Open-data based methodology for detecting and analyzing urban voids

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NO VOID

Ruins and Vacant Lands In the Portuguese Cities

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The experience of contemporary urbanity is inescapably marked by the presence of abandonment, ruination and emptiness. Ruin, abandoned buildings and vacant lands are ubiquitous presences in contemporary cities

(Edensor, 2005; Berger, 2006; DeSilvey,2013).

The project **aims** to answer two key questions:

- Which positivities and aptitudes do abandoned and ruined spaces enclose?

- How can these spaces be availed towards a more sustainable , inclusive and plural project of cities?

The research will focus on a sample of four cities in **demographic loss**, representative of differentiated urban contexts.

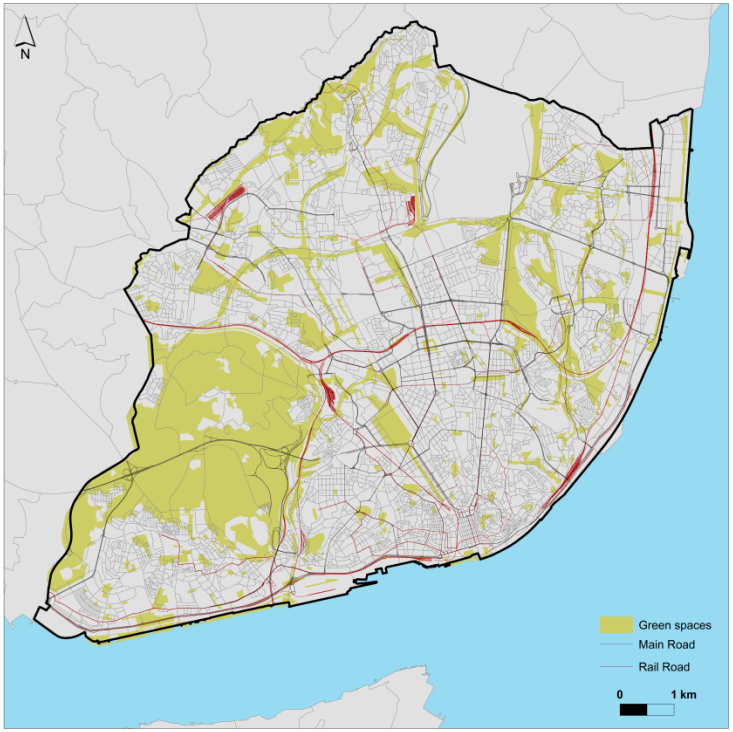


Figure 1 – Lisbon, representative of a metropolitan center

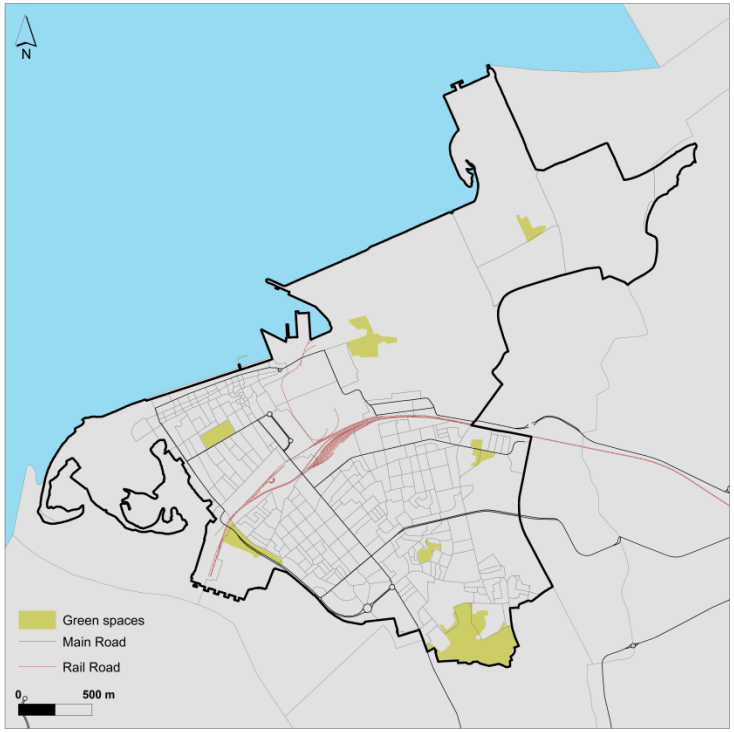


Figure 2 – Barreiro, representative of an industrial belt

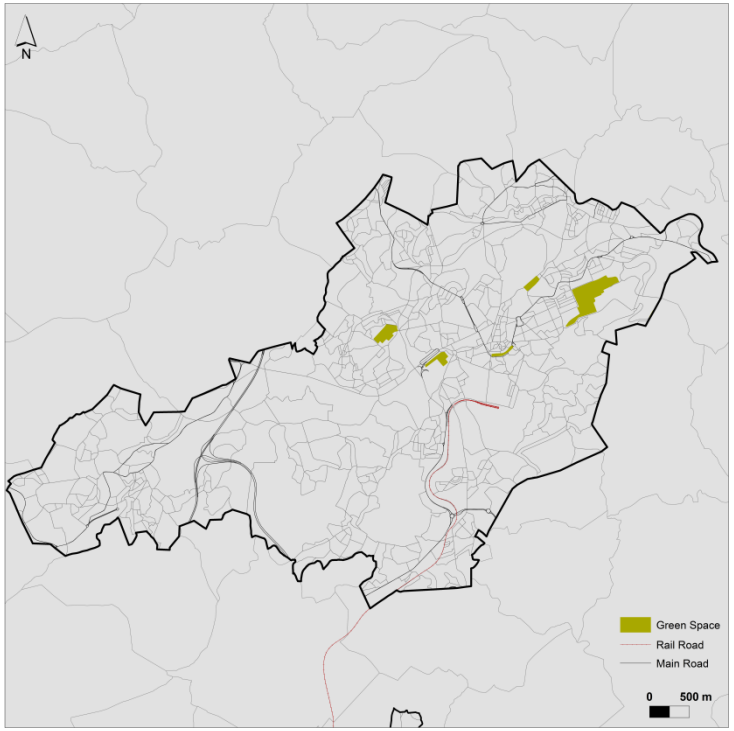


Figure 3 – Guimarães, representative of periurbanization in a historic city

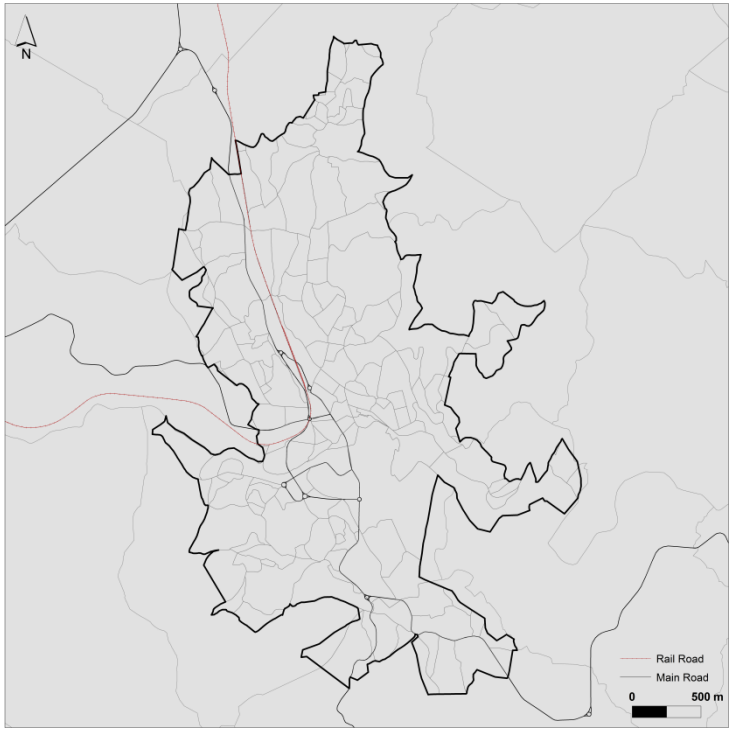
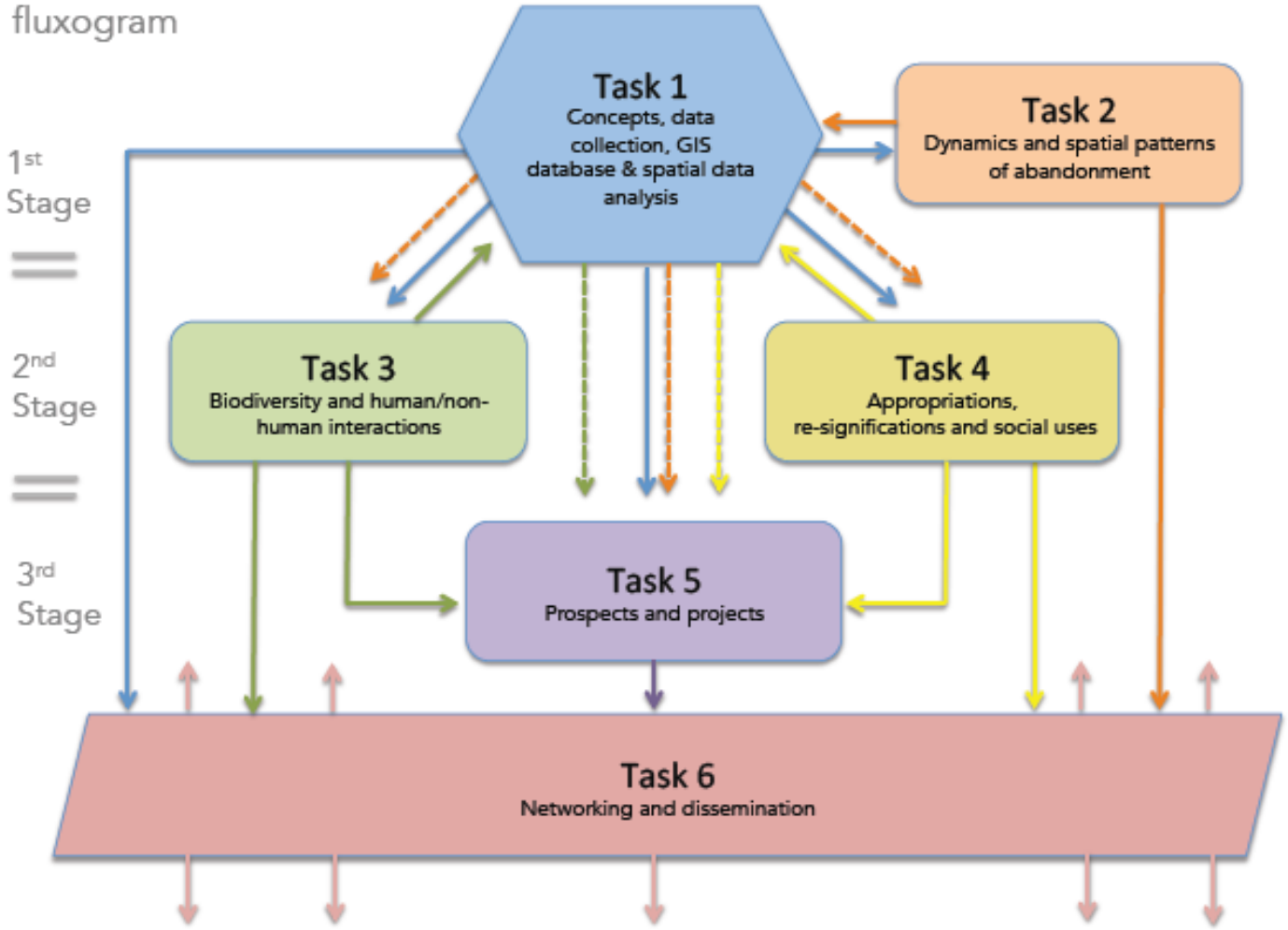
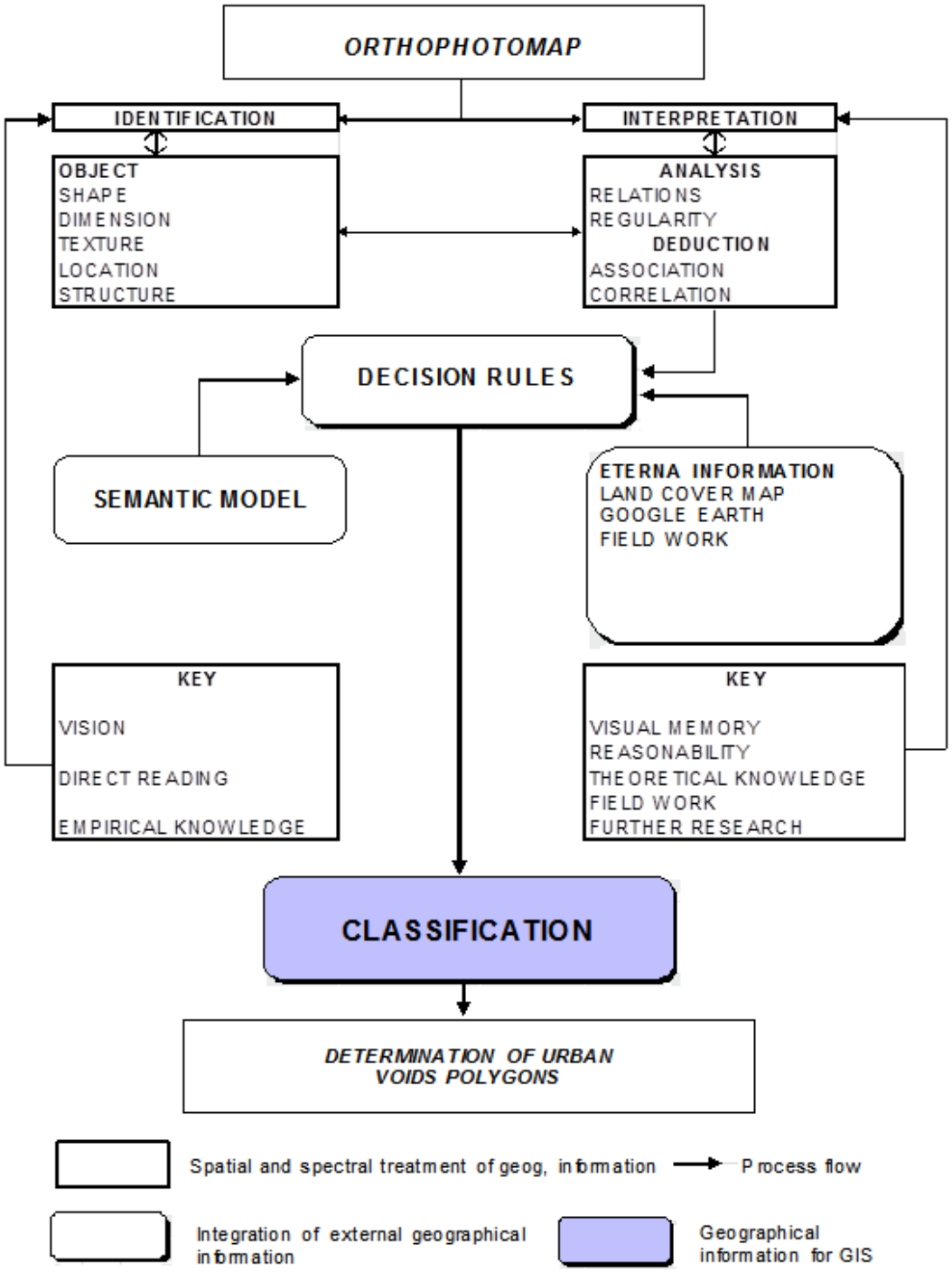


Figure 4 – Vizela, representative of a recent small town that grew in the last decades of the 20th century in association with industrialization of small and medium-sized enterprises.

Project NoVOID fluxogram



Methodology


ORTHOPHOTOMAP
IDENTIFICATION
INTERPRETATION
OBJECT
SHAPE
DIMENSION
TEXTURE
LOCATION
STRUCTURE
ANALYSIS
RELATIONS
REGULARITY
DEDUCTION
ASSOCIATION
CORRELATION
DECISION RULES
SEMANTIC MODEL
ETERNA INFORMATION
LAND COVER MAP
GOOGLE EARTH
FIELD WORK
KEY
VISION
DIRECT READING
EMPIRICAL KNOWLEDGE
KEY
VISUAL MEMORY
REASONABILITY
THEORETICAL KNOWLEDGE
FIELD WORK
FURTHER RESEARCH
CLASSIFICATION
DETERMINATION OF URBAN VOIDS POLYGONS
Spatial and spectral treatment of geog. information
Process flow
Integration of external geographical information
Geographical information for GIS

Semantic approach to NoVOID classes - Definitions

ruins

may be described as structures produced by technology and intended for human use or for other purposes that have reached an advanced state of dilapidation, being therefore incapable of performing the function for which they were originally designed. They are characterized by being partially or fully destroyed (e.g. lack of windows, doors, or other physical components, damaged roofs, broken walls) and by being abandoned (i.e. not having regular conventional use). Included in this category are boarded up buildings, even though they strictly are not in a ruinous state as well as buildings whose construction work have been interrupted and remain unfinished or half-finished.

Semantic approach to NoVOID classes - Definitions

Ruinyards

correspond to non-built lands surrounding dilapidated buildings that visually can be considered as integral parts of the same property. They are identified by having spontaneous dry vegetation and other signs of abandonment and disorder, such as the presence of debris and residues, junkyards, or tanks and pools with no water or with unduly treated water. Ruinyards only configure autonomous polygons when they have an area bigger than the one of the dilapidated buildings to which they are associated; otherwise, they are considered part of the same ruin.

Semantic approach to NoVOID classes - Definitions

vacant land
is defined in this study as unutilized, non-cultivated, non-landscaped, and non-built up land, with shrub and herbaceous covering showing signs of neglect and lack of maintenance, or presenting bare soil, rubble, and vestiges of razed buildings. Only the vacant land located inside official urban areas was contemplated in our approach. Land zoned for agricultural use and for green infrastructure was not considered vacant land.

Open data &
free data

2D

3D

WMS & GoogleEarth & OpenStreetMap

Free
software

2,5D

QGIS & ArcGIS

CALIBRATION

GDB & Spatial
Analysis

TASK 1

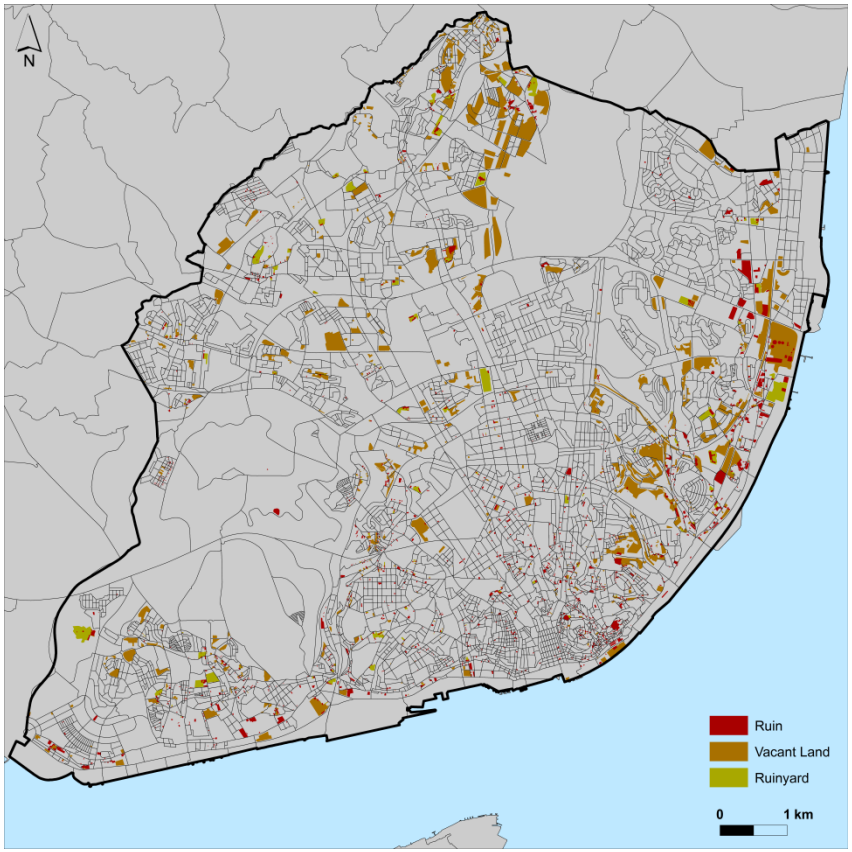
- Identification of three categories of abandoned urban spaces
    1. Ruin
    2. Ruinyard
    3. Vacant Land

Spatial Analysis Results

Where? How much?

- Geographical portrait

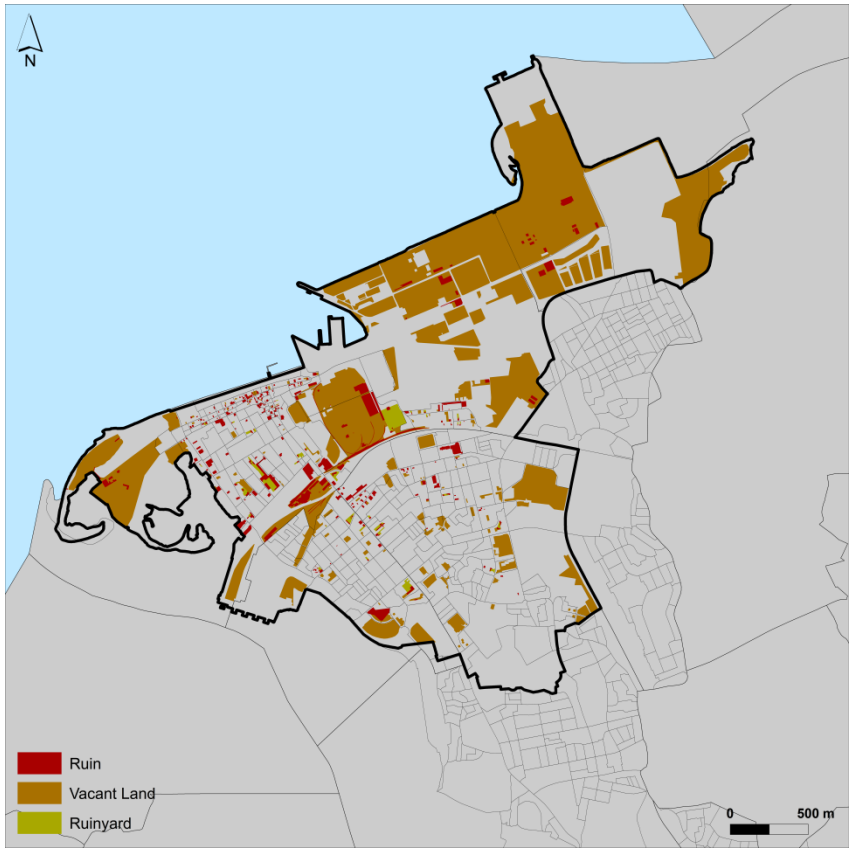
  - Lisbon



Type	Nº	Total area (%)	Built-up area (%)	Classification Accuracy (%)
Ruin	2171	1,1	1,5	96
Ruinyard	170	0,6	0,9	-
Vacant Land	772	4,0	5,4	96

Figure 5 – Lisbon classification (Ruin, Ruinyard, Vacant Land)

- Geographical portrait
  - Barreiro



Type	Nº	Total area (%)	Built-up area (%)	Classification Accuracy (%)
Ruin	377	2,2	2,7	99
Ruinyard	36	5,4	6,0	-
Vacant Land	169	29,2	34,9	100

Figure 6 – Barreiro classification (Ruin, Ruinyard, Vacant Land)

Spatial Analysis
Results

How are they spread? Is there some spatial patterns?
Is there some spatial trend?

- Statistical Analysis

  - Lisboa: Distance to Centroid

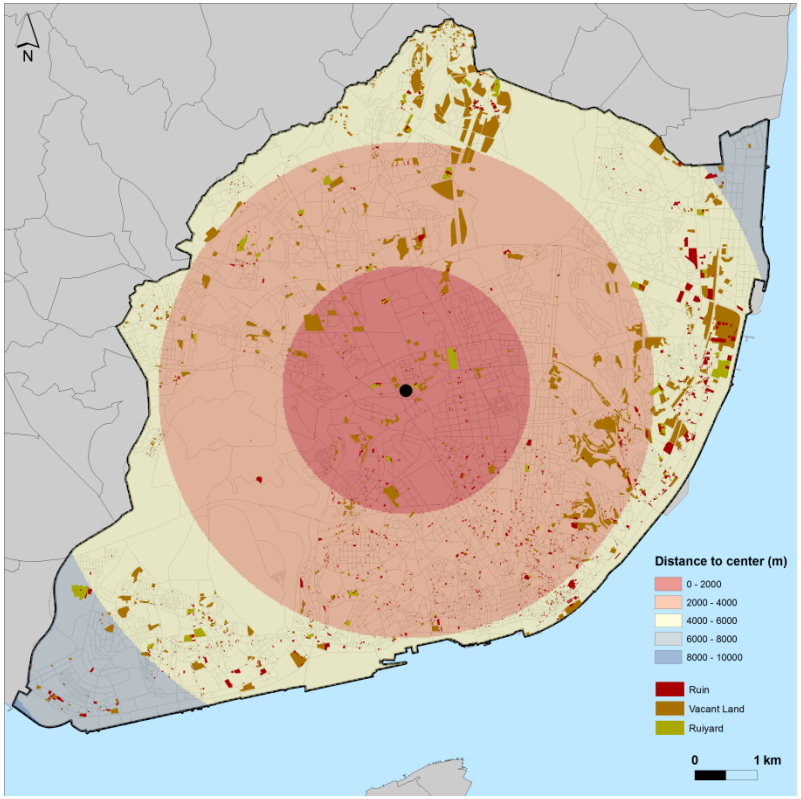


Figure 7 – Lisbon (ruin, ruin yard and vacant land) distance to centroid

	%		
Distance to centroid (m)	Ruin	Ruinyard	Vacant Land
0-2000	11	6	14
2000-4000	37	12	17
4000-6000	51	17	9
6000-8000	1	22	14

- Statistical Analysis

  - Lisbon: Distance to Paços

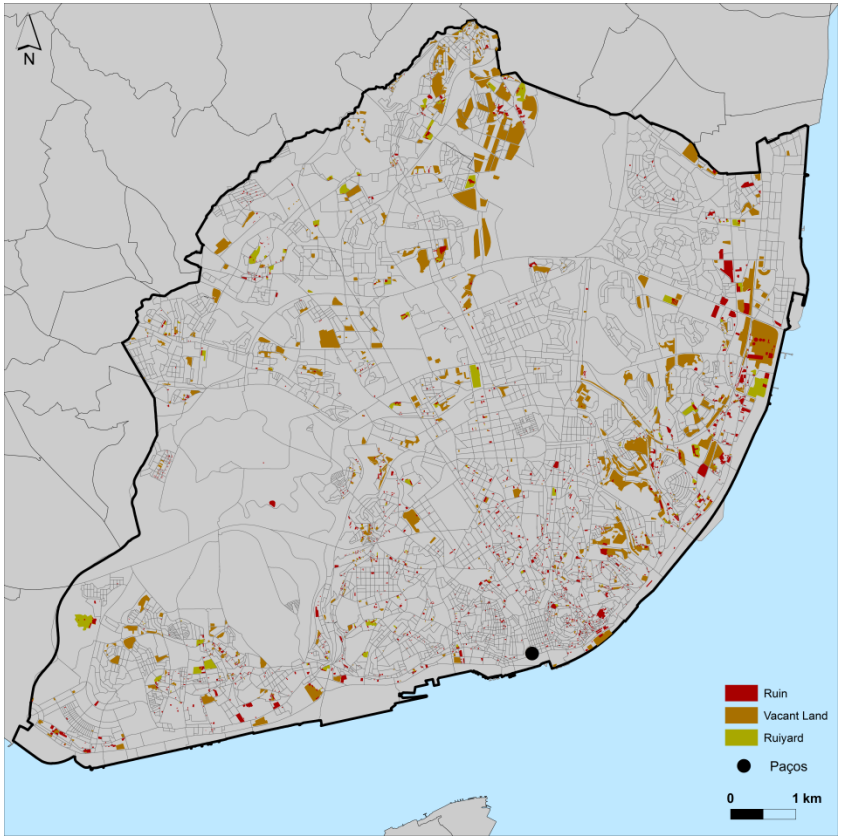


Figure 8 – Lisbon Paços do concelho

	%		
Distance to Paços (m)	Ruin	Ruinyard	Vacant Land
0-2000	17	2	3
2000-4000	26	13	21
4000-6000	27	42	30
6000-8000	25	31	30
8000-10000	5	13	17

- Statistical Analysis

  - Lisboa: Distance to central features

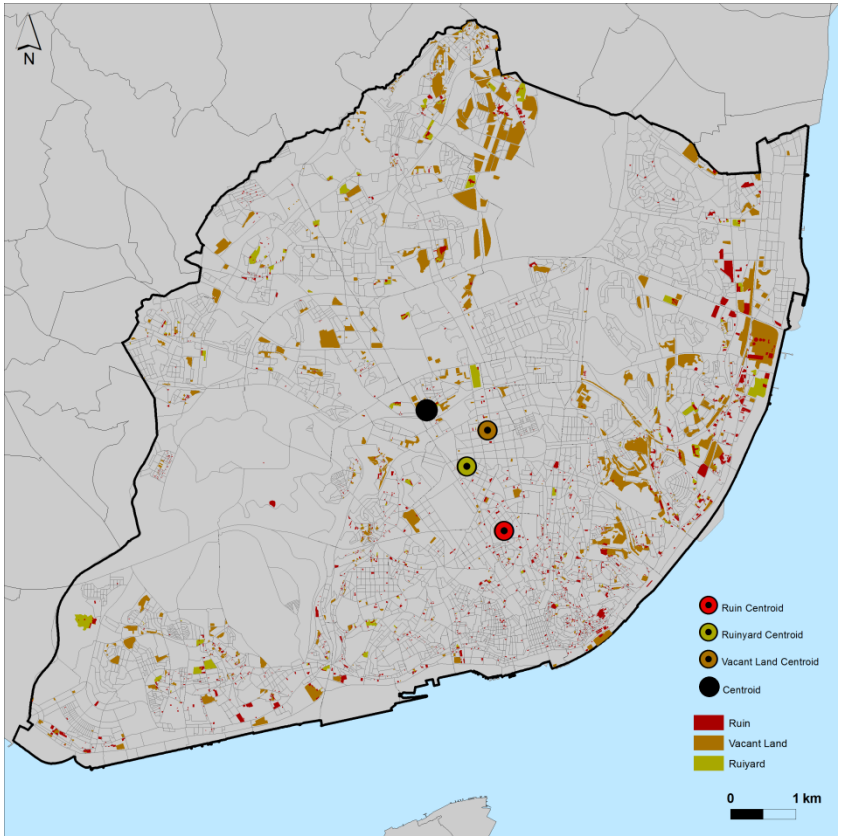


Figure 9 – Lisbon (ruin, ruin yard and vacant land) central features

	%		
Distance to central feature (m)	Ruin	Ruinyard	Vacant Land
0-2000	22	14	9
2000-4000	30	21	43
4000-6000	37	56	43
6000-8000	12	9	4

- Statistical Analysis

➢ Barreiro: Distance to centroid

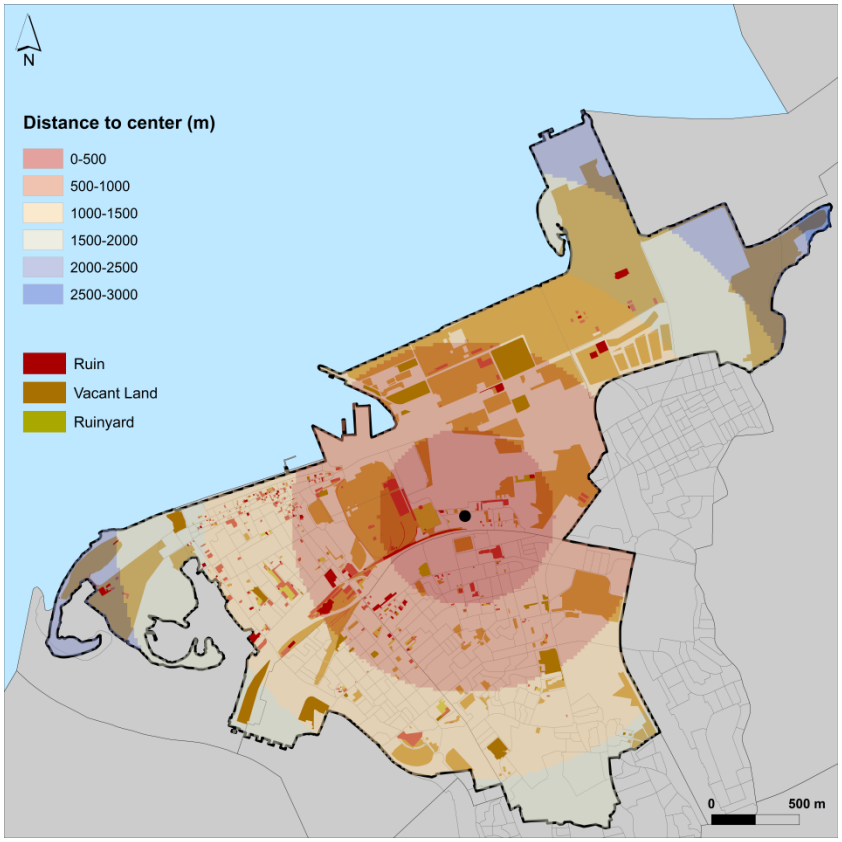
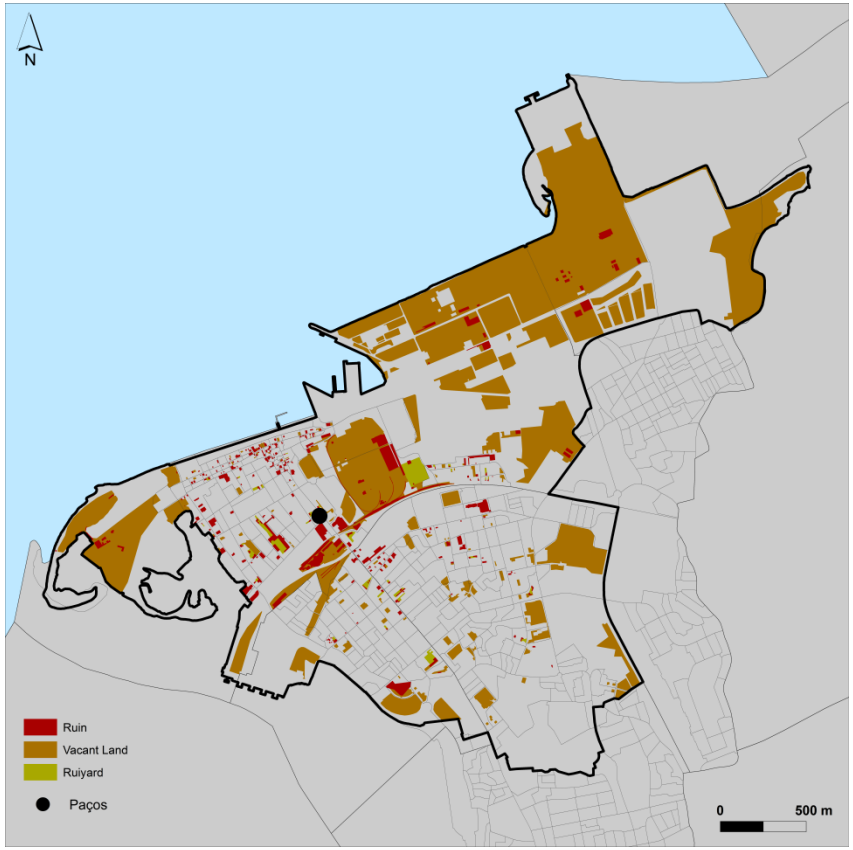


Figure 10 – Barreiro (ruin, ruin yard and vacant land) distance to centroid

	%		
Distance to centroid (m)	**Ruin**	**Ruinyard**	**Vacant Land**
0 - 500	22	45	7
500 - 1000	35	23	31
1000 - 1500	36	32	27
1500-2000	5	0	22
2000-2500	2	0	13
2500-3000	0	0	1

- Statistical Analysis

➢ Barreiro: Distance to Paços



	%		
Distance to Paços (m)	**Ruin**	**Ruinyard**	**Vacant Land**
0 - 500	38	32	10
500 - 1000	36	56	8
1000 - 1500	17	11	30
1500-2000	4	0	19
2000-2500	5	0	18
2500-3000	0	0	11
3000-3500	0	0	3

Figure 11 – Barreiro Paços do concelho

- Statistical Analysis

➢ Barreiro: Distance to central features

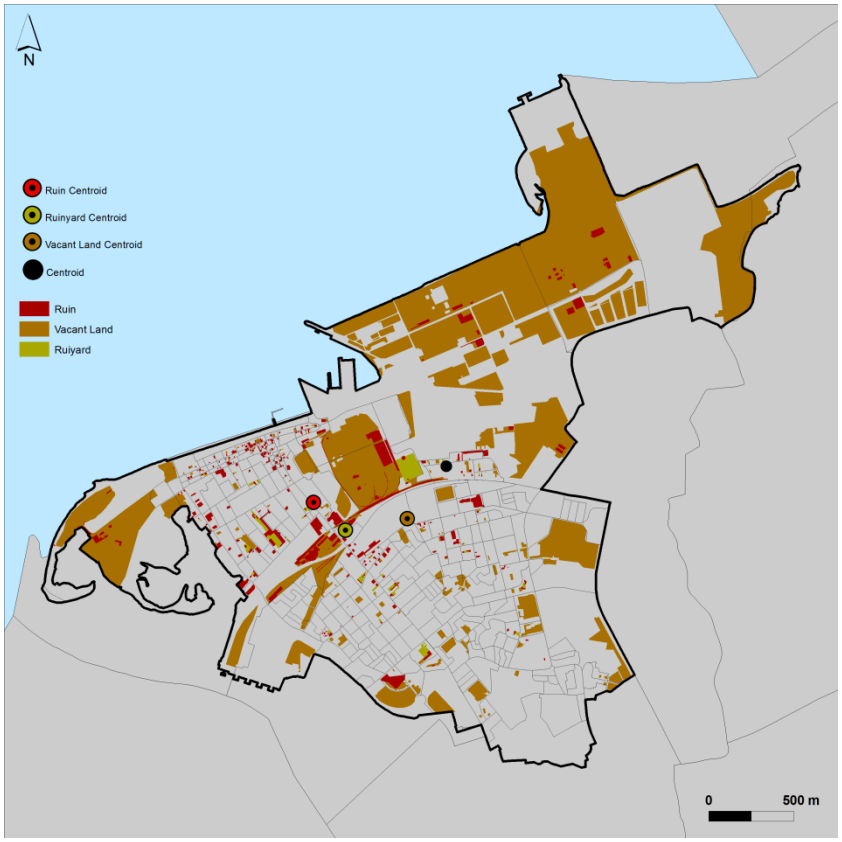


Figure 12 – Barreiro (ruin, ruin yard and vacant land) central features

	%		
Distance to central features (m)	**Ruin**	**Ruinyard**	**Vacant Land**
0 - 500	22	45	7
500 - 1000	35	23	31
1000 - 1500	36	32	27
1500-2000	5	0	22
2000-2500	2	0	13
2500-3000	0	0	1

- Statistical Analysis
  - Standard Deviation Ellipses

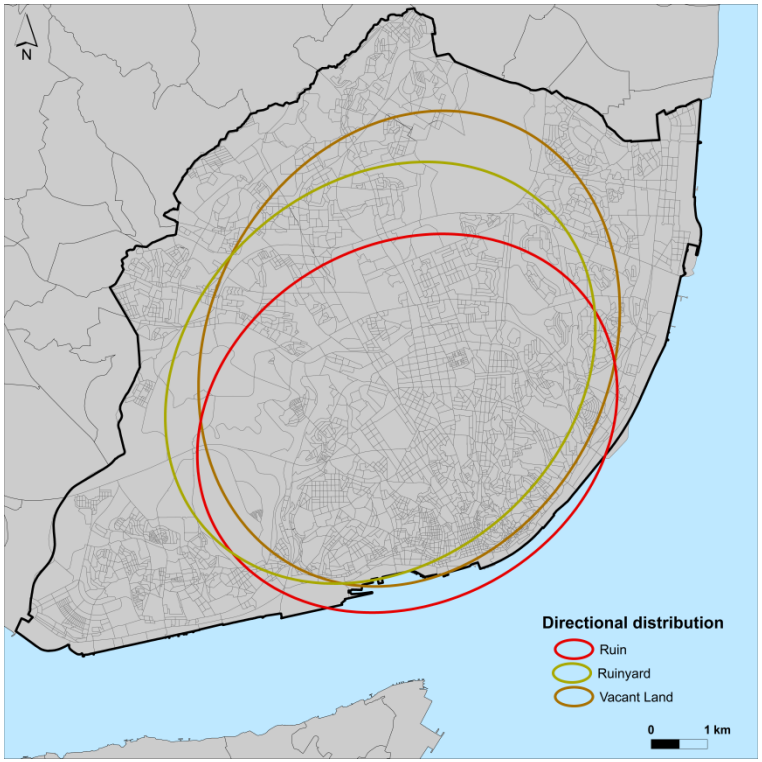


Figure 13 – Lisbon Standard Deviation Ellipses

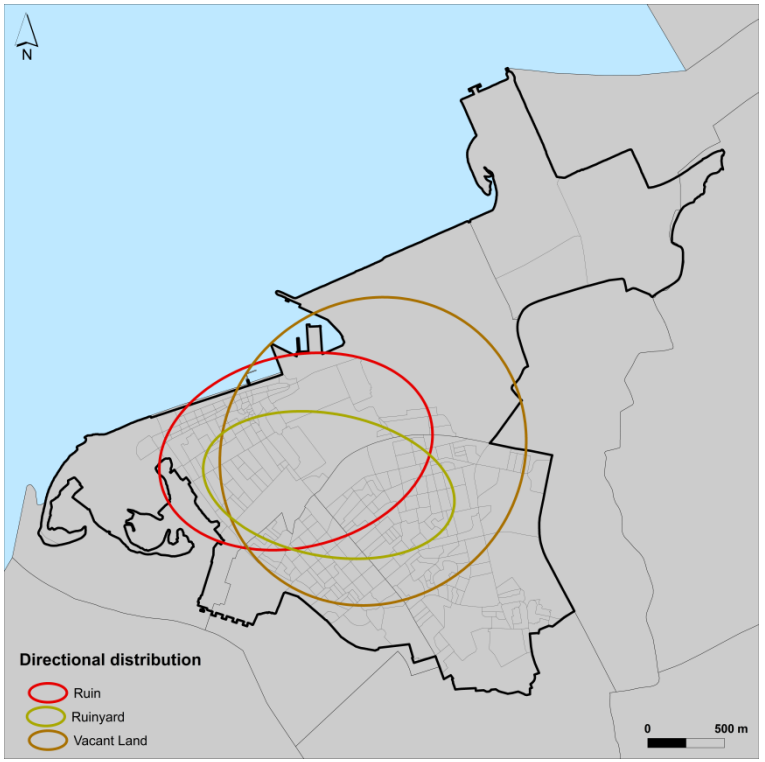


Figure 14– Barreiro Standard Deviation Ellipses

- Statistical Analysis

  - Kernel Density: Ruin

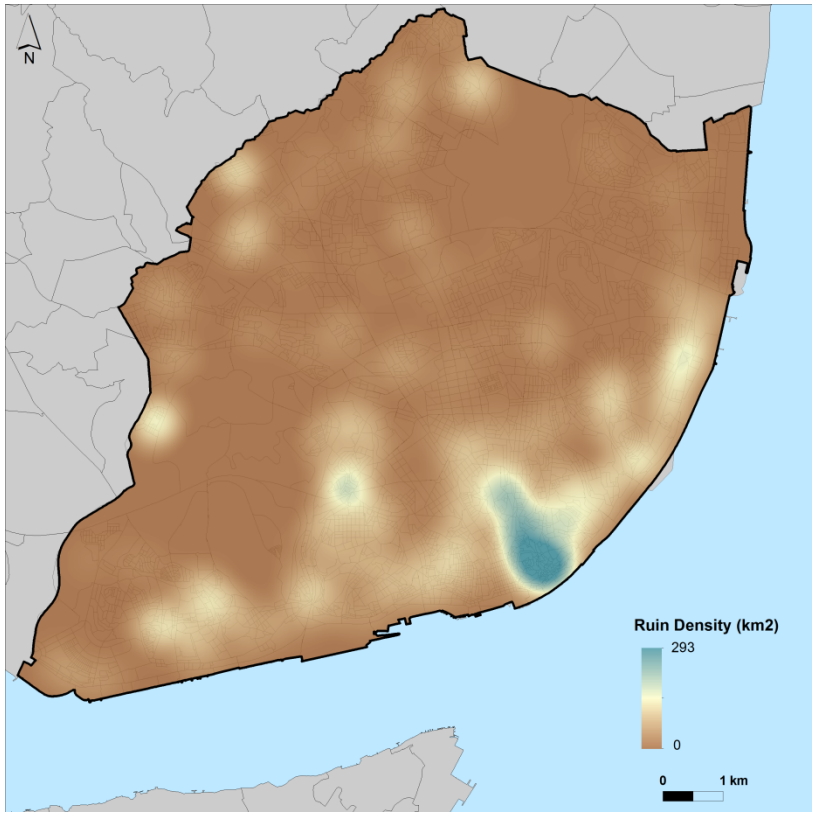


Figure 15 – Ruin density in Lisbon

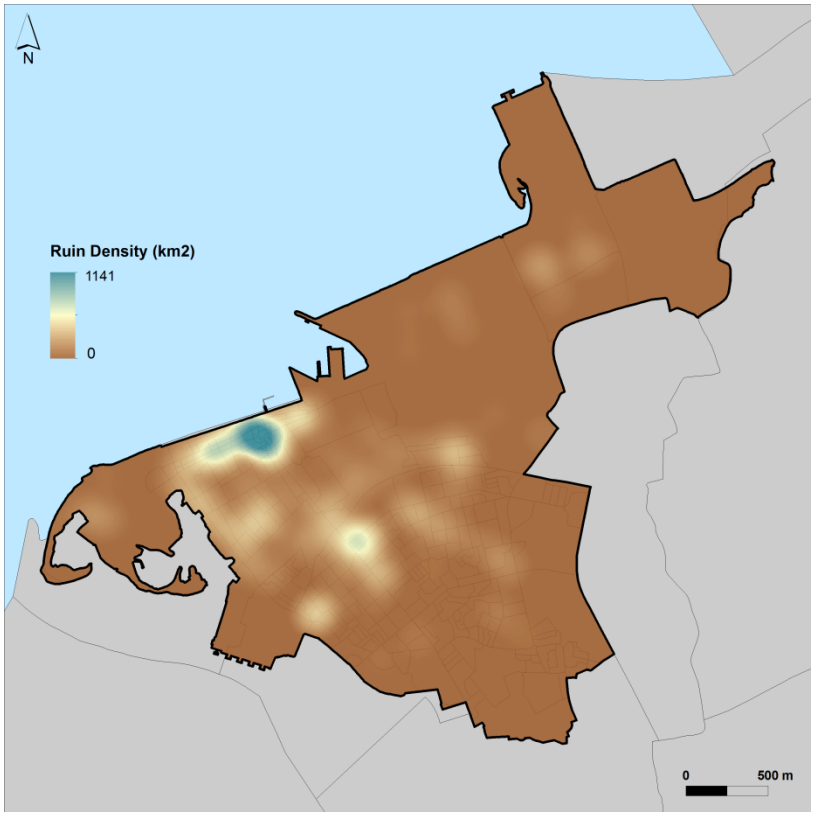


Figure 16– Ruin density in Barreiro

- Statistical Analysis

  - Kernel Density: Ruinyard

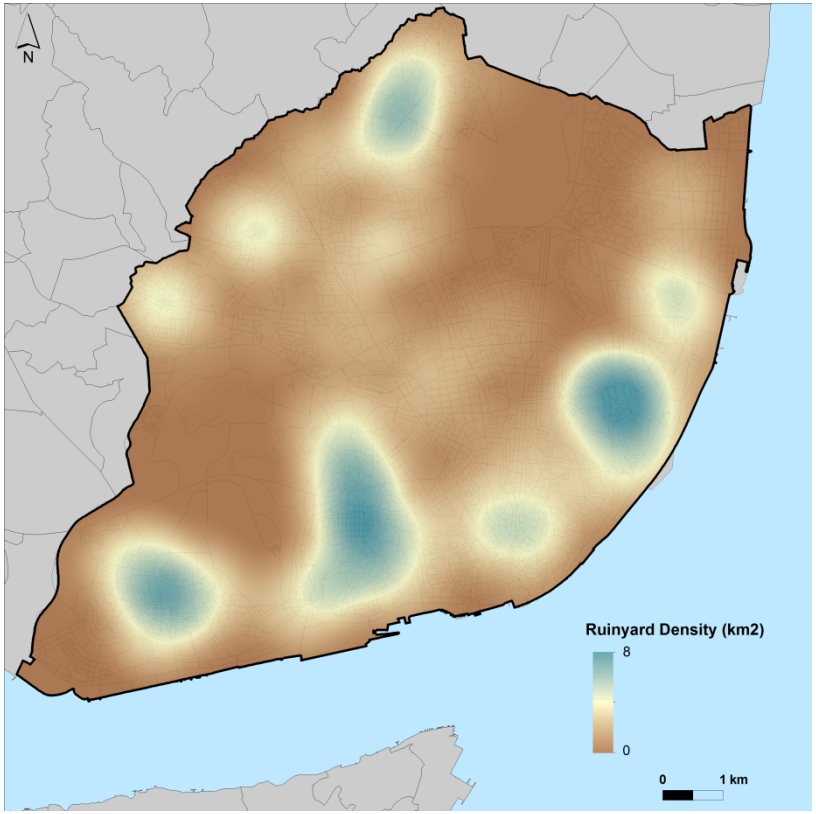


Figure 17 – Ruinyard density in Lisbon

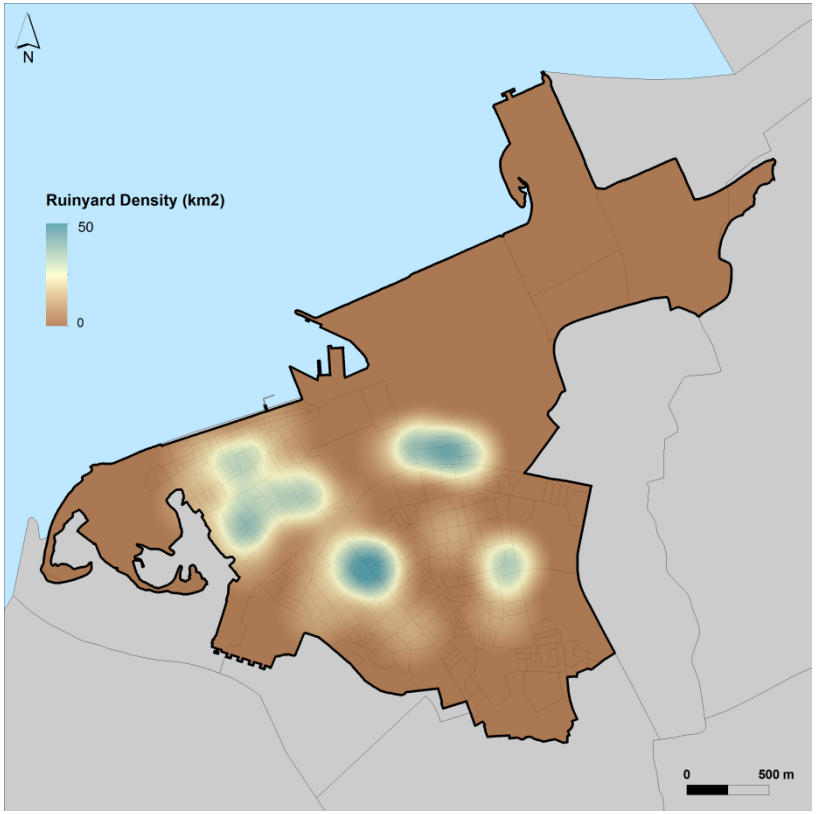


Figure 18 – Ruinyard density in Barreiro

- Statistical Analysis

  - Kernel Density: Vacant Land

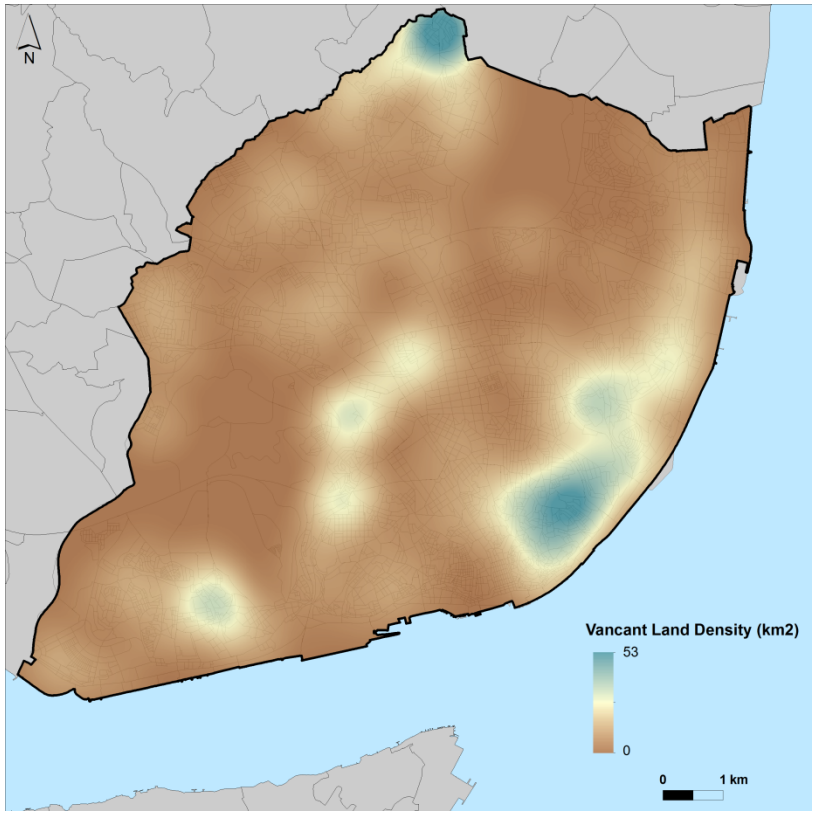


Figure 19 – Vacant Land density in Lisbon

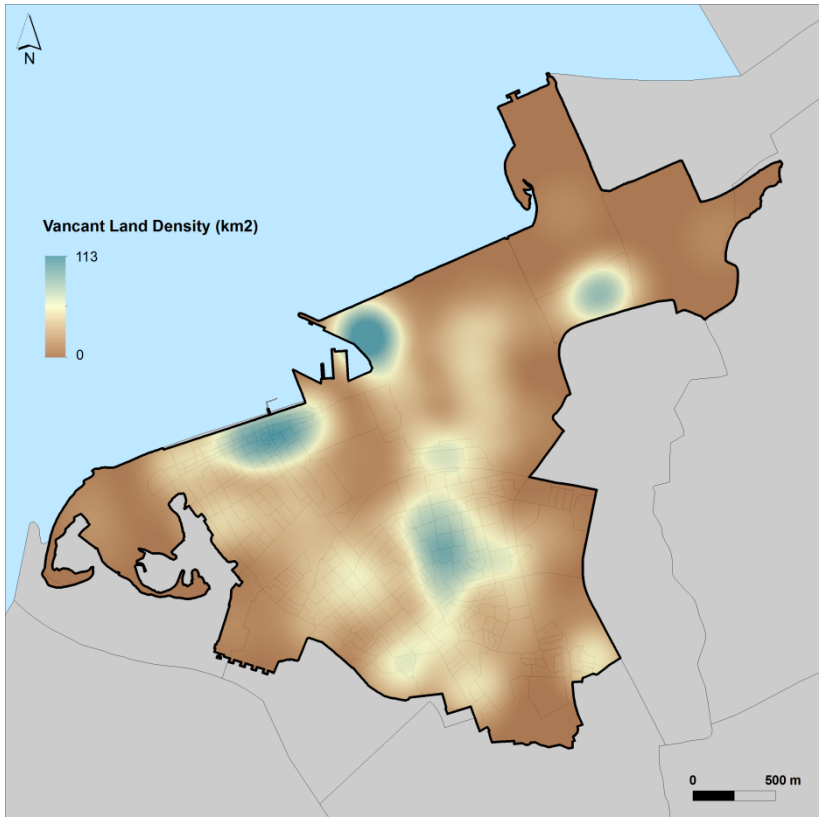


Figure 20 – Vacant Land density in Barreiro

Spatial Analysis
Results
what about the neighborhood?
Is there some spatial correlation with land cover?

➢ Lisbon: Land cover versus abandoned urban spaces

		%		
Land cover	%	Ruin	Ruinyard	Vacant Land
Continuous urban fabric	**41,5**	**58,94**	**23,17**	17,51
Discontinuous urban fabric	0,5	2,16	3,11	1,04
Industry, Commerce and general equipment	11,5	29,83	17,21	10,43
Road and Rail network and associated spaces	10,1	1,07	0,33	0,91
Port Areas	1,8	0,11	0,00	0,22
Airports and aerodromes	2,9	0,00	0,00	0,00
Areas of waste disposal	0,0	0,00	0,00	0,00
Areas under construction	2,3	1,51	**25,56**	**20,43**
Urban green spaces	4,0	0,28	0,57	0,54
Sports cultural leisure equipment and historical zones	2,8	0,79	0,07	0,72
Temporary dry cultures	0,7	0,00	0,00	0,00
Temporary irrigated cultures	0,0	0,00	0,00	0,00
Vineyards	0,1	0,00	0,00	0,25
Orchards	0,0	0,00	0,00	0,00
Olive groves	0,1	0,15	0,00	0,05
Temporary crops and / or pasture permanent crops	0,0	0,15	0,00	0,00
Complex cultural and partial systems	0,9	0,83	5,70	1,31
Deciduous Forests	0,9	0,23	0,48	0,05
Resinous Forests	5,4	0,78	4,59	0,58
Mixed Forest	5,5	1,31	0,00	0,17
Natural herbaceous vegetation	1,9	0,35	1,88	12,21
Woods	6,1	1,23	17,34	**31,72**
Opened Forests	0,6	0,28	0,00	1,86
Beaches, dunes and coastal plains	0,0	0,00	0,00	0,00
Water bodies	0,1	0,00	0,00	0,00
Inland waterways	0,1	0,00	0,00	0,00

➢ Barreiro: Land cover versus abandoned urban spaces

		%		
Land cover	%	Ruin	Ruinyard	Vacant Land
Continuous urban fabric	34,6	**45,18**	**52,68**	4,90
Discontinuous urban fabric	0,6	2,49	0,00	0,99
Industry, Commerce and general equipment	17,8	19,82	0,28	16,13
Road and Rail network and associated spaces	4,7	15,85	0,00	3,03
Port Area	6,8	6,68	0,00	11,87
Areas under construction	16,5	7,28	43,38	**47,64**
Urban green spaces	7,5	1,08	0,00	1,29
Sports, cultural and leisure equipment and historical zones	0,4	0,54	3,66	0,01
Complex cultural and partial systems	0,3	0,13	0,00	0,04
Deciduous Forests	0,4	0,00	0,00	0,00
Natural herbaceous vegetation	0,7	0,00	0,00	1,19
Woods	1,7	0,34	0,00	4,02
Open forests, cuts and new plantations	0,7	0,00	0,00	0,02
Beaches, dunes and coastal plains	3,8	0,07	0,00	6,14
Marshlands	2,2	0,47	0,00	0,86
Water bodies	0,6	0,00	0,00	1,89
Inland waterways	0,7	0,07	0,00	0,01