

CONFERÊNCIAS
DE COIMBRA

SEGURANÇA URBANA

OS MUNICÍPIOS E A PROTEÇÃO
DO ESPAÇO PÚBLICO

18 | 19 OUT.

CONVENTO SÃO FRANCISCO | COIMBRA



Repensar a Cidade

a segurança no espaço urbano

Teresa Sá Marques
Miguel Saraiva

18 de outubro 2022

A Geografia da Criminalidade em Portugal (Projeto CANVAS)



Crime and Violence Prevention
through Smart Planning and
Artistic Resistance



Cofinanciado por:

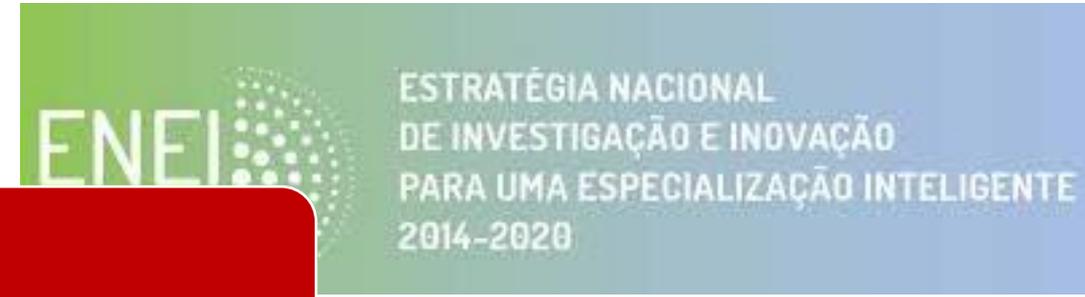


UNIÃO EUROPEIA
Fundo de Coesão





A segurança urbana nas agendas de coesão e sustentabilidade



Sustentáveis

Inovadoras

Inclusivas

Qualidade de vida

Sociedades Seguras

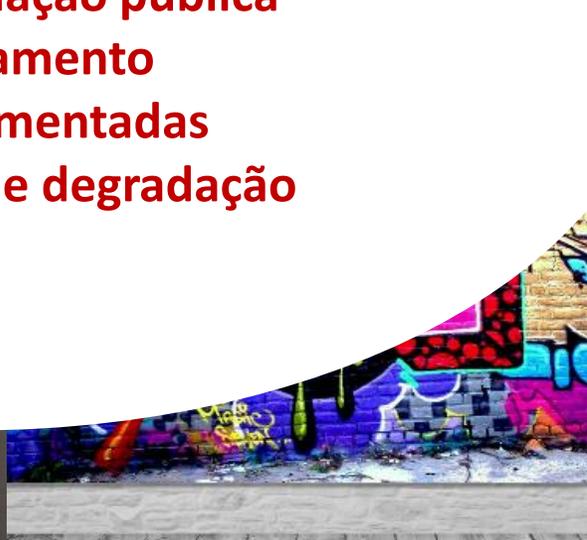




Estar seguro e Sentir-se seguro

Perceção de Insegurança

- Locais de confusão, desacatos e violência
- Áreas com marcas de vandalismo
- Insuficiente iluminação pública
- Insuficiente policiamento
- Áreas pouco movimentadas
- Áreas com sinais de degradação





As quatro dimensões do crime segundo Chainey



LEGAL



VITIMA



OFENSOR



ESPAÇO

Geografia
Planeamento
/
Ordenamento
Urbanismo
Design



Criminologia Ambiental

CPTED

- Redução de oportunidades (design e gestão)

Routine Activities Theory

- Convergência de ofensores, alvos e guardiões

Situational Prevention / Rational Choice

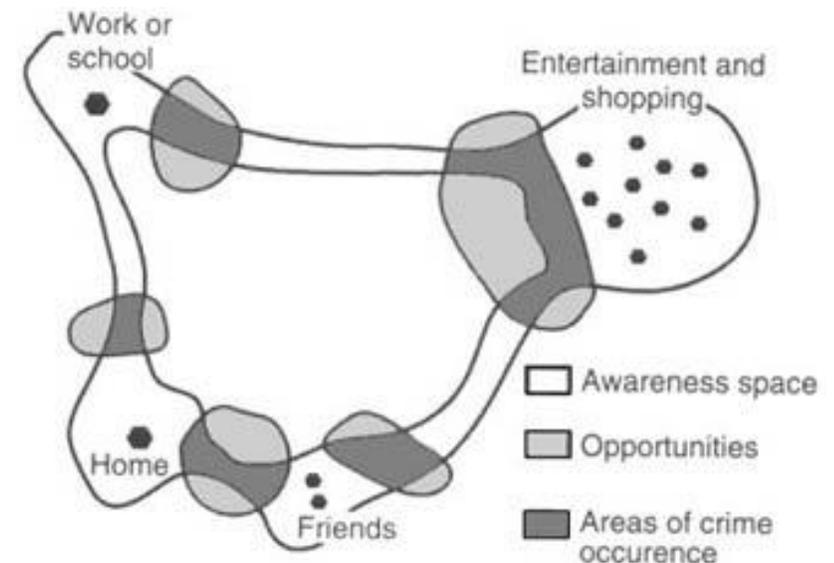
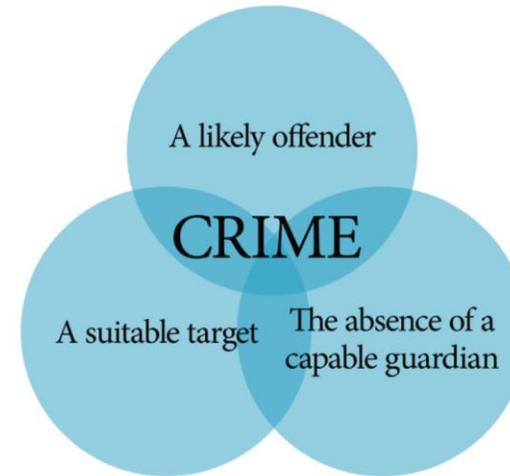
- Ofensor como decisor

Crime Pattern Theory

- **Convergência geográfico-espacial**

Criminology of Places

- **O crime concentra-se em hot-spot estáveis**



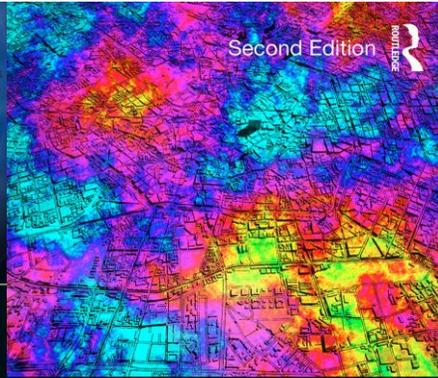


O lugar importa – o papel dos Sistemas de Informação Geográfica



GEOGRAPHICAL
INFORMATION SYSTEM
AND CRIME MAPPING

Monika Kannan
Mehtab Singh

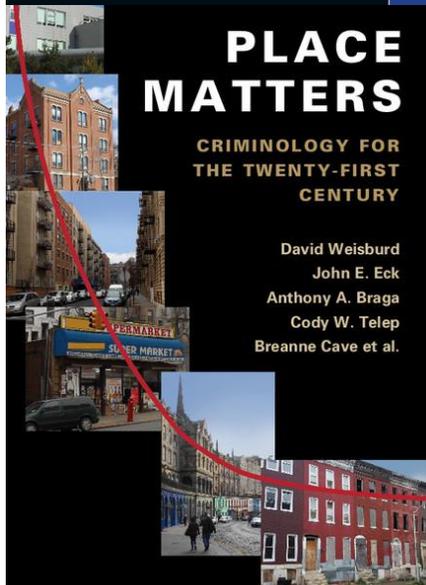


Second Edition

ENVIRONMENTAL
CRIMINOLOGY AND
CRIME ANALYSIS

EDITED BY RICHARD WORTLEY
AND MICHAEL TOWNSLEY

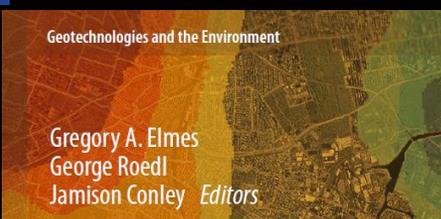
Crime Science Series



PLACE
MATTERS

CRIMINOLOGY FOR
THE TWENTY-FIRST
CENTURY

David Weisburd
John E. Eck
Anthony A. Braga
Cody W. Telep
Breanne Cave et al.



Geotechnologies and the Environment

Gregory A. Elmes
George Roedl
Jamison Conley *Editors*

Forensic GIS

The Role of Geospatial Technologies for
Investigating Crime and Providing
Evidence

1) a distribuição de um crime não é aleatória, pois é consequência de condições propícias que variam geográfica e temporalmente

Geografia

2) o comportamento criminal é significativamente influenciado pela natureza do ambiente onde ocorre

Contexto

3) a remoção/alteração de elementos potenciadores de crime em locais específicos pode reduzir a incidência de ocorrências

Planeamento



Crime mapping

Mapear

**Analisar
Padrões**

**Apoiar a
Decisão**

**Localização / alocação
de recursos**

**Intervenções urbanas
(macro / micro - escala)**

Prevenção / redução

Previsão



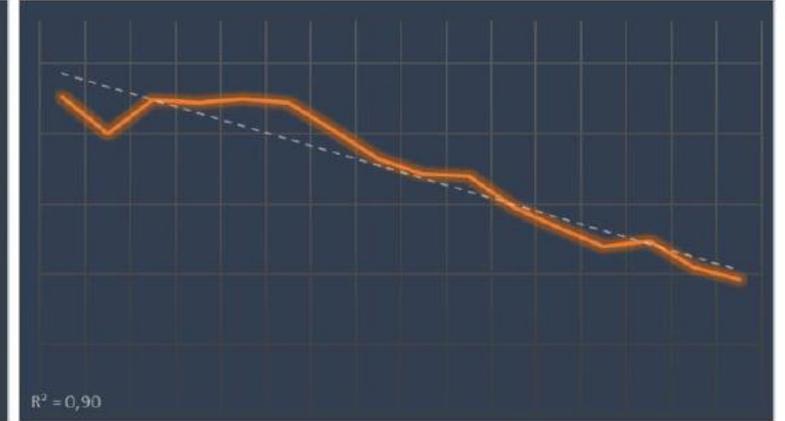
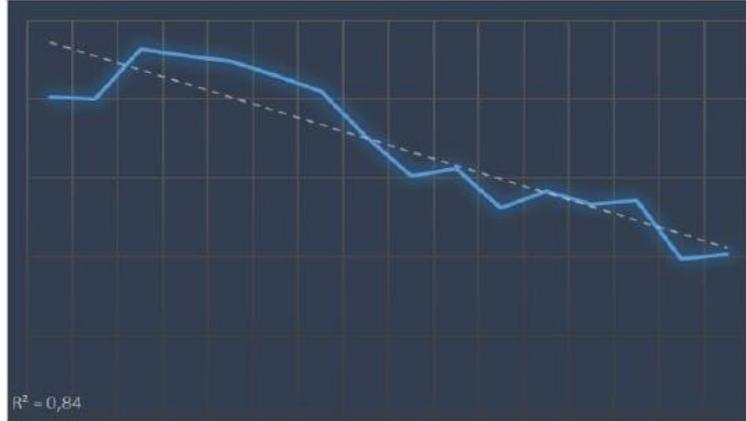
Portugal – Diminuição estatística nos últimos 15 anos



RELATÓRIO ANUAL
DE SEGURANÇA
INTERNA 2021



SISTEMA
DE SEGURANÇA INTERNA



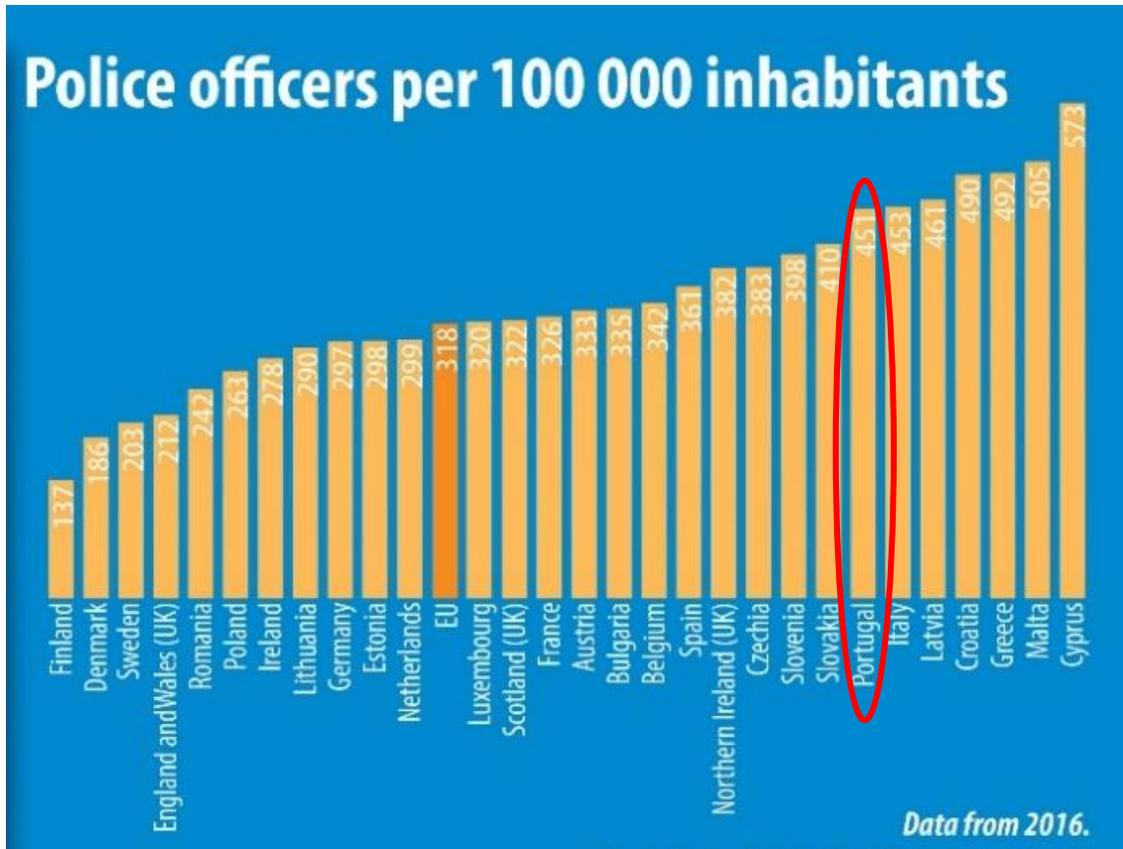
Evolução da Criminalidade Geral e da Criminalidade Violenta e Grave, 2006-2021



RANK	COUNTRY	SCORE	CHANGE
1	Iceland	1.107	↔
2	New Zealand	1.269	↔
3	Ireland	1.288	↑ 3
4	Denmark	1.296	↓ 1
5	Austria	1.3	↑ 2
6	Portugal	1.301	↓ 1

3º (2020) / 6º (2022)

Top 10 dos países europeus com mais polícias por habitante



Europe's Most Heavily Policed Countries

Countries with the most police officers per 100,000 inhabitants in Europe in 2020*



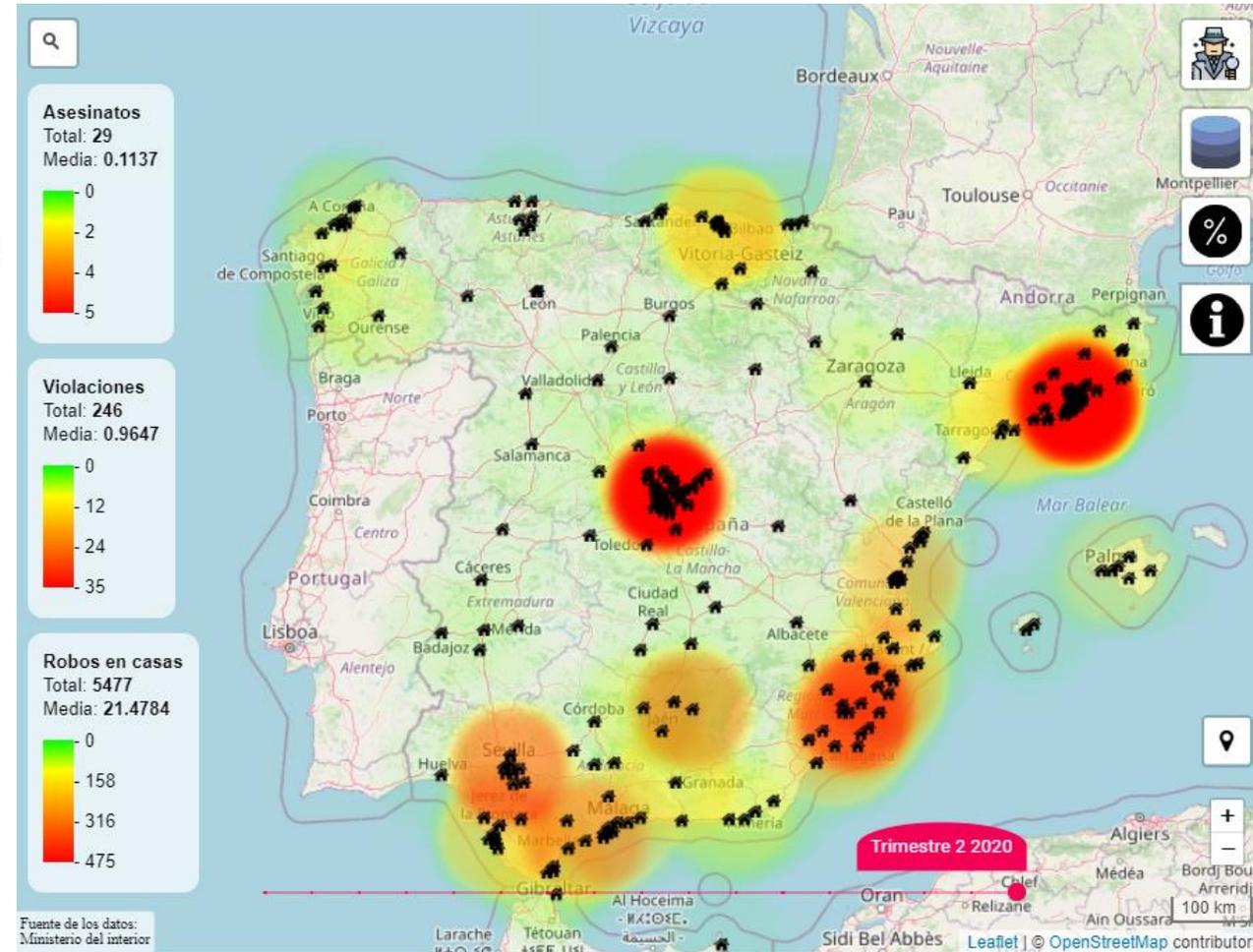
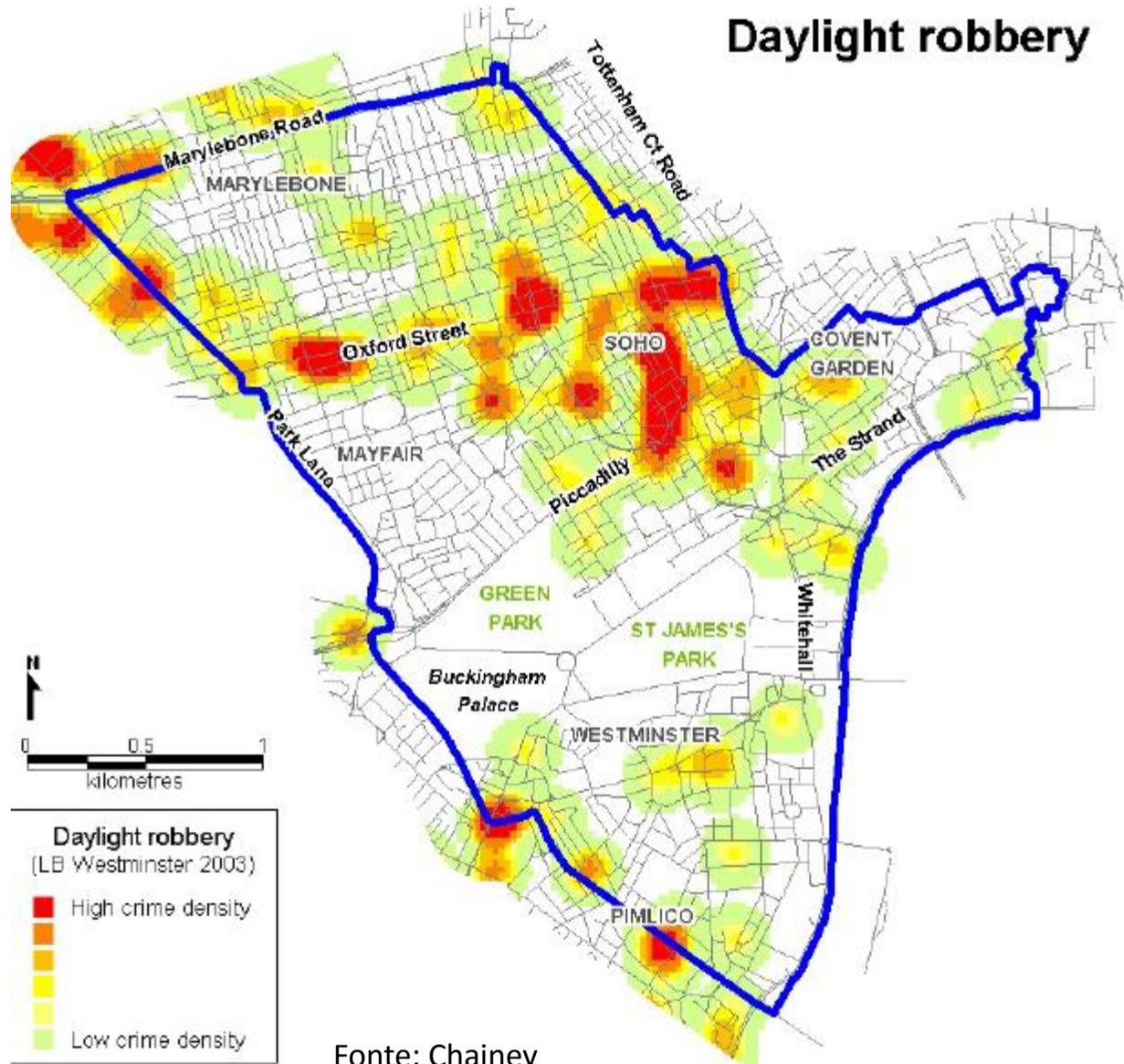
* Data was not available for Ireland, France, Norway, UK, North Macedonia, Serbia, Bosnia and Herzegovina.

** Kosovo's data was not recorded in 2015.

Source: Eurostat



O papel da Geografia da Criminalidade



Fonte: <https://entredatos.es/en/analisis-de-la-criminalidad-en-las-comunidades-autonomas-de-espana/>



Análise multi-escala e multi-variável

Escala Nacional



Escala Municipal

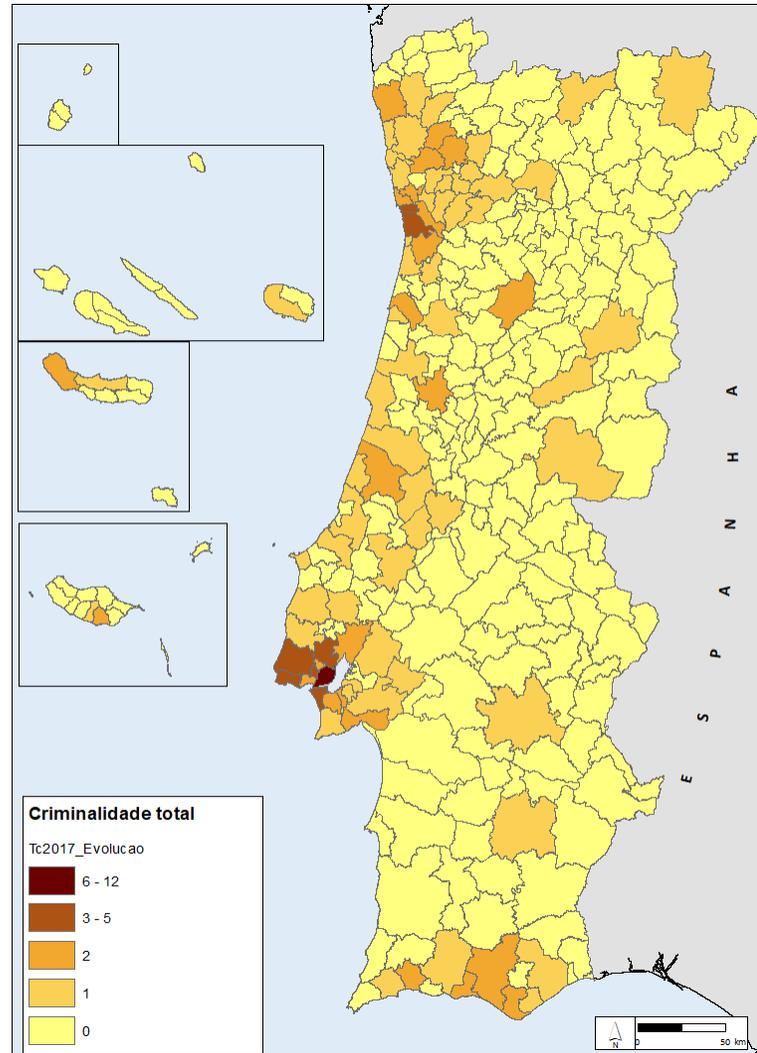


Escala Local

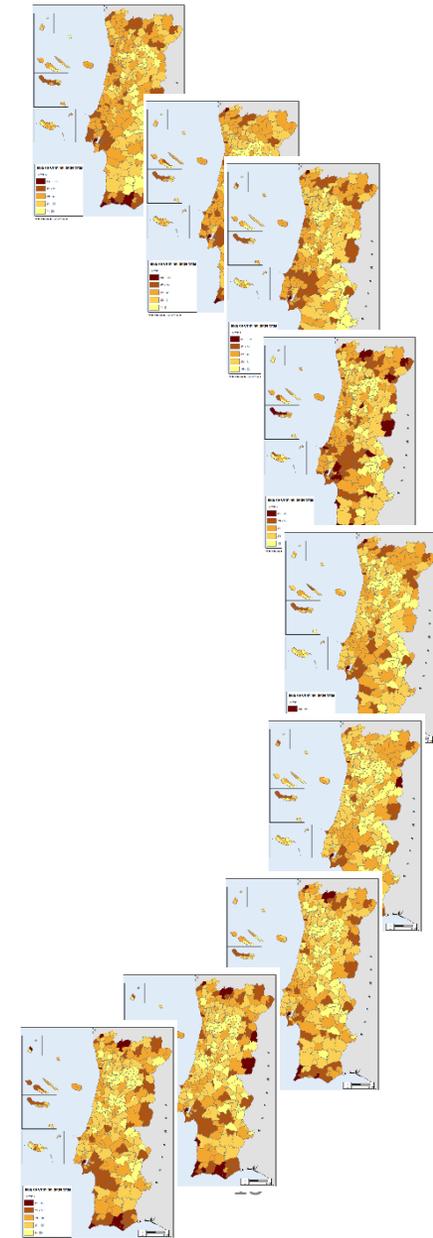
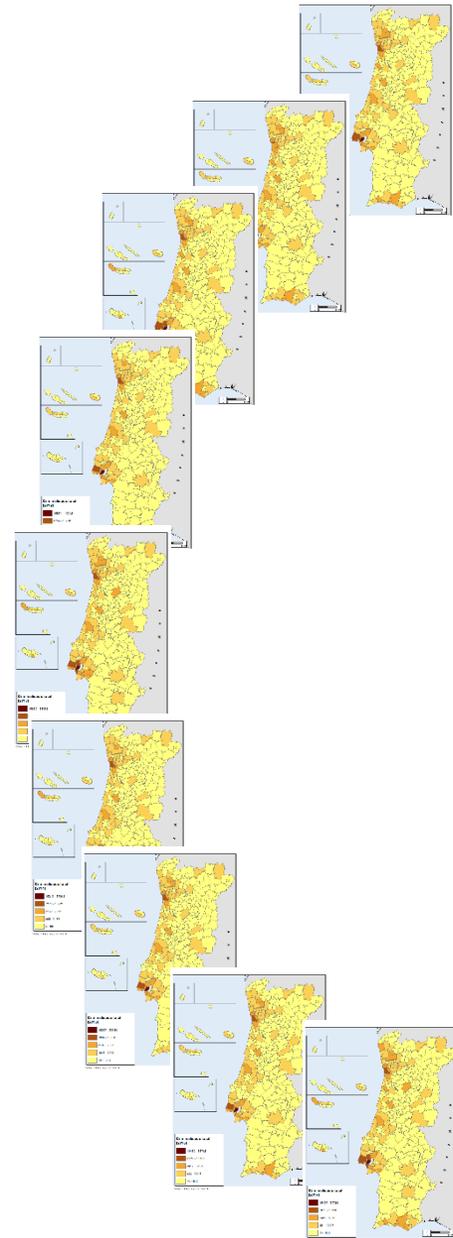
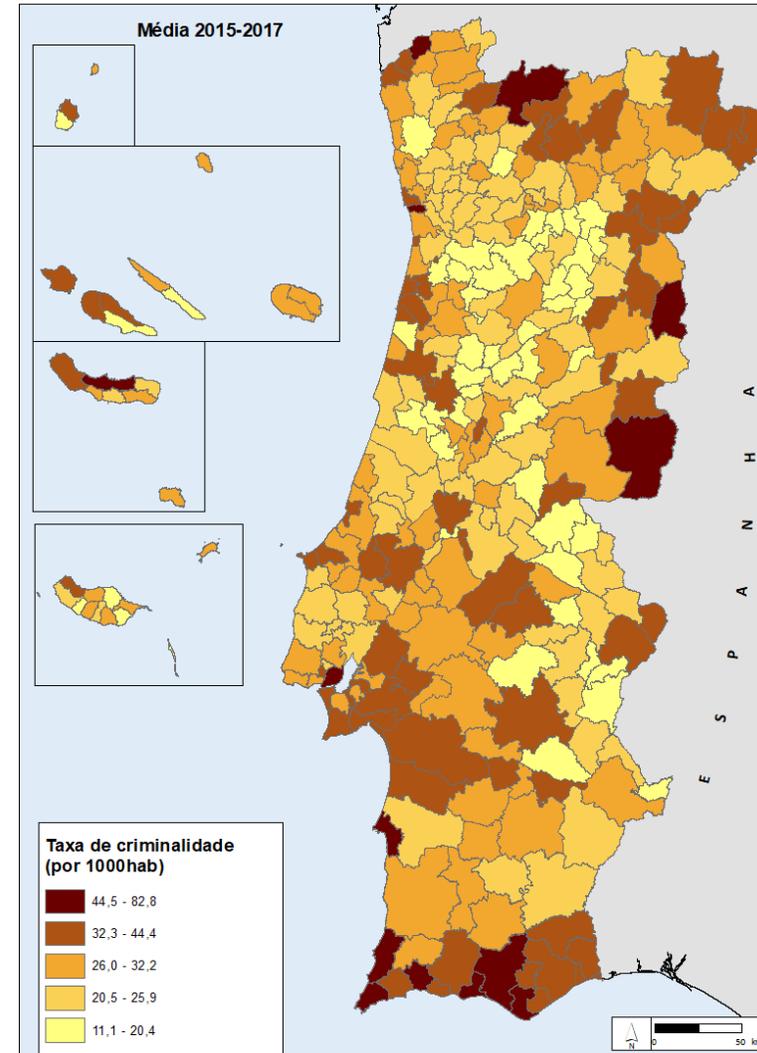


- Criar, em parceria com as instituições de segurança, um observatório da geografia da criminalidade em Portugal
- Analisar as tendências espaço-temporais da última década, a várias escalas
- Compreender os contextos urbanísticos associados aos hot-spots
- Criação de uma ferramenta digital de monitorização

Criminalidade Total



Taxa de Criminalidade Total





Estatísticas Nacionais, por município (2009-2019)

Saraiva, M.; Amante, A.; Marques, T.; Ferreira, M.; Maia, C. (2021).
Perfis territoriais de criminalidade em Portugal (2009-2019).
Finisterra. LVI(116). pp. 49-73. doi: 10.18055/Finis20682. URL:
<https://revistas.rcaap.pt/finisterra/article/view/20682>



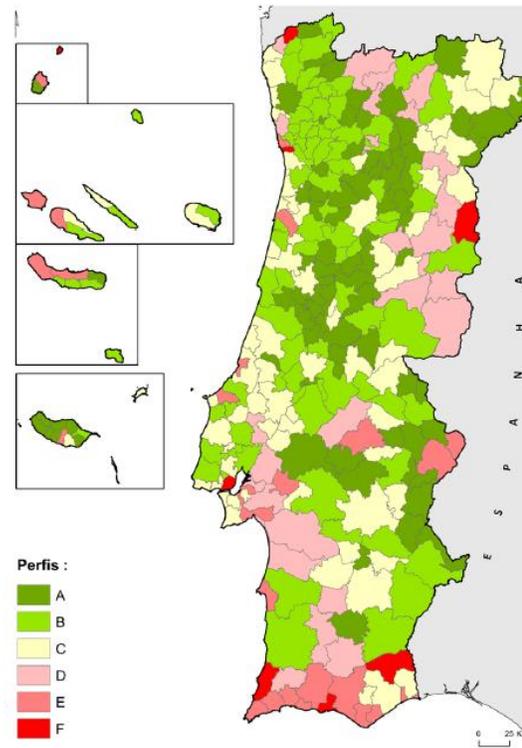
Finisterra, LVI(116), 2021, pp. 49-73
ISSN: 0430-5027
doi: 10.18055/Finis20682
Artigo

PERFIS TERRITORIAIS DE CRIMINALIDADE EM PORTUGAL (2009-2019)

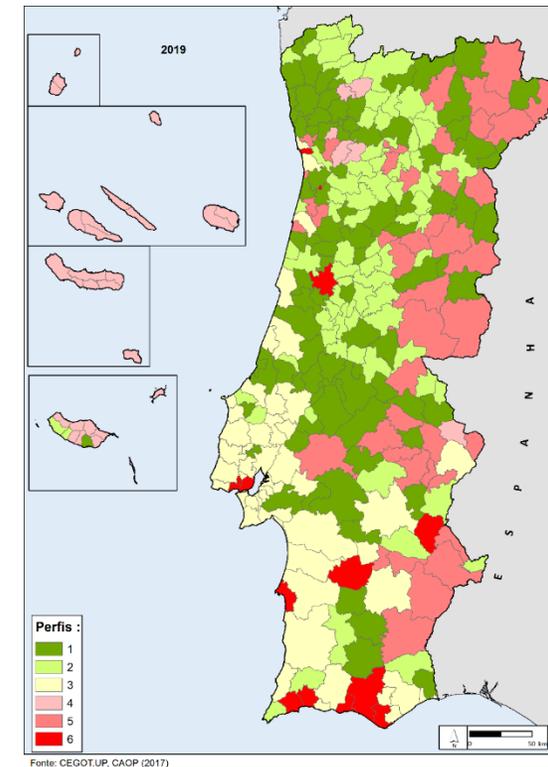
MIGUEL SARAIVA¹
ANA AMANTE²
TERESA SÁ MARQUES³
MÁRCIO FERREIRA⁴
CATARINA MAIA⁵

RESUMO – Na última década, a criminalidade em Portugal decresceu 21%. Contudo, a crise económica e o aumento das disparidades socio-territoriais acentuaram práticas criminais específicas e enfatizaram a importância da sua expressão territorial. Enquanto as agendas europeias têm promovido a redução das desigualdades territoriais através de uma maior espacialização das políticas públicas, a dimensão geográfica da criminalidade tem ganho relevância na investigação. Nesse âmbito, a literatura aponta para a necessidade de conceber análises multivariadas e multi-escalares de base territorial que apoiem as políticas públicas. Este artigo contribui para colmatar a insuficiente reflexão de cariz territorial, ao explorar as disparidades espaciais associadas à criminalidade da última década em Portugal. É aplicada uma análise multivariada para construir perfis integrados que permitem evidenciar e caracterizar territórios vulneráveis face à criminalidade, informando o planeamento urbano da necessidade de respostas mais articuladas e integradas.

Crime

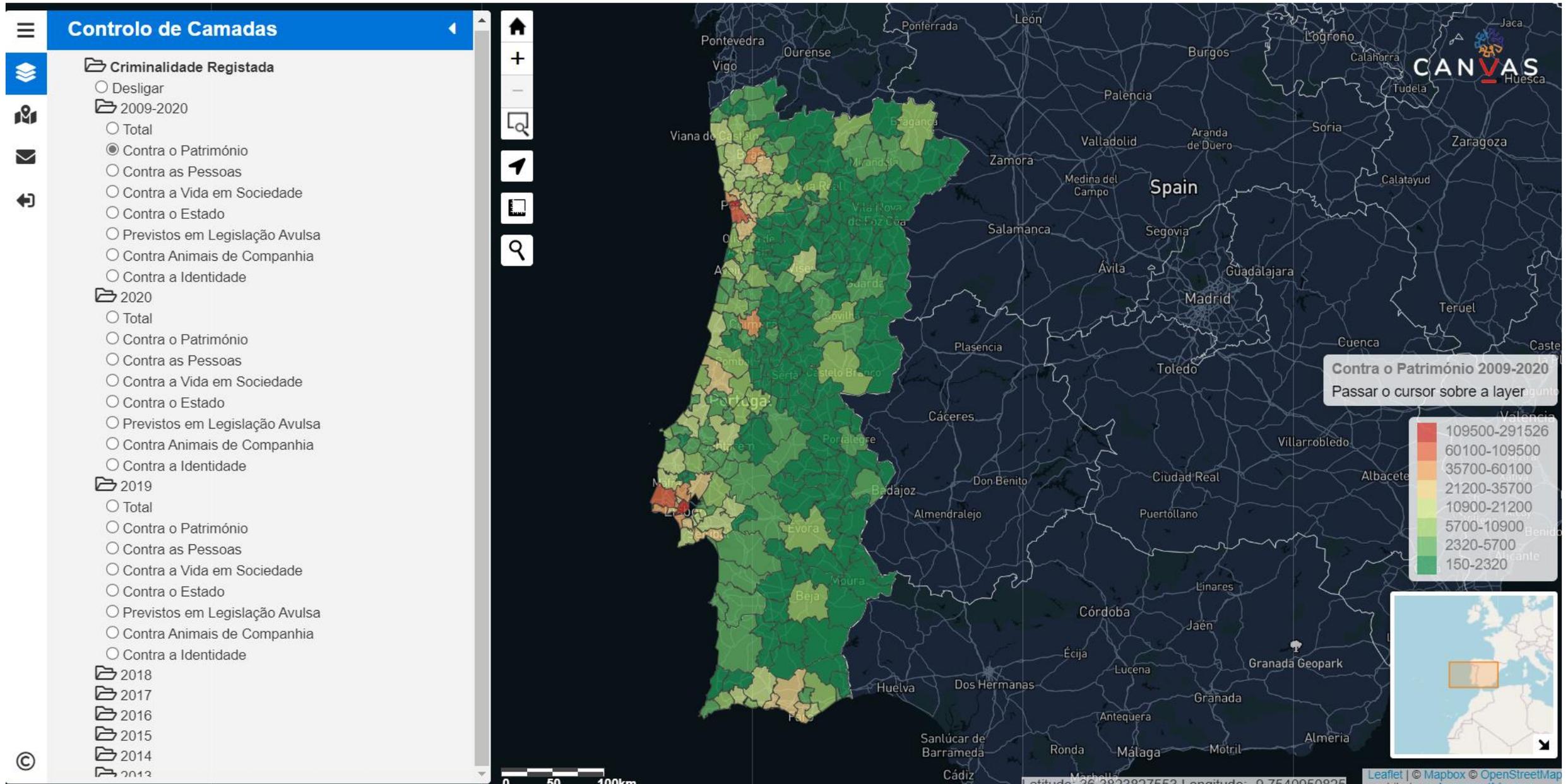


Contextos





Websig CANVAS





Análise multi-escala e multi-variável

Escala Nacional



Escala Municipal

- Os dados a escalas intra-municipais não são públicos
- Criação de **parcerias** Organizações de Segurança – Universidades



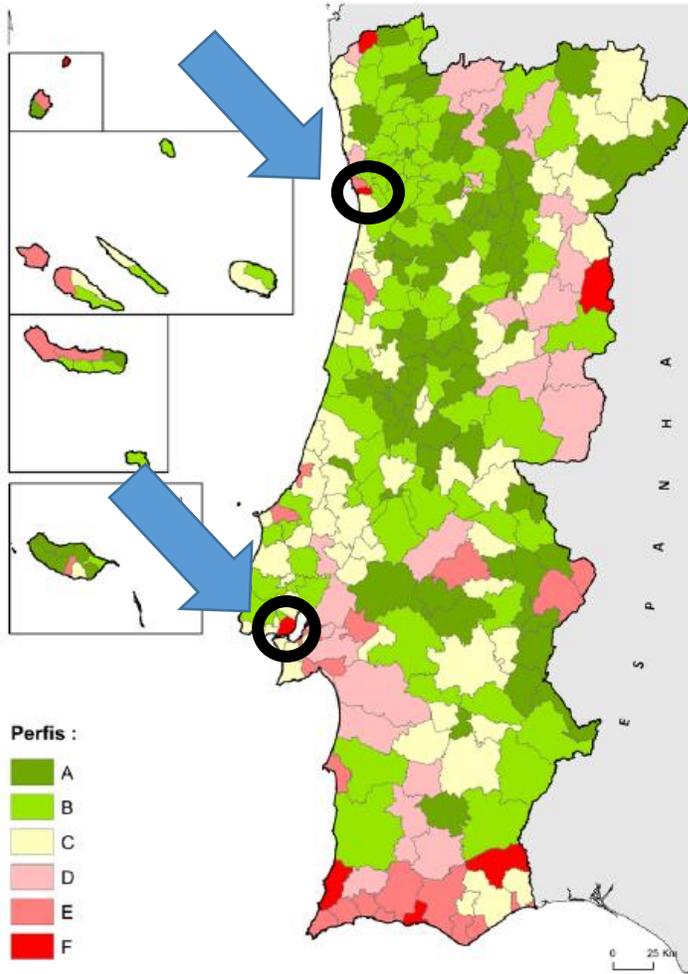
Escala Local

- À micro-escala, existe um **maior potencial de análise e compreensão** dos fatores urbanísticos e economico-sociais que podem condicionar dos padrões
- Possibilidade de modelar, prever e prevenir



U. PORTO

CANVAS



- Crimes georeferenciados: Porto: 148.481 / Lisbon: 480.594

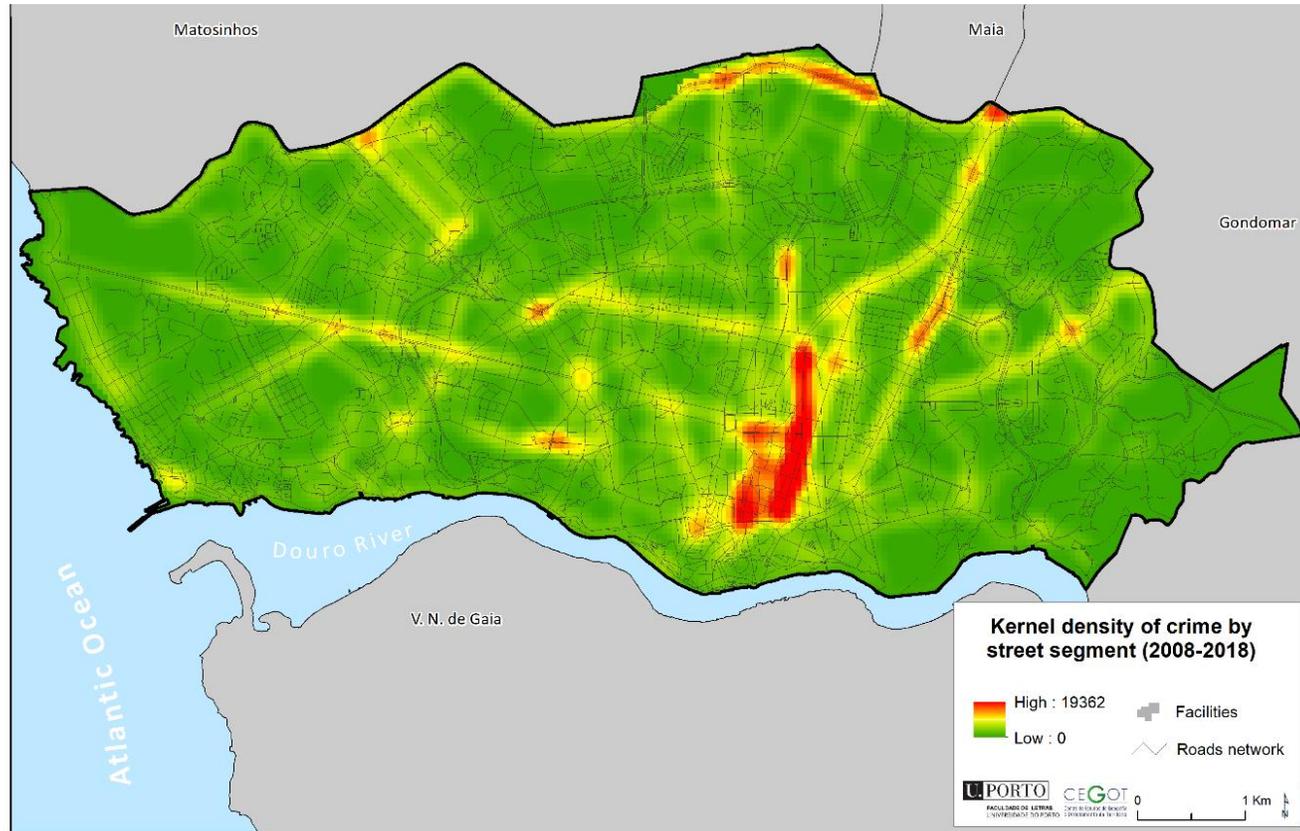
Crime data at street segment level (2009-2018)

Urban Morphology Data	Socio-economic Data	Centrality Data
<ul style="list-style-type: none"> Building typologies Building age Building height Building use Connectivity 	<ul style="list-style-type: none"> Age structure Family size Education data Employment data Home ownership types Urban Mobility data 	<ul style="list-style-type: none"> Student and employment data Number of beds in hotels and health facilities Passengers at stations Users of different services, commerce, culture, leisure, health and social facilities

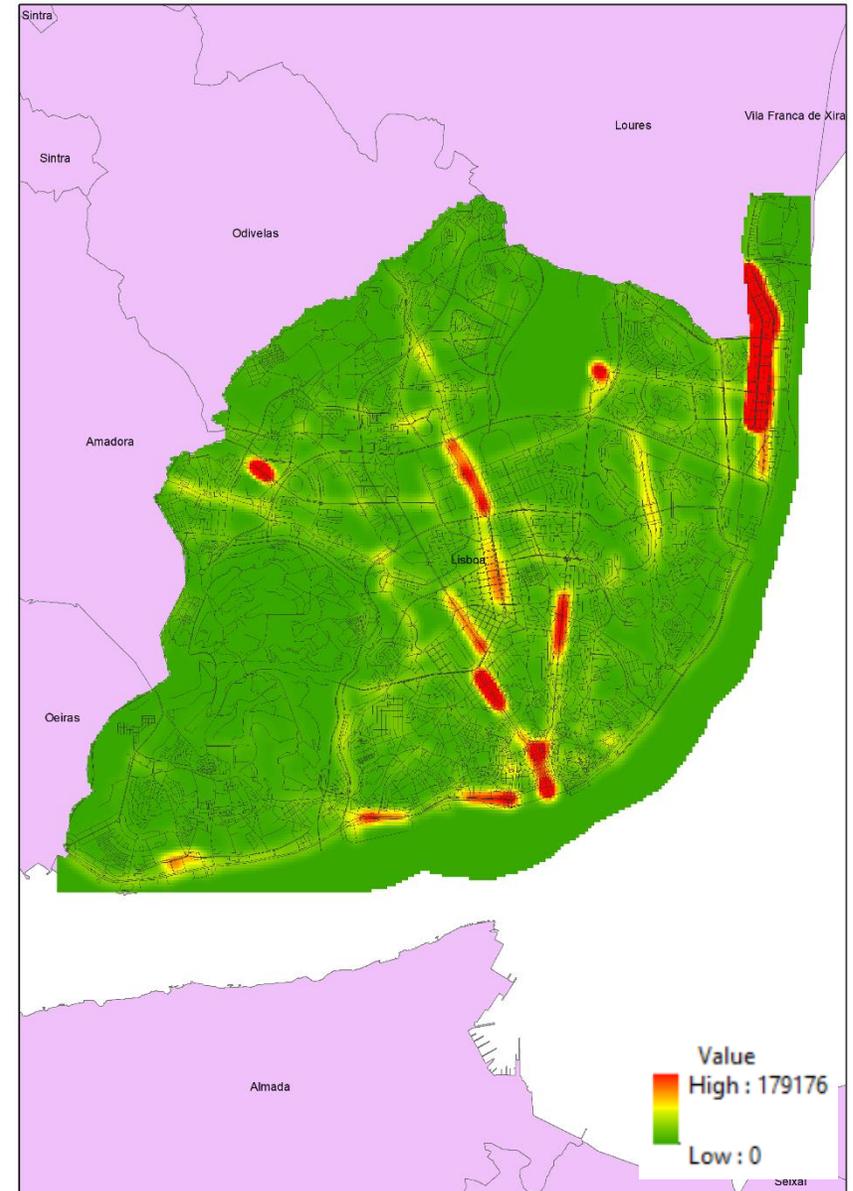
Locations perceived as unsafe (Population survey)



Porto e Lisboa (Densidade de Kernel, 50*50m)

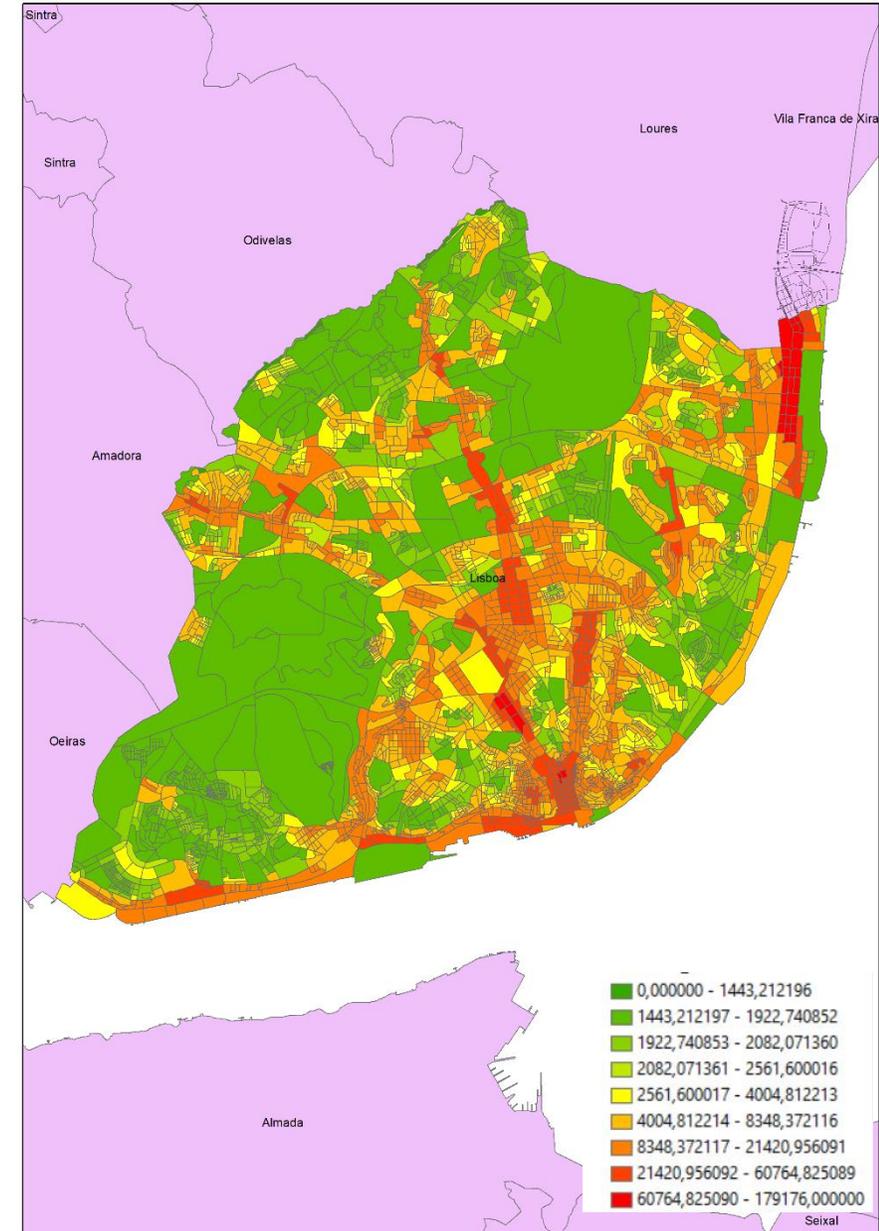
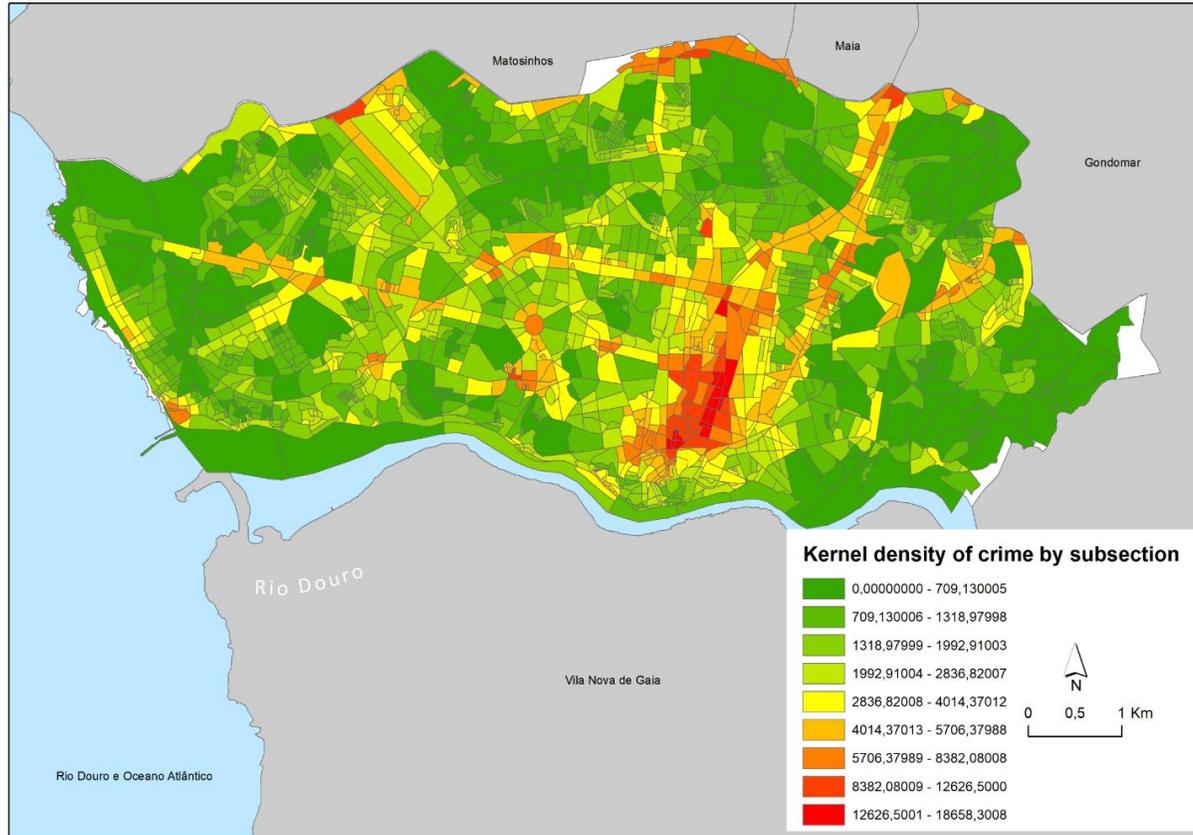


Source: Own; based on untreated data from the Public Safety Police (2019)



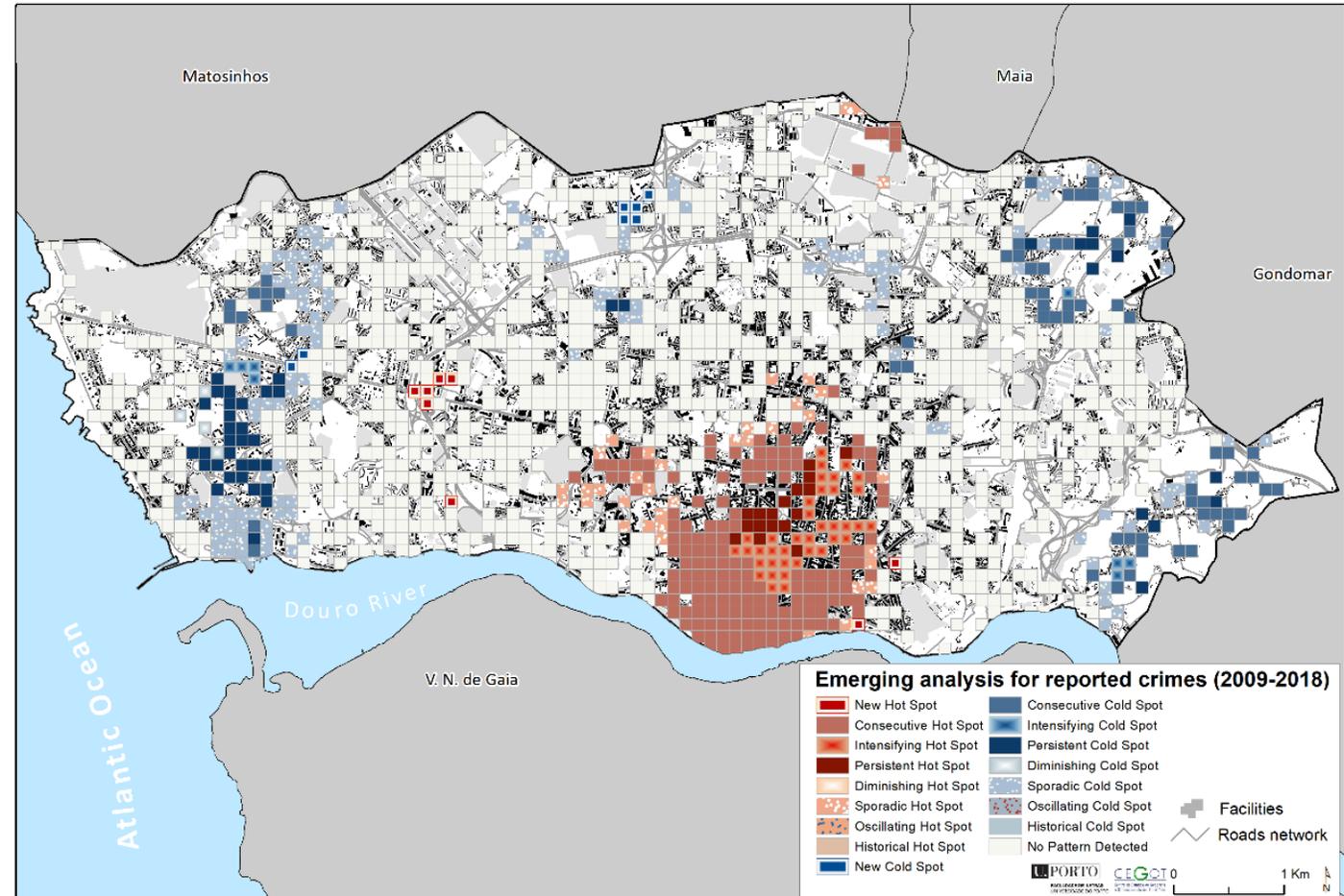
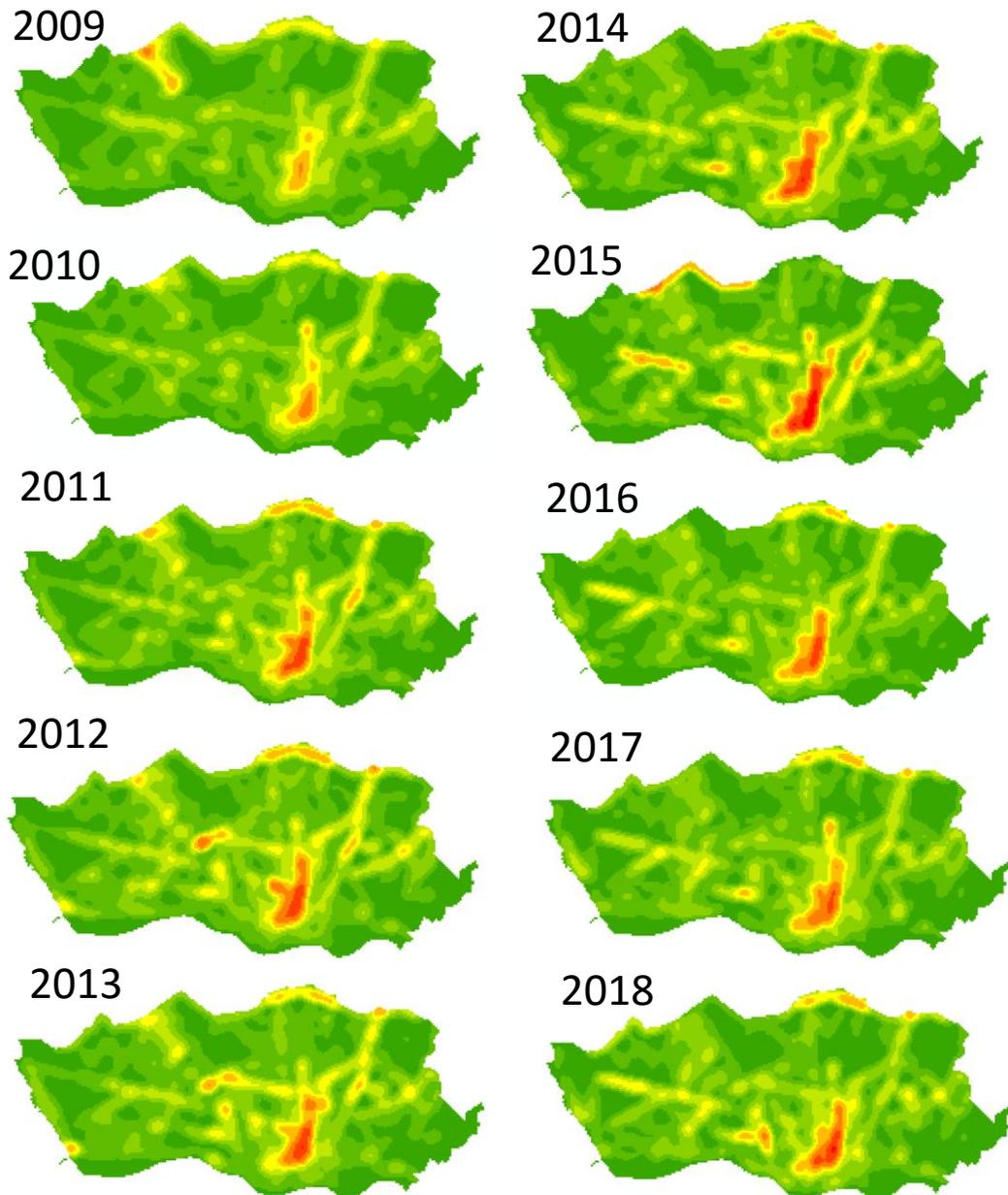


Porto e Lisboa (Densidade de Kernel, conversão à subsecção)





Análise temporal, Porto



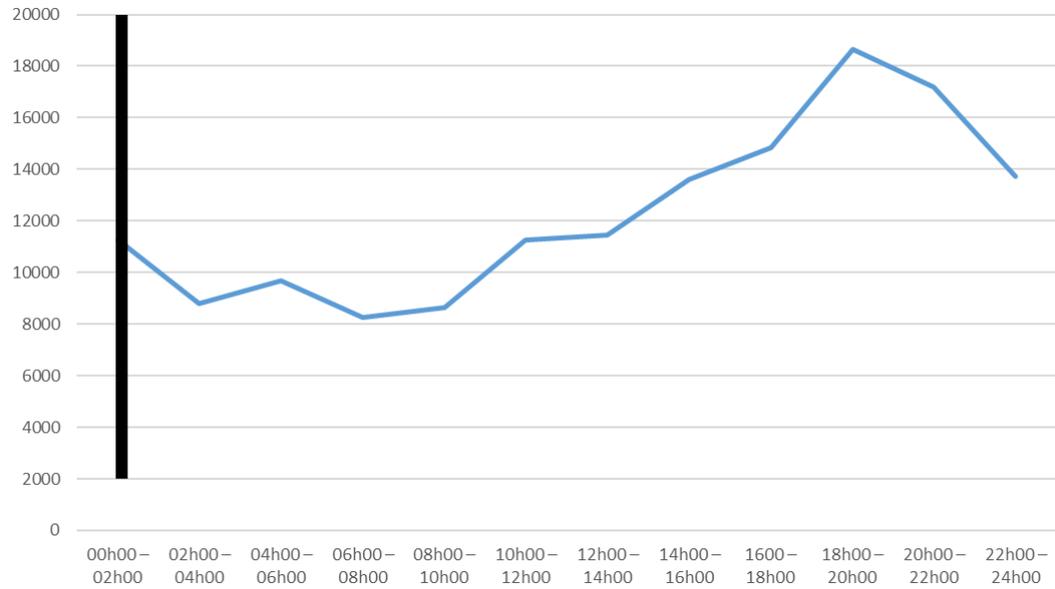
Source: Own; based on untreated data from the Public Safety Police (2019)

NOTA: Análise para Lisboa sujeita à validação com a PSP de dados incongruentes para o ano de 2016

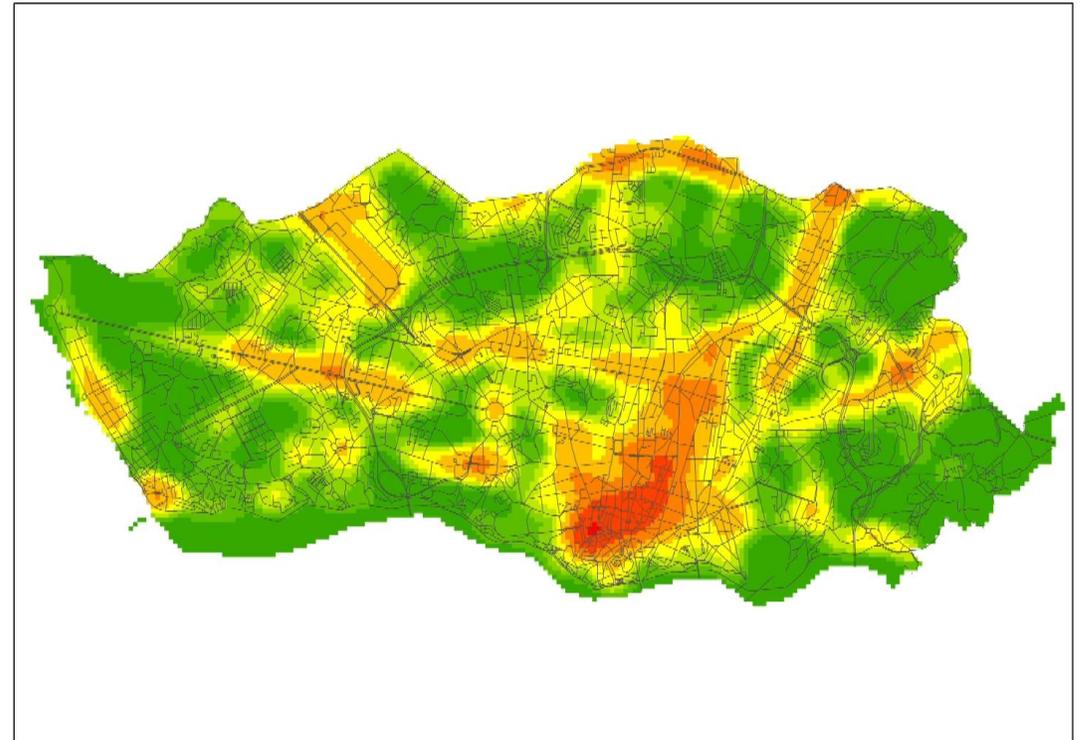
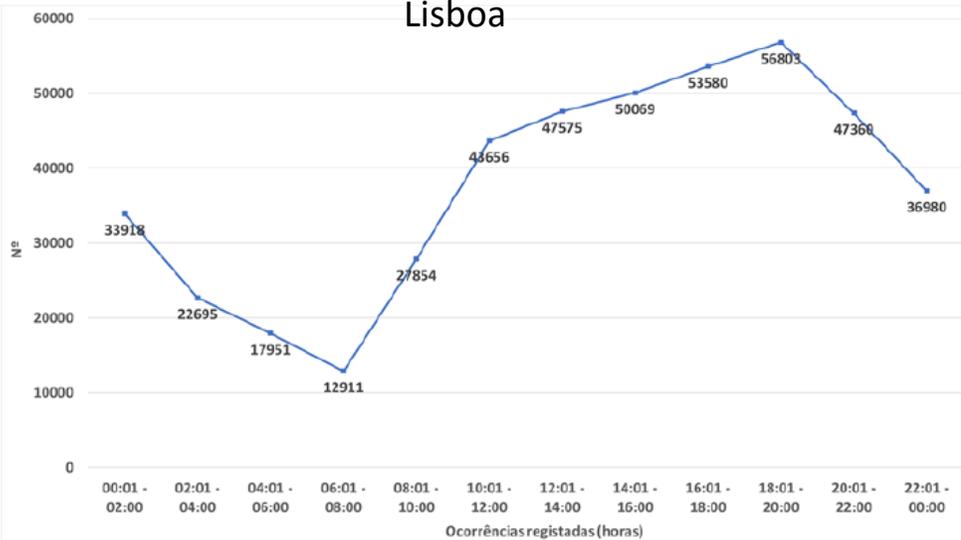


Por hora do dia

Criminalidade Registada Porto (2009-20218), por hora do dia



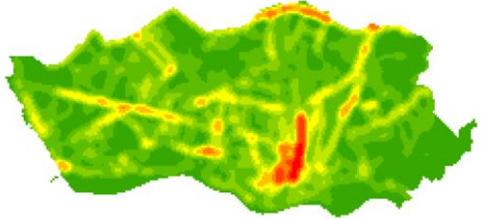
Lisboa



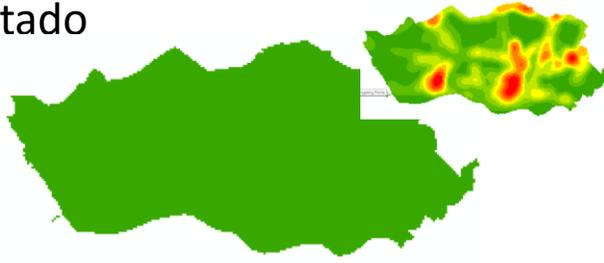


Por tipos (exemplo Porto)

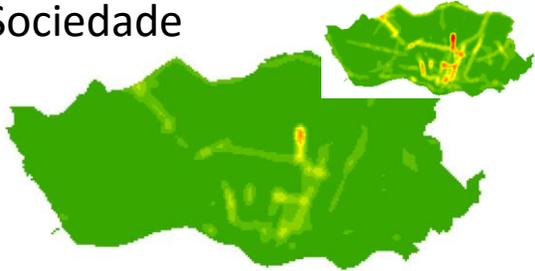
Património



Estado



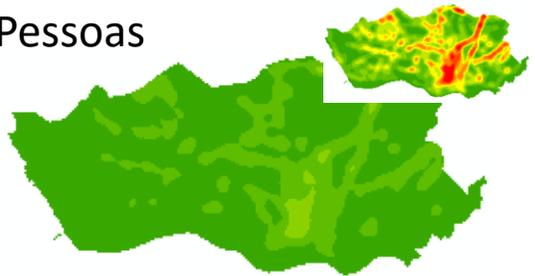
Sociedade



Identidade Cultural



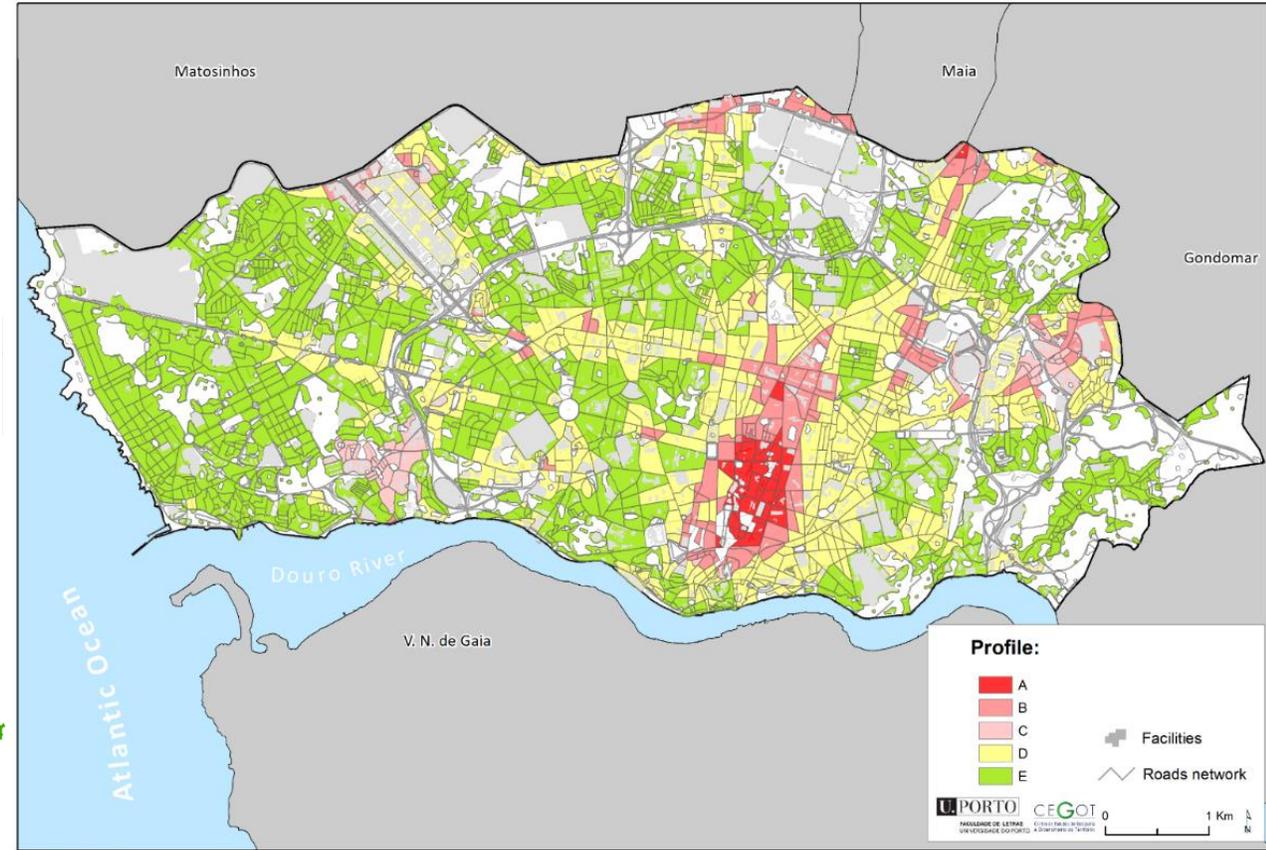
Pessoas



Animais de Estimação



Legislação Avulsa



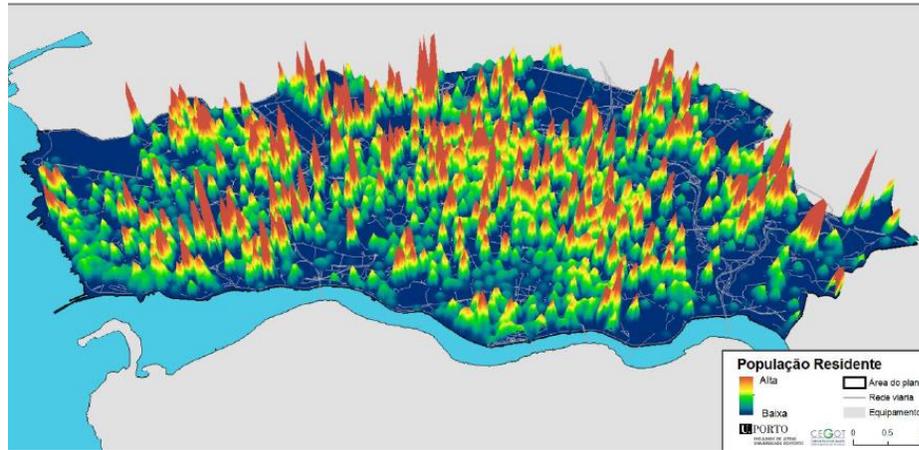
Source: INE (2011)

	A	B	C	D	E
against Property / Heritage	Very High	High	Medium	Medium	Very Low
against the State	Very High	High	Very High	Medium	Very Low
Miscellaneous	High	High	Very High	Medium	Very Low
against Persons	Very High	High	High	Medium	Very Low
against life in Society	High	Medium - High	Low	Low	Very Low
against Pets	Very High	Very High - High	Very High	High - Medium	Very Low
against Cultural Identity	Very High	High	Very Low	Low	Very Low
Total registered crimes	High	High - Medium	Medium	Low - Medium	Very Low

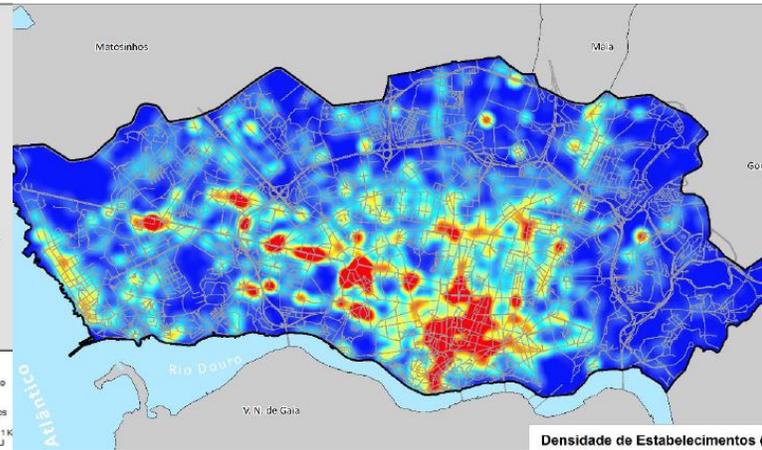


Análise intra-municipal (exemplo Porto)

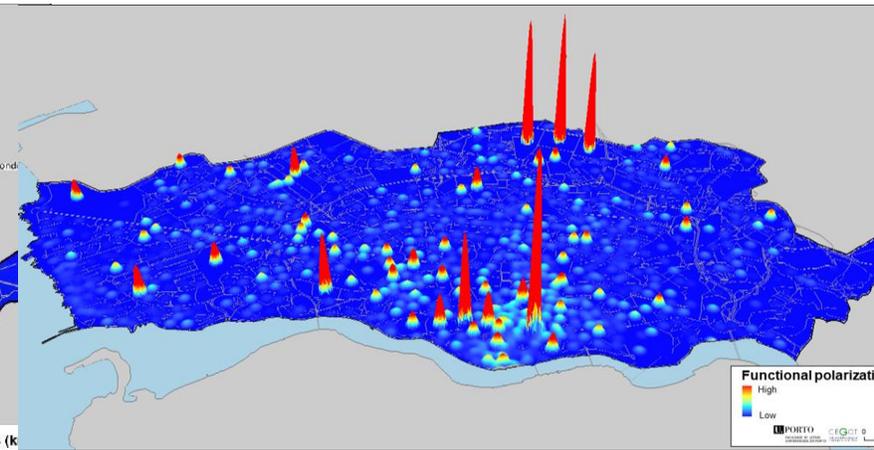
População residente



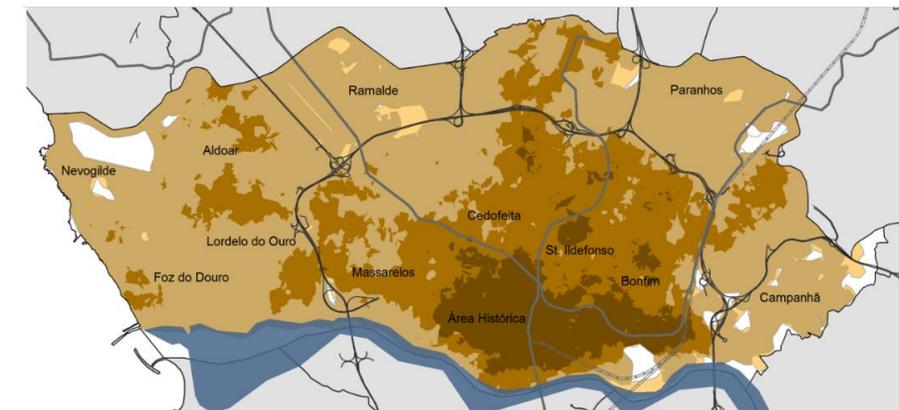
Comércio



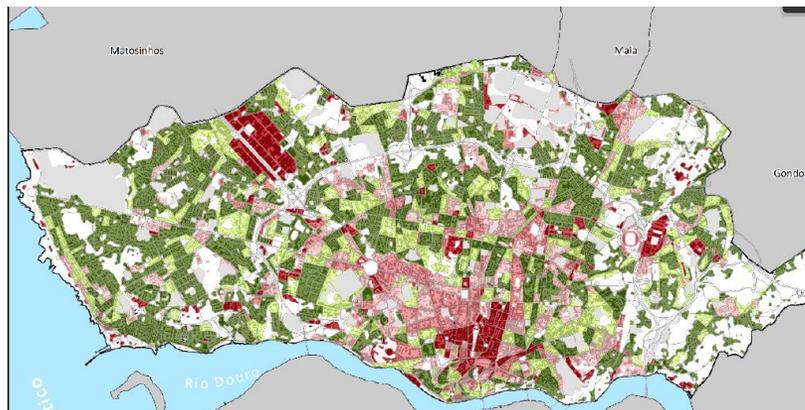
Polarização funcional



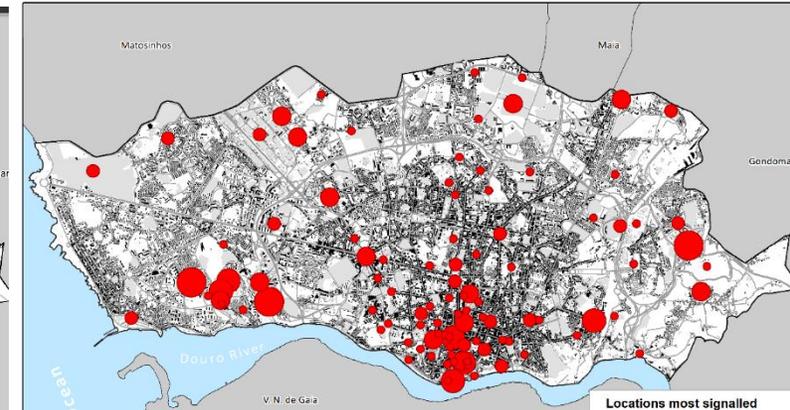
Níveis de acessibilidade



Usos do solo



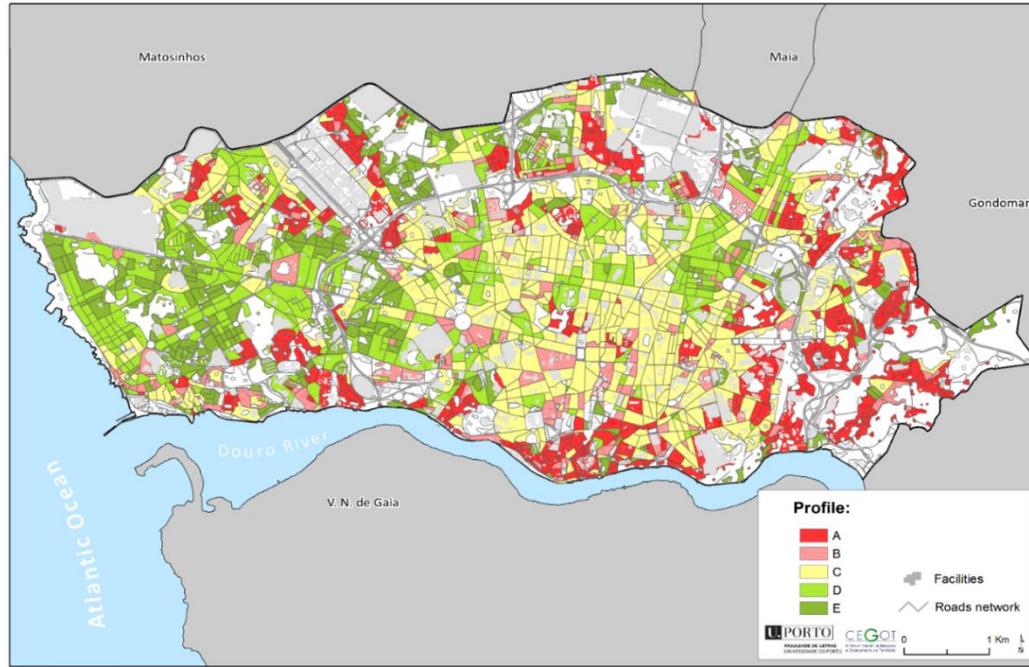
Locais inseguros (inquérito)



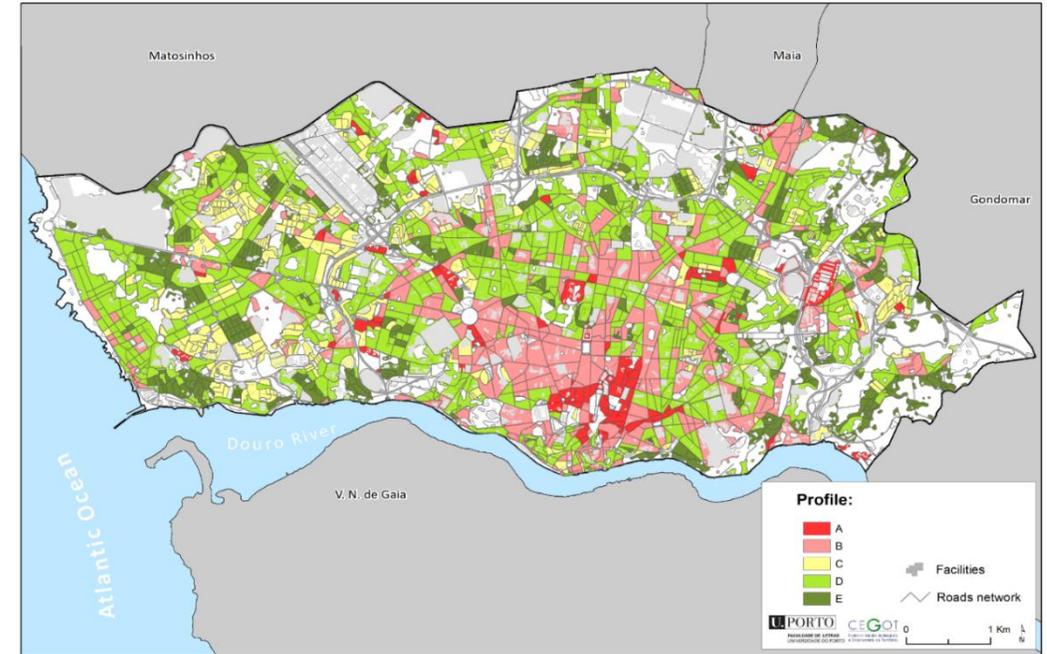


Perfis (exemplo Porto)

Socio-económico



Morfologia Urbana



		A	B	C	D	E
Age structure	Young Population	Medium	Low	Low - Medium	High - Medium	Very High - High
	Adult Population	Medium	Low	Medium	Medium	High
Educational Stage	Older Population	Low	High	Low - Medium	Low	Very Low
	Low level education	Very High - High	High	Medium	Low	Very Low
	Medium level education	Low - Very Low	Low	Medium	High	
Employment	High level education	Very low	Very Low	Low - Medium	High	Very High - High
	Employed	Low	Low - Very Low	Medium	High - Medium	High
	Unemployed	High - Medium	Very Low	Low - Medium	Low	Very Low
Travel mode	Students	Low	Low - Very Low	Medium	High	Very High - High
	Retired	Medium	High - Very High	Medium	Low	Very Low
	Mainly by car	Very Low - Low	Very Low	Low - Medium	High - Medium	Very High - High
Family size	Mainly by public transport	High	Low	Medium	Low	Very Low
	1/2 persons	Low	High	High	Medium	Very Low
	3/4 persons	Medium	Very Low	Low	Medium	Very High - High
Home ownership	5 or more persons	Medium	Very Low	Low	Medium	High
	Owner	Very Low	Low	Medium	High	Very High
	Tenant	Very High	High	Medium	Low	Very Low

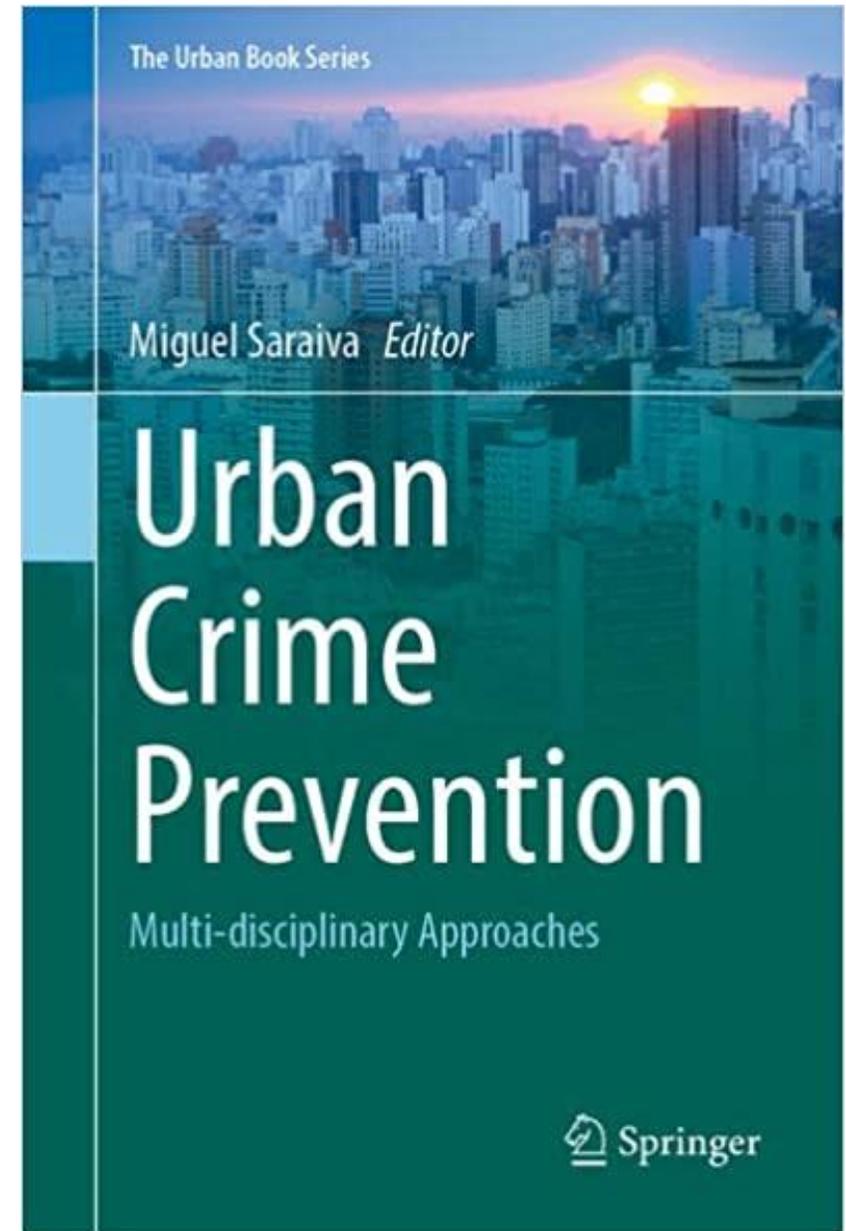
		A	B	C	D	E
Building typologies	Detached	Very Low		Very Low	Low	Very High
	Semi-detached	Very Low	Very Low	Very Low	Medium	Very High
	In a row	Very Low	Low	Very Low	Medium - High	Very High
Building Age	<1919	Very High	Medium	Very Low	Medium - Low	Very Low
	1919-1945		Low	Very Low	Medium	Very High
	1946-1970	Very Low	Low - Medium	Very High	Low - Medium	Very High
	1971-1990	Very Low	Medium - Low	Very High	Low	Very Low
	1991-2011	Very High	Low	Very High	Low - Medium	Very Low
Building Height	1/2 floors	Very Low	Low	Very Low	High - Medium	Very High
	3/4 floors	High	High - Medium	Very High	Low	Very Low
	5 or more floors	Very High	Medium - Low	Very High	Low	Very Low
Building use	Exclusively residential	Very Low	Low - Medium	Very High	High	Very High
	Mostly non residential	Very High	High - Medium	Very Low	Low	Very Low
	Local Accomodation	Very High	High - Medium	Very Low	Low	Very Low
Social typology	Social neighborhood	No	No	Yes	No	Yes
	Islands*		Yes	Yes	No	No
Connectivity	Node Density	High	Low	Medium	Low	Very low / Very high
	Pedestrian Shed Ratio	Low	Low		Medium	High - Very High
	Average link length		High - Medium		High	Low

* an island is a specific type of neighbourhood characteristic of traditional Porto areas (originally created to house factory workers), comprised of a row of very small houses inside the backlots of the properties that face the street



Perfis de criminalidade e características do ambiente urbano

Registered Crime Profile (Figure 5)	A Very high crime rate	B High crime rate, except against Society	C High crime rate against Persons and State	D Medium/low crime rate	E Low crime rate
Socio-economic Profile (Figure 6)	A / B <ul style="list-style-type: none"> • Low level of education • Tenants • Low use of private transport • Unemployed or retired 	B / C <ul style="list-style-type: none"> • Medium/low level of education • Low use of private transport • Retired or employed • Small family size 	A <ul style="list-style-type: none"> • Low level of education • Tenants • Unemployed • Large households 	C <ul style="list-style-type: none"> • Small family size • Miscellaneous ; Small tendency towards working adults, medium/ low level education; public transport use 	D / E <ul style="list-style-type: none"> • Higher level of education • Home owners • Use private transport • Younger persons • Employed or students
Urban Morphology Profile (Figure 7)	A <ul style="list-style-type: none"> • Dense grid • Relatively high buildings • Non-residential activities (retail, services, tourism) 	B <ul style="list-style-type: none"> • Longer streets • Built mid-20th Century • 3-4 floors high • High proportion of non-residential activities 	C <ul style="list-style-type: none"> • Residential and social neighborhoods • Built in the last 50 years • Higher number of floors 	B / D <ul style="list-style-type: none"> • Longer avenues • Medium to low height buildings • Combines residential use and non-residential use 	E <ul style="list-style-type: none"> • High ped-shed • Built mid-20th Century • Low-rise • Residential use • Single-family, semi-detached or row houses
Centrality Profile (Figure 8)	B / C Medium-high polarization	B High polarization	E Low polarization	C / D Medium-low polarization	E Low polarization
Insecurity Hotspots (Figure 9)	11% of responses in 8 locations	12% of responses in 16 locations	17% of responses in 5 locations	23% of responses in 33 locations	37% of responses in 39 locations





Websig CANVAS





Modelos de previsão / análise de Big Data

International Journal of
Geo-Information



Article

Crime Prediction and Monitoring in Porto, Portugal, Using Machine Learning, Spatial and Text Analytics

Miguel Saraiva ^{1,*}, Irina Matijosaiteienė ², Saloni Mishra ² and Ana Amante ¹

- ¹ CEGOT—Centre of Studies in Geography and Spatial Planning, Faculty of Arts and Humanities, University of Porto, Via Panorâmica s/n, 4150-564 Porto, Portugal; anatavaesporto@gmail.com
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Abstract: Crimes are a common societal concern impacting quality of life and economic growth. Despite the global decrease in crime statistics, specific types of crime and feelings of insecurity, have often increased, leading safety and security agencies with the need to apply novel approaches and advanced systems to better predict and prevent occurrences. The use of geospatial technologies, combined with data mining and machine learning techniques allows for significant advances in the criminology of place. In this study, official police data from Porto, in Portugal, between 2016 and 2018, was georeferenced and treated using spatial analysis methods, which allowed the identification of spatial patterns and relevant hotspots. Then, machine learning processes were applied for space-time pattern mining. Using lasso regression analysis, significance for crime variables were found, with random forest and decision tree supporting the important variable selection. Lastly, tweets related to insecurity were collected and topic modeling and sentiment analysis was performed. Together, these methods assist interpretation of patterns, prediction and ultimately, performance of both police and planning professionals.

Keywords: spatial analysis; machine learning; criminology of place; sentiment analysis; topic modeling; Portugal

1. Introduction

Crime is defined as any act that is unlawful. The existence of crime, and more importantly the feelings of insecurity that may stem directly from it, affects quality of life and the sustainability of societies. Relevant policy and planning agendas such as the UN's Sustainable Development Goals, UN Habitat's Safer Cities Program, OECD's well-being index [1] or the EU's Cohesion Reports [2] clearly stress the need to create urban spaces where inhabitants feel safe and secure. In that sense, it has long been established that traditional crime fighting responses are not, in themselves, enough [3]. Already since the 1970s, but particularly in



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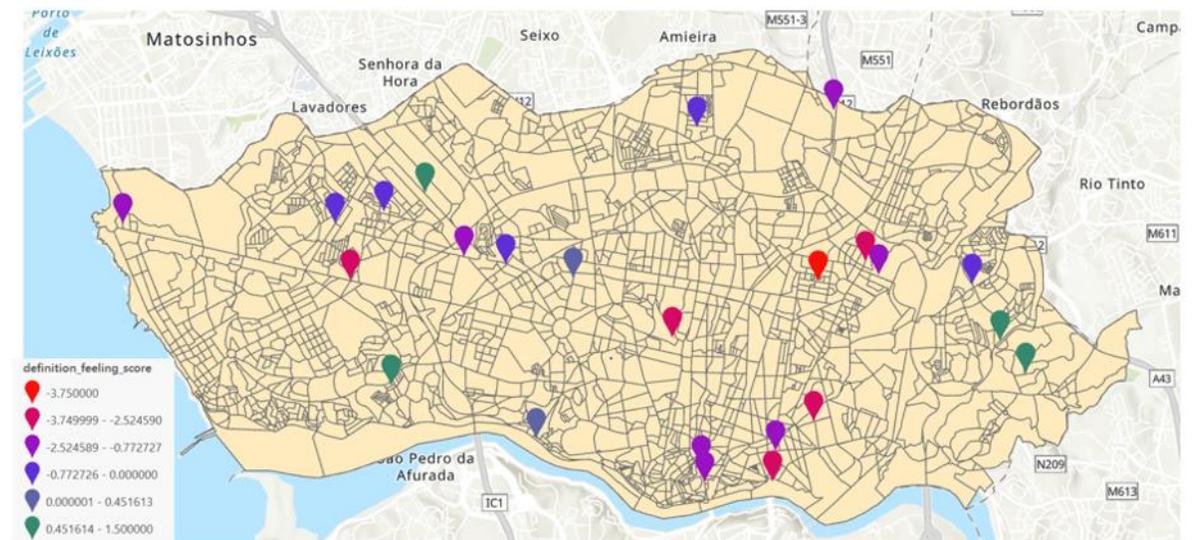
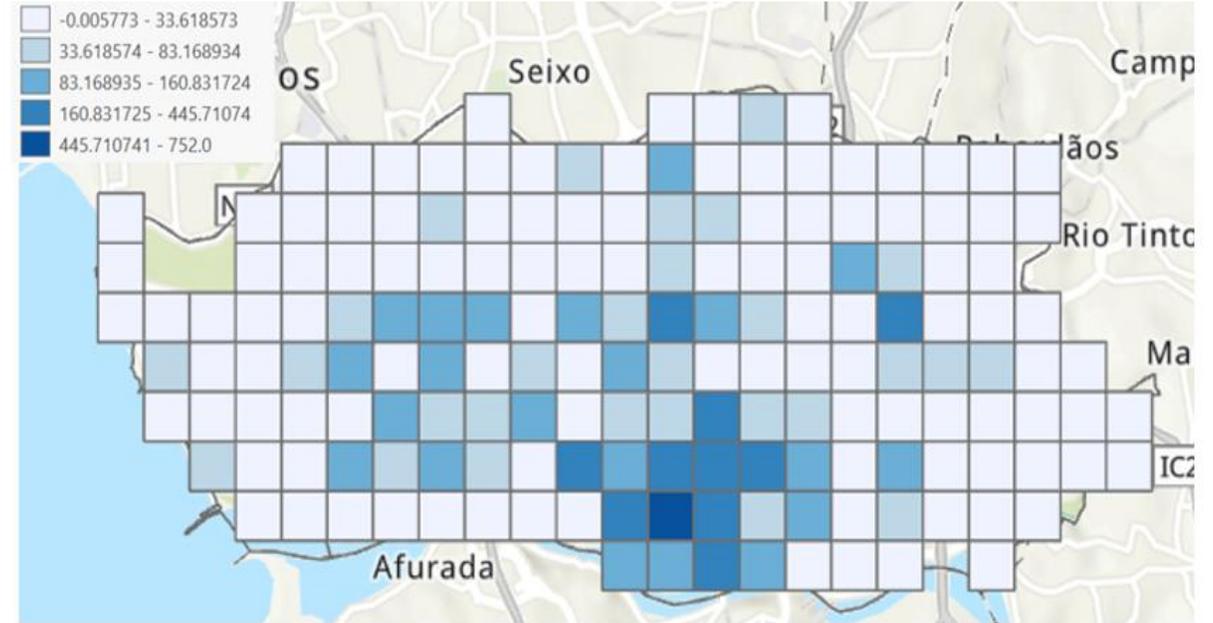


Figure 13. Distribution of sentiments in Porto, Portugal.



Contribuições para um planeamento preventivo

Pesquisas recentes mostram a necessidade de fazer abordagens mais holísticas – visões mais integradas, multidisciplinares e baseadas no local

A localização da insegurança deriva de um efeito cumulativo de elementos morfológicos/uso do solo e da própria percepção de padrões espaciais identificáveis (Foster et al., 2010)

Há variações nos padrões de crime em níveis microgeográficos (The Law of Crime Concentration; Weisburd, 2015)

O crime registrado e a insegurança têm padrões territoriais distintos (Sohn, 2016)

Agregação inteligente de dados (Hunt et al., 2011)

- Necessidade de conjuntos de dados de crimes numa escala mais fina (tendência da própria denúncia do crime)
- Necessidade de mais variáveis sobre eficácia coletiva, redes sociais e controle social informal
- A correlação não implica necessariamente em causalidades dinâmicas

Uso mais inteligente de ferramentas -> compartilhar know-how e as potencialidades do SIG (Andresen, 2018)

Contribuições para o apoio à decisão -> do diagnóstico espacial aos planos de ação concretos e políticas direcionadas (PSPS, 2021)



Crime and Violence Prevention
through Smart Planning and
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