDP

TWIN2EXPAND

Area covered by the manually edited and processed street network .



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Motivation: challenges for EBDP

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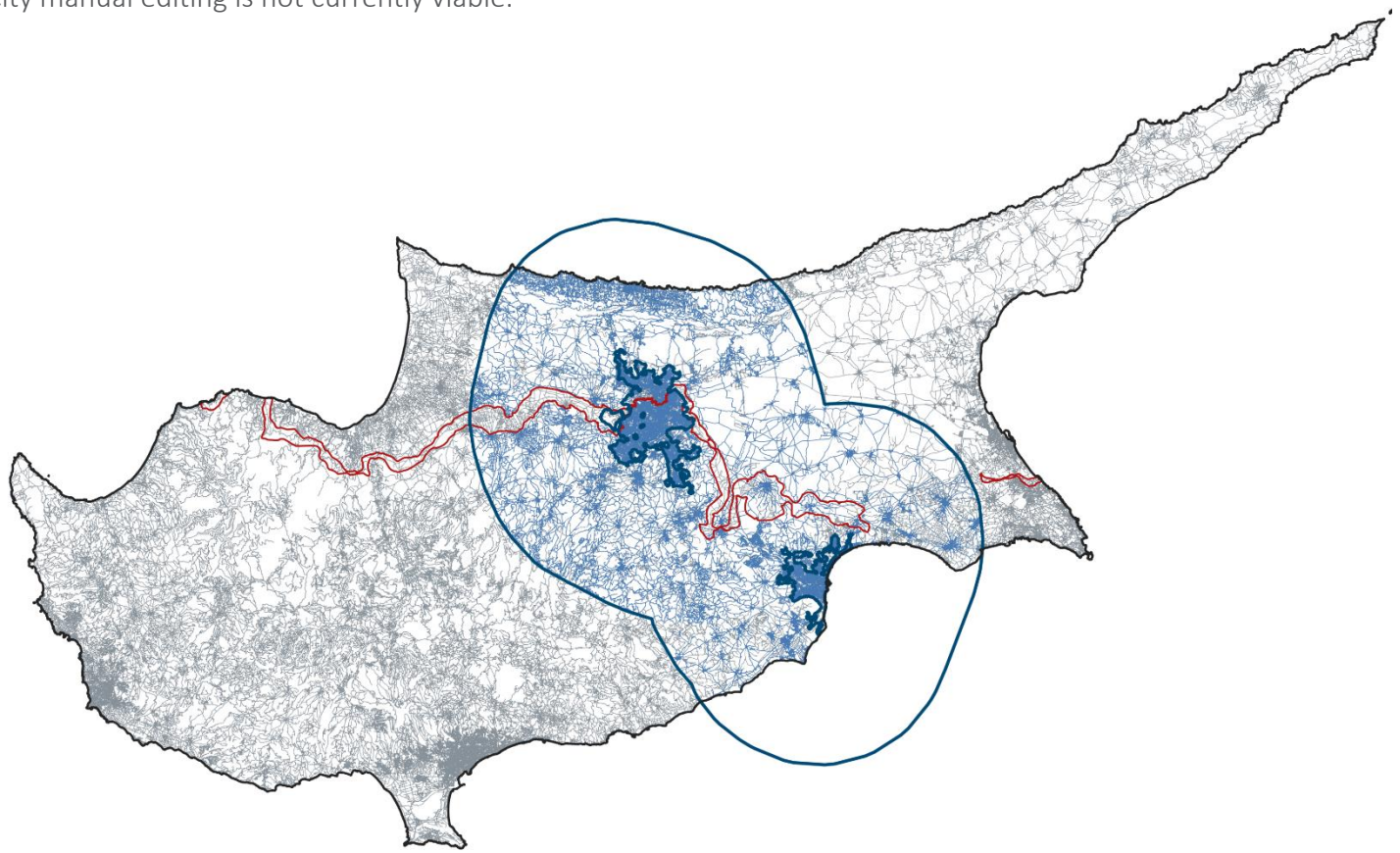
Area that is covered by open-source data (OSM), but due to limited capacity manual editing is not currently viable.



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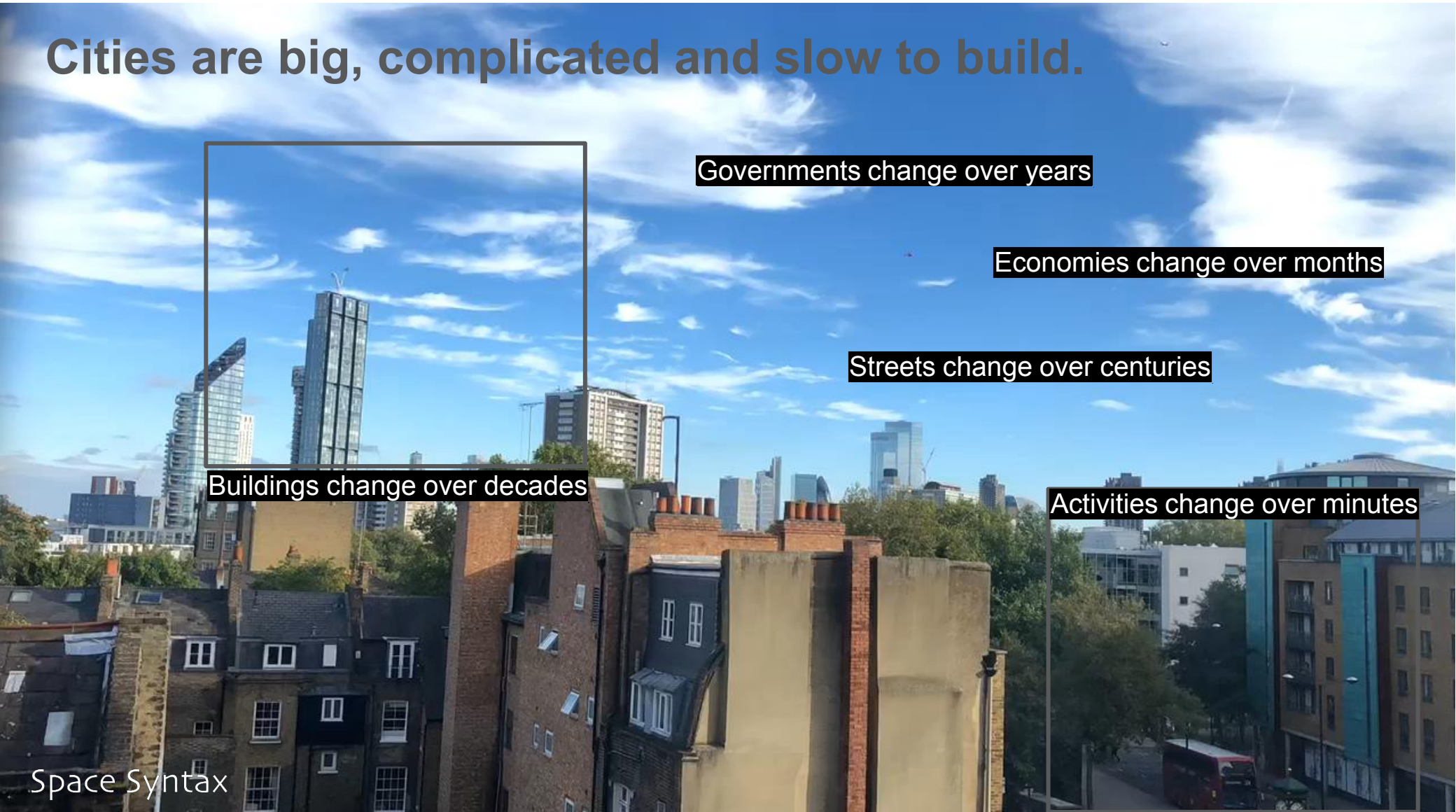
Background: the nature of cities



Background: space syntax

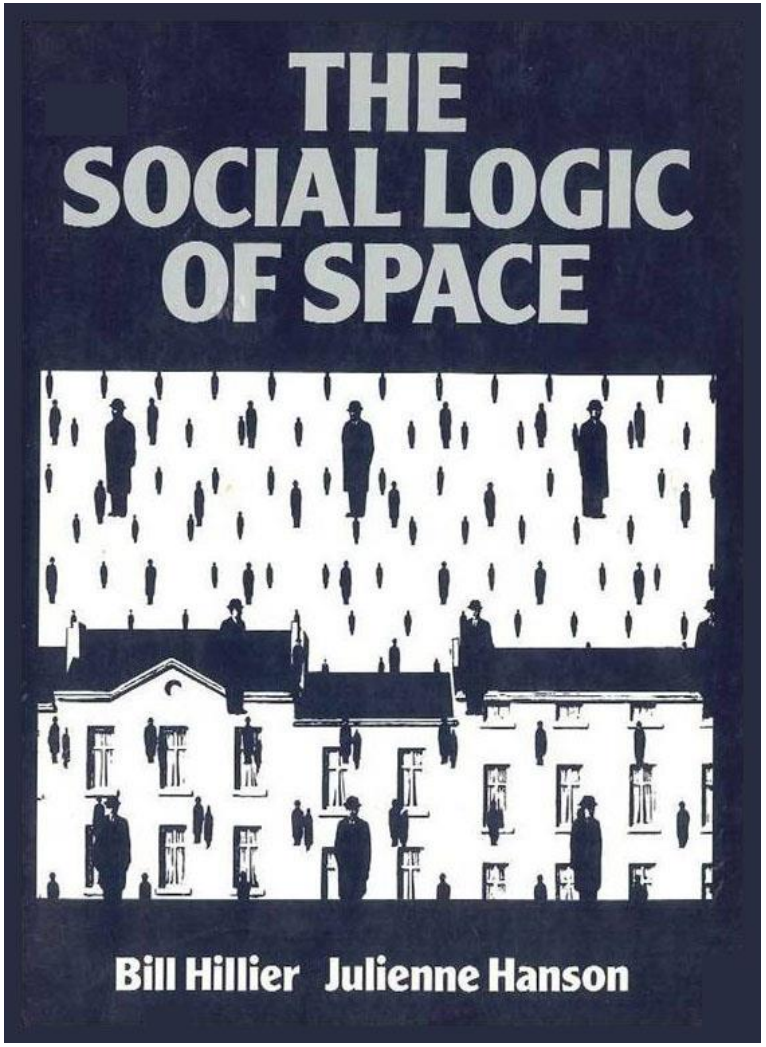
Space is not a background to human activity but is intrinsic to it.

Space syntax is a theory and a method for quantitatively describing patterns of spatial layout and relating these patterns to social activities such as movement, behaviour, and even social meaning and interpretation

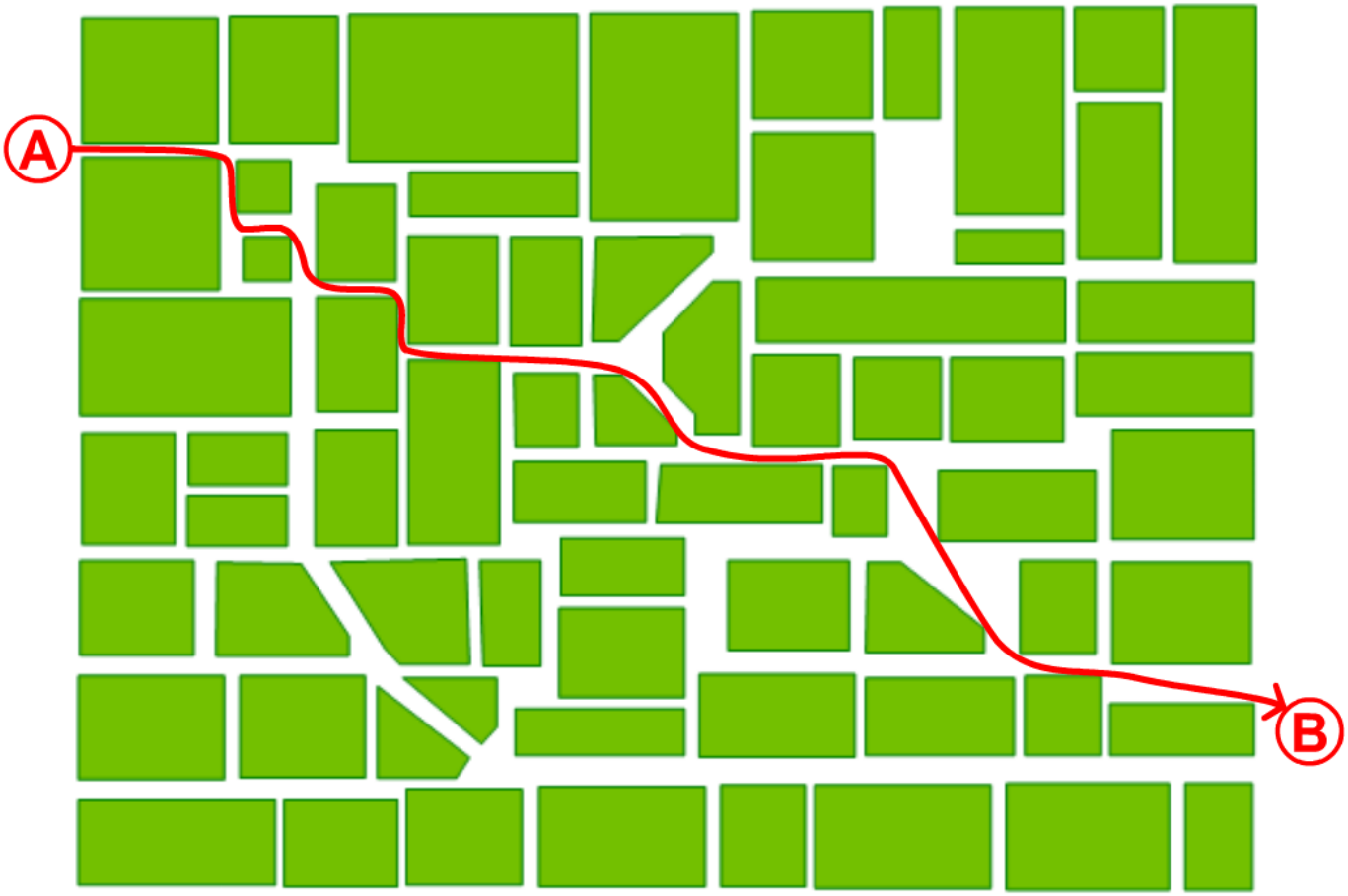
- to understand and simulate the social effects of design.

Space is first and foremost configurational

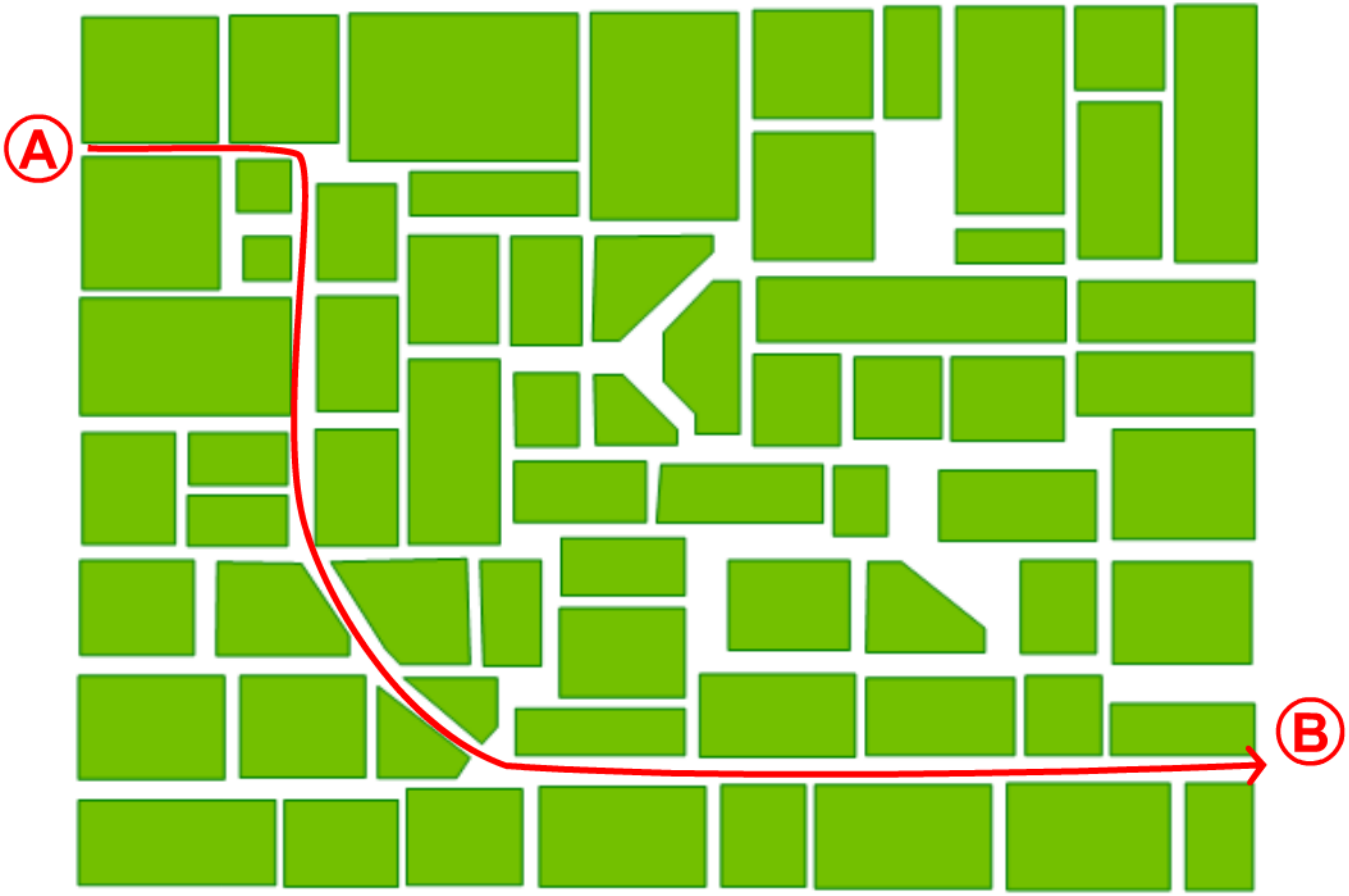
- what happens in any individual space is fundamentally influenced by the relationships between that space and the network of spaces to which it is connected.



Background: shortest path

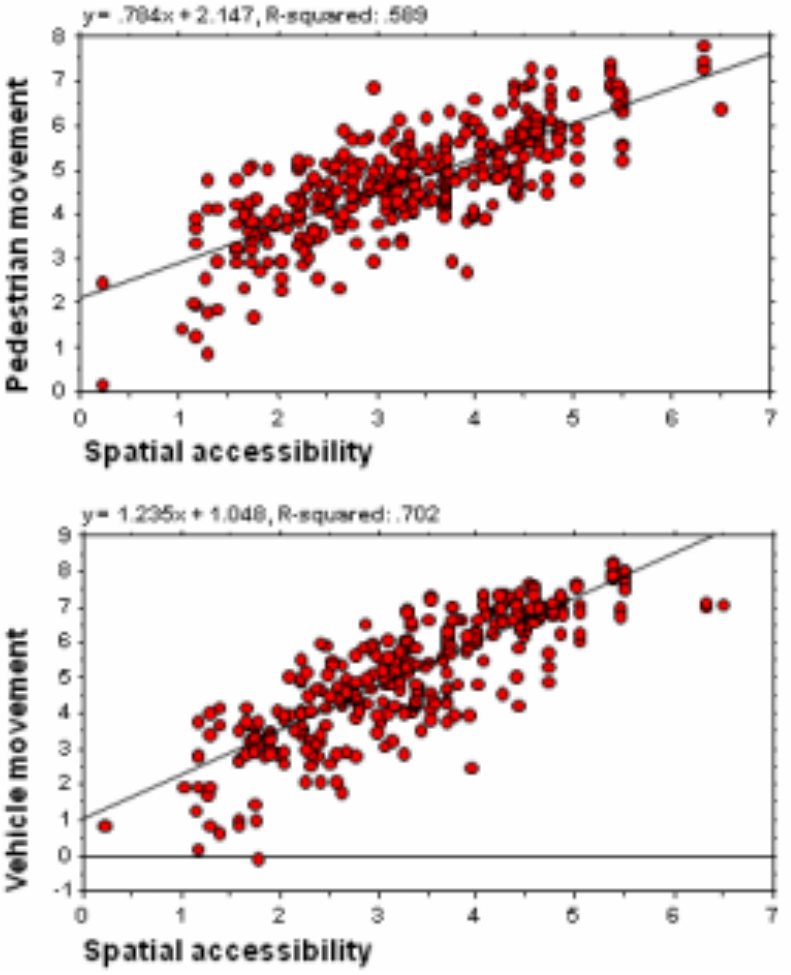


Background: simplest path

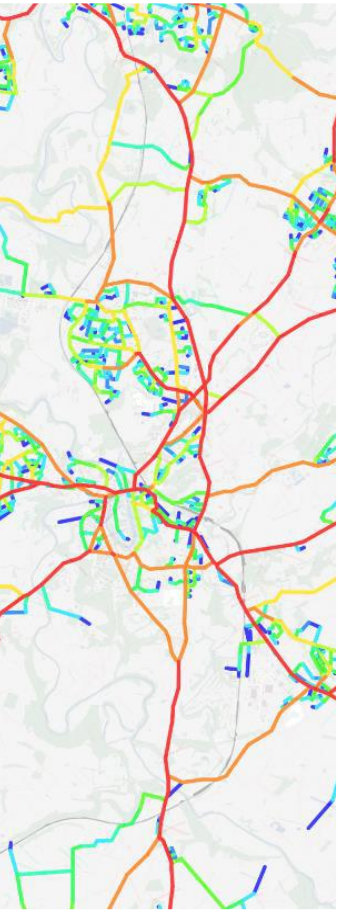


Background: spatial layout organises movement

60-80% of movement flows are due to the structure of the network



Background: key relationships



Urban form

Movement

Land use

Economy

Crime

Sustainability

Space Syntax

Objectives

TWIN2EXPAND

TWIN2EXPAND is a project funded by Horizon Europe. It aims to enhance research capacities in evidence-based urban design and planning (EBDP) as a field of critical importance in the R&I of integrated approaches and technologies for effective spatial planning and sustainable urban governance.

University of Cyprus | UCL | CHALMERS UNIVERSITY OF TECHNOLOGY | Politecnico di Torino | Space Syntax

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Research Question

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What are the challenges and barriers of applying existing spatial models, KPIs and tools focusing on social-economic performance in *data challenging urban environments*?

↓

Automated **models validated mathematically** against well-established manually edited model **and applied in real-world projects** to establish their capability to respond to context-sensitive, practice-relevant questions.

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Results: representation of space

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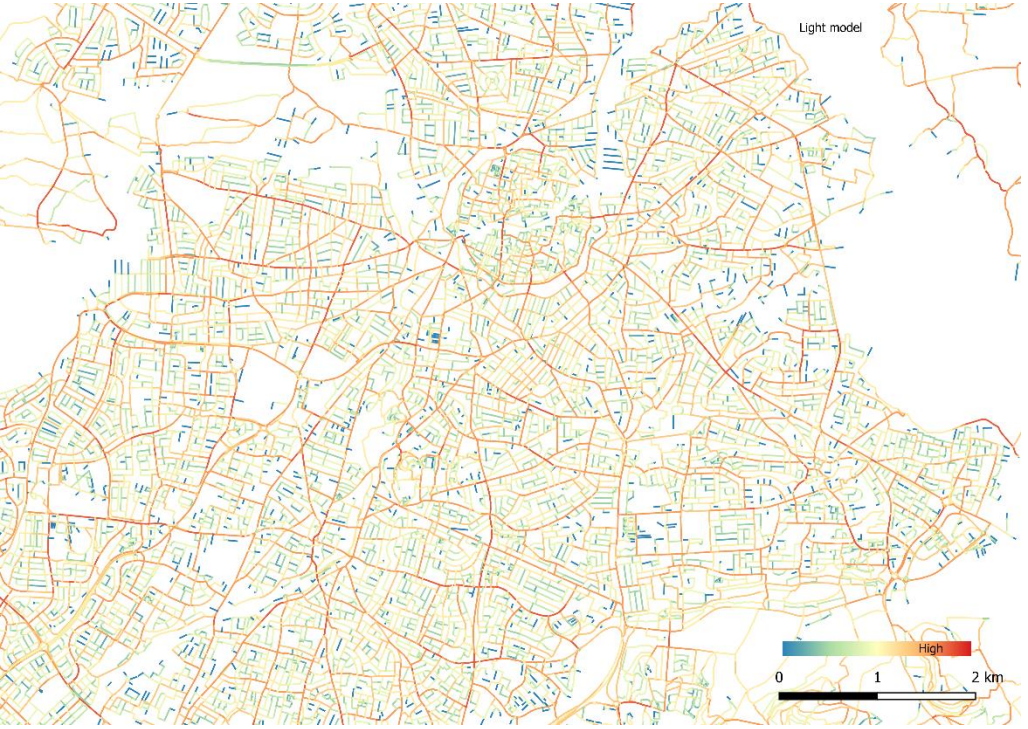

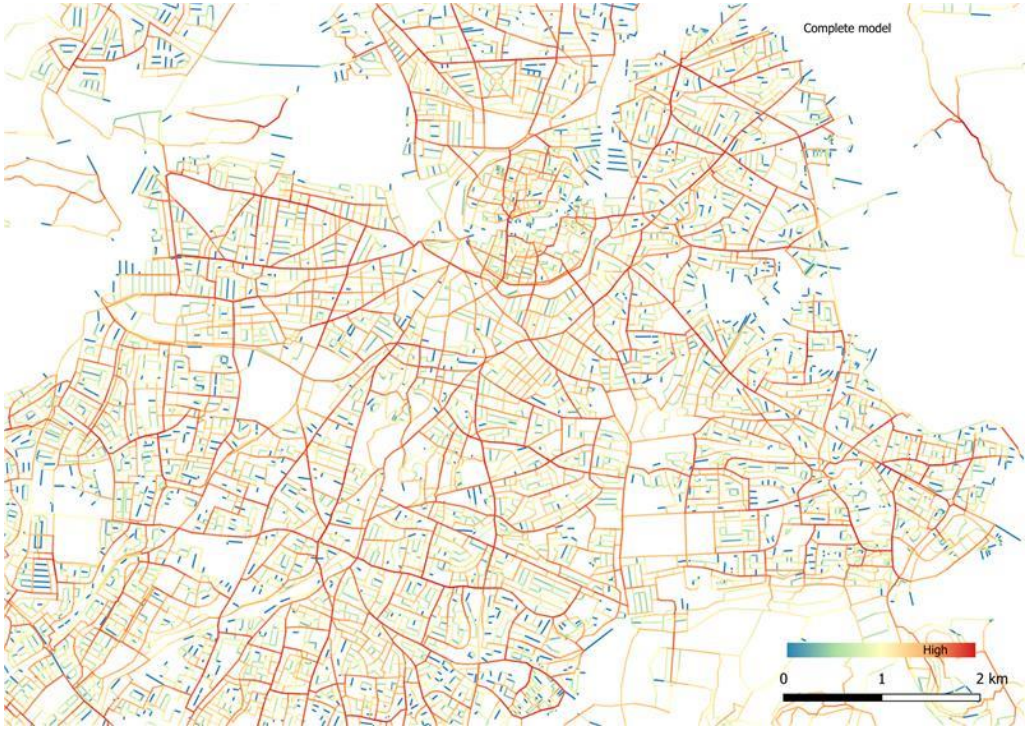

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Results: mathematical validation

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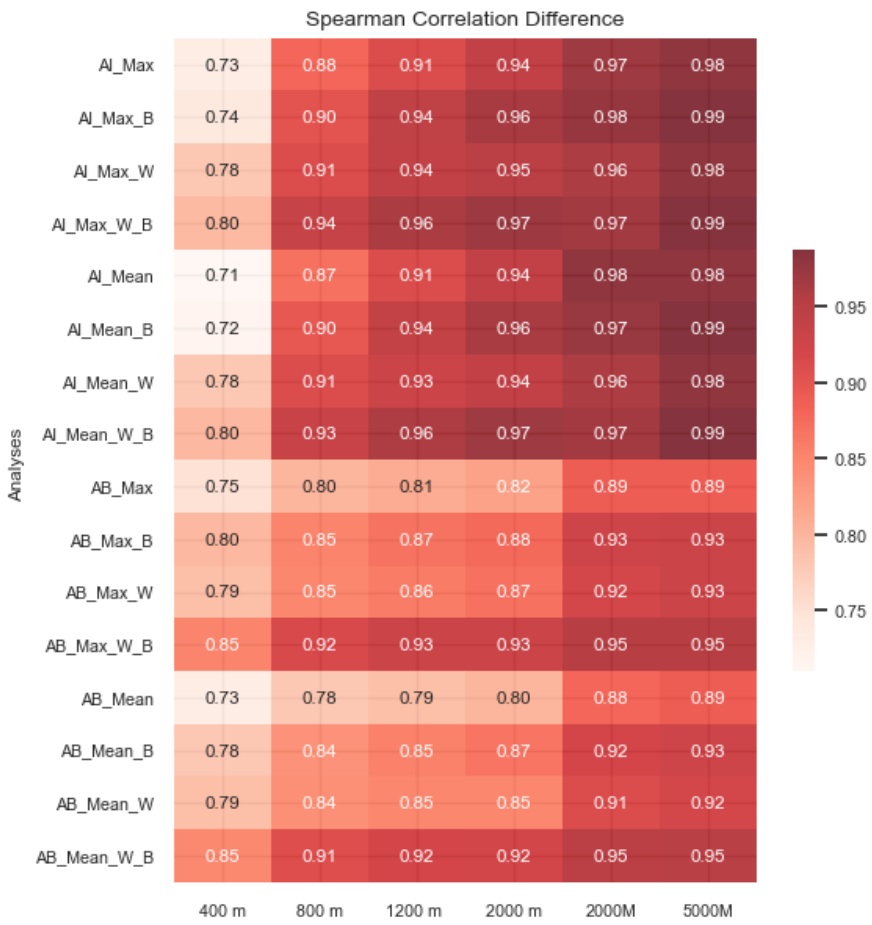

Centrality: high correlations for both motorised and non-motorised networks; increases at larger radii (0.71 – 0.98; weighted: 0.78 – 0.98)

Betweenness: slightly lower maximum correlations also increasing at the larger radii (0.75 – 0.89; weighted: 0.79 – 0.93)

Accessibility to POIs: the automated model reaches more destinations, agreement between models decreases at larger radii

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Practice oriented ‘testing’ questions

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Testing question	Description	Scale
R1	Assessing the viability of Citizen Service Centres based on population density that they will serve and their accessibility by different transport modes.	Urban
R2	What is the accessibility of amenities and services from and within Pedieos linear park [existing + masterplan]?	Project
R3	What is the accessibility of the Land of Tomorrow masterplan’s waterfront / amenities and services from the waterfront?	Project
R4	What is the accessibility of green public spaces through routes which provide at least 50% of green canopy [Nicosia]?	Urban
R5	What is the accessibility of intercity bus stops + rural bus stops in relation to Citizen Service Centres in the area between Larnaca and Nicosia.	Territorial
R6	What is the accessibility of heritage and cultural sites from cycling routes?	National

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Results: practice questions (citizen services)

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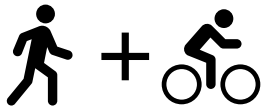

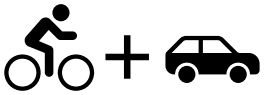

Location	1200m Population	Location	1200m Built Density
Pallouriotissa S2	11704	Makariou	3216
Makariou	11231	Pallouriotissa S2	2326
Pallouriotissa S1 (PO)	11080	Pallouriotissa S1 (PO)	2308
Aglantzia S1 (PO)	9313	Aglantzia S1 (PO)	1609
Aglantzia S3	6632	Aglantzia S3	1296
Engkomi	3890	Engkomi	614
Aglantzia S2	2360	Aglantzia S2	235
Latsia S1	275	Latsia S1	12
Location	**5000m Population**	**Location**	**5000m Built Density**
Makariou	142037	Makariou	27,657
Pallouriotissa S2	106634	Pallouriotissa S2	21,064
Aglantzia S3	96693	Pallouriotissa S1 (PO)	18,841
Aglantzia S1 (PO)	96531	Aglantzia S1 (PO)	18,523
Pallouriotissa S1 (PO)	95036	Aglantzia S3	18,367
Engkomi	88064	Engkomi	14,226
Aglantzia S2	54568	Aglantzia S2	9,086
Latsia S1	45856	Latsia S1	7,732
Location	**Public Transport Population**	**Location**	**Public Transport Built Density**
Aglantzia S2	30338	Aglantzia S2	4,804
Makariou	27701	Makariou	4,611
Pallouriotissa S2	24103	Pallouriotissa S2	4,339
Aglantzia S1 (PO)	17429	Pallouriotissa S1 (PO)	3,117
Pallouriotissa S1 (PO)	16072	Aglantzia S1 (PO)	2,504
Latsia S1	12564	Latsia S1	1,951
Aglantzia S3	9350	Aglantzia S3	1,232
Engkomi	0	Engkomi	0

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Results: practice questions (citizen services)

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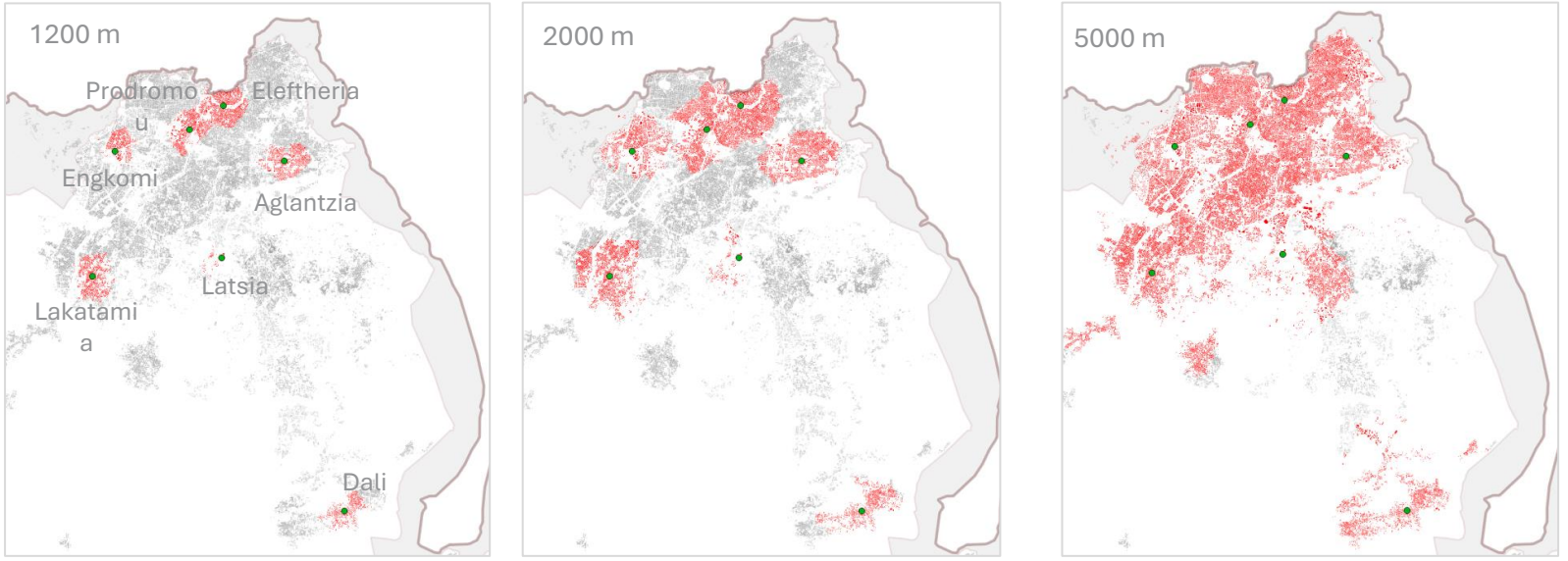

Location	400m	1200m	2000m	5000m	Public Transport
	Population	Population	Population	Population	Population
Engkomi	435	3,890	12,739	88,064	0
Aglantzia	696	6,632	18,295	96,693	9,350
Dali	235	2,430	5,574	12,603	5128
Prodromou	538	6,880	25,050	143,583	65,342
Eleftheria	622	8,000	26,861	136,997	201,225
Latsia	35	275	955	45,856	12,564
Lakatamia	598	6176	17195	67620	7588

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Results: practice questions (Lan d of Tomorrow)

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What is the accessibility of the promenade?

What is the general accessibility of the masterplan?

How does the existing main road design affect accessibility?

What is the accessibility to amenities in the area [existing + predicted POIs]?

Which uses should be placed where and in what percentage?

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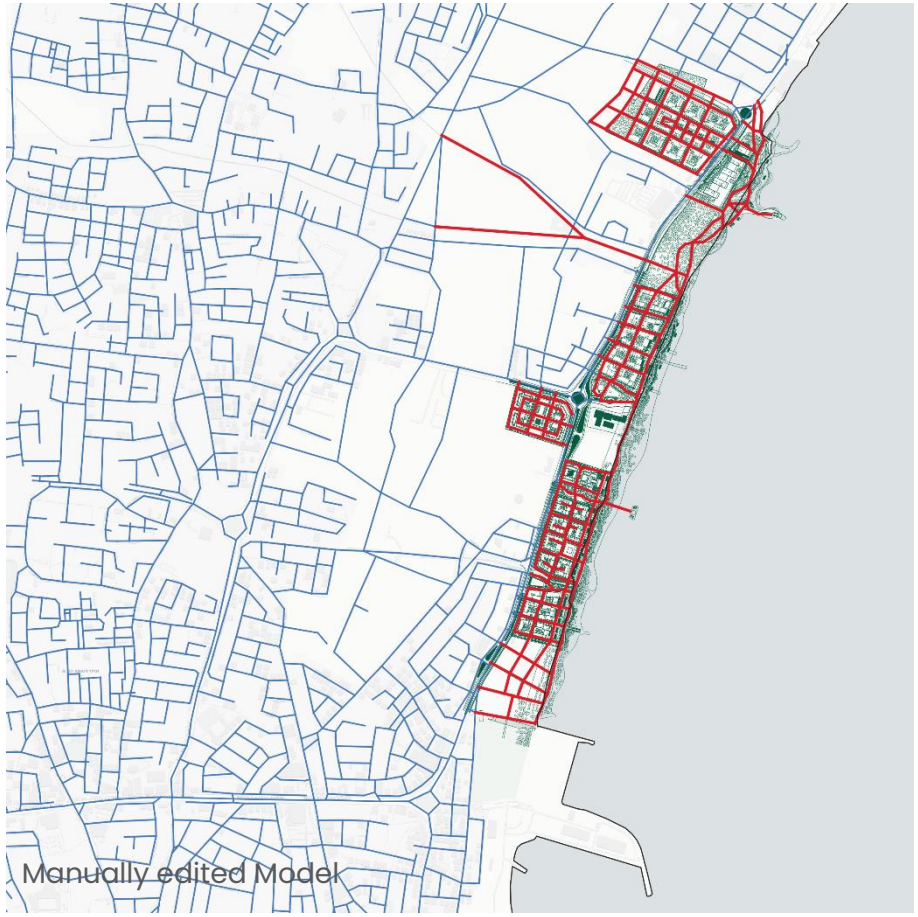

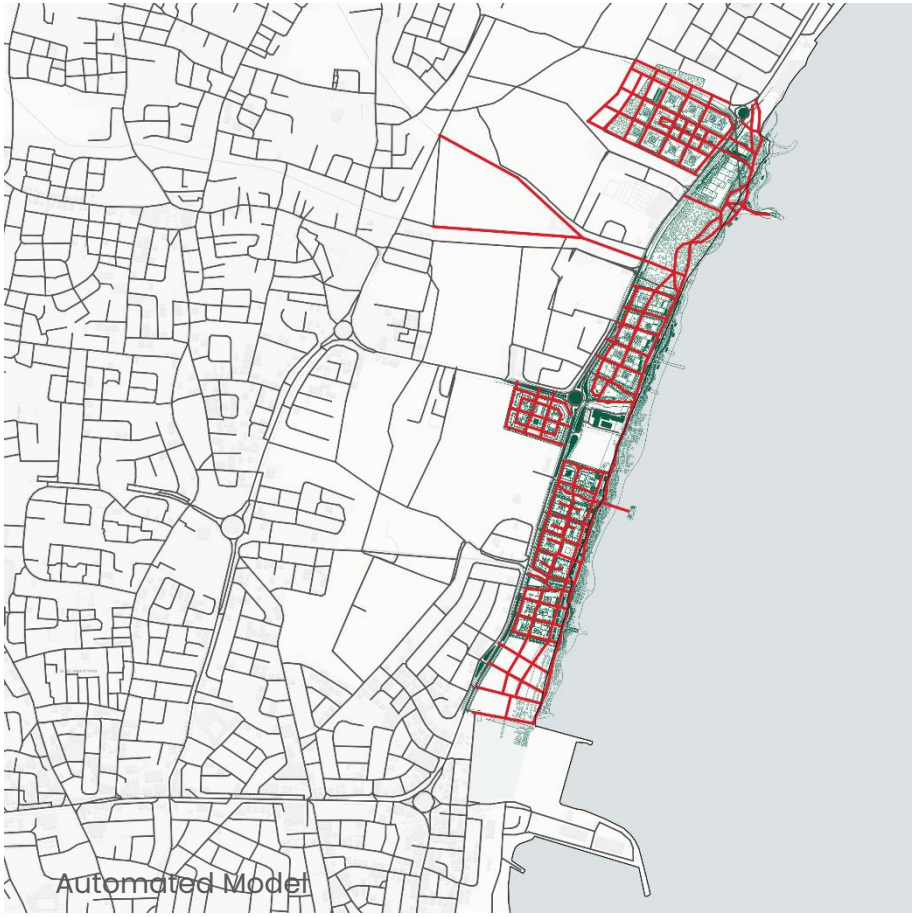

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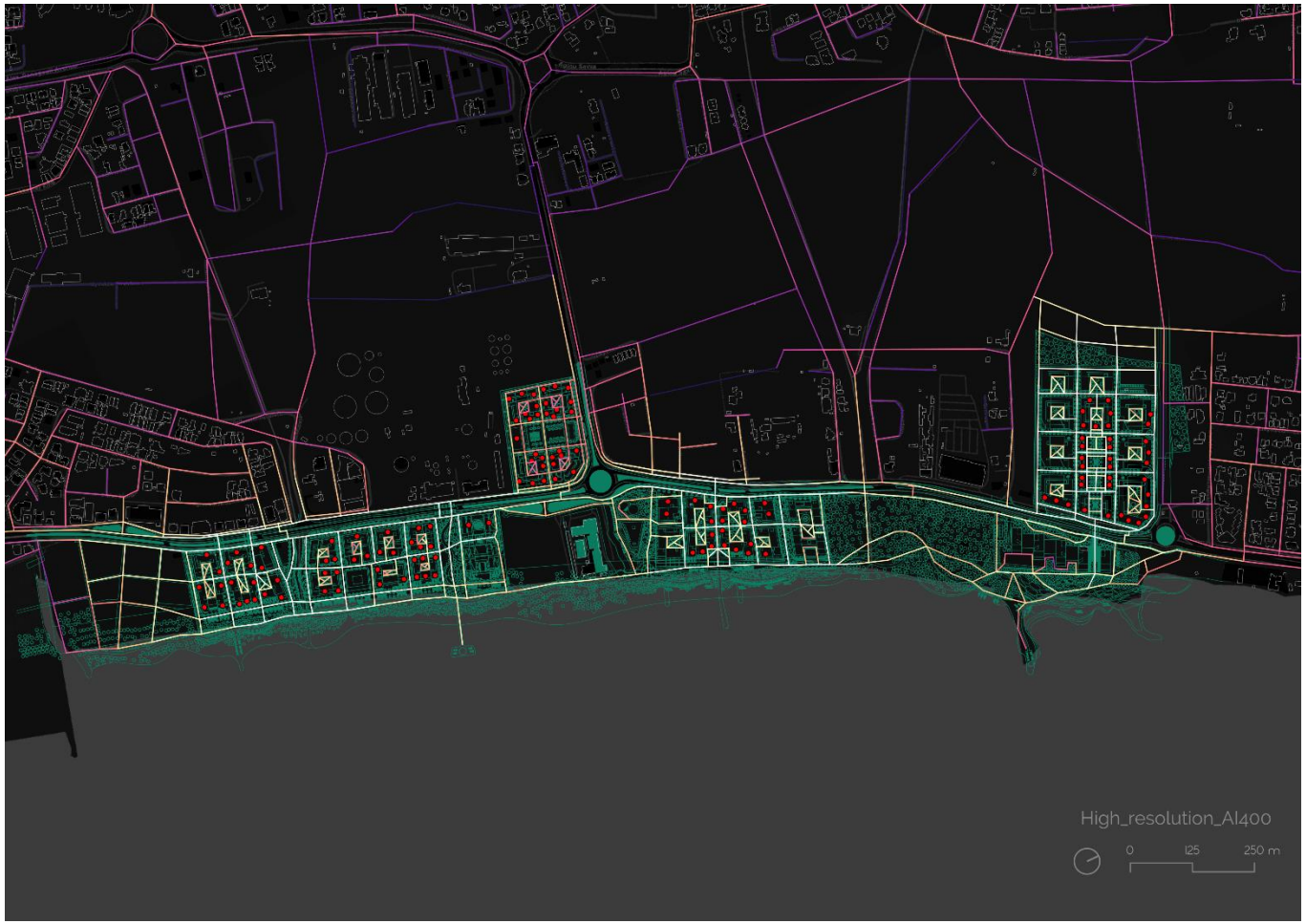

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Conclusions

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- The automated models perform satisfactorily when compared to manually edited model, both mathematically and practically.
- Substantial reduction in effort to produce relevant datasets.
- At very small scales and when dealing with specific design questions or land uses, manual intervention or data collection, where data are limited, is still required to meet accuracy and respond effectively to practitioners' questions.

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Thank you!

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