

**LOW-COMPLEXITY RISK ASSESSMENT TO MONITOR AND PRIORITIZE WUI FIRE PREVENTION
IN THE PORTUGUESE NATIONAL PLAN FOR INTEGRATED RURAL FIRE MANAGEMENT**

Contribution to the IAP Workshop
**Wildfires and their impact on the built
environment**

Royal Spanish Academy of Sciences, Madrid, 17-18th March 2025

Yannick Le Page

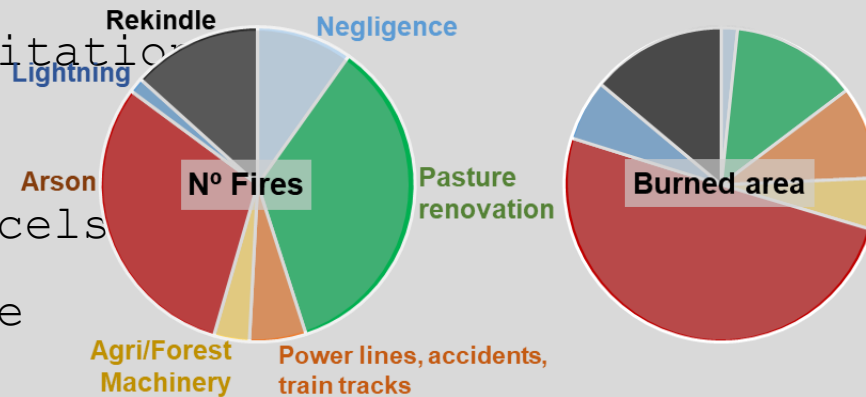
Knowledge & Innovation team

 **AGIF** Portuguese Agency for Integrated Rural Fire
Management

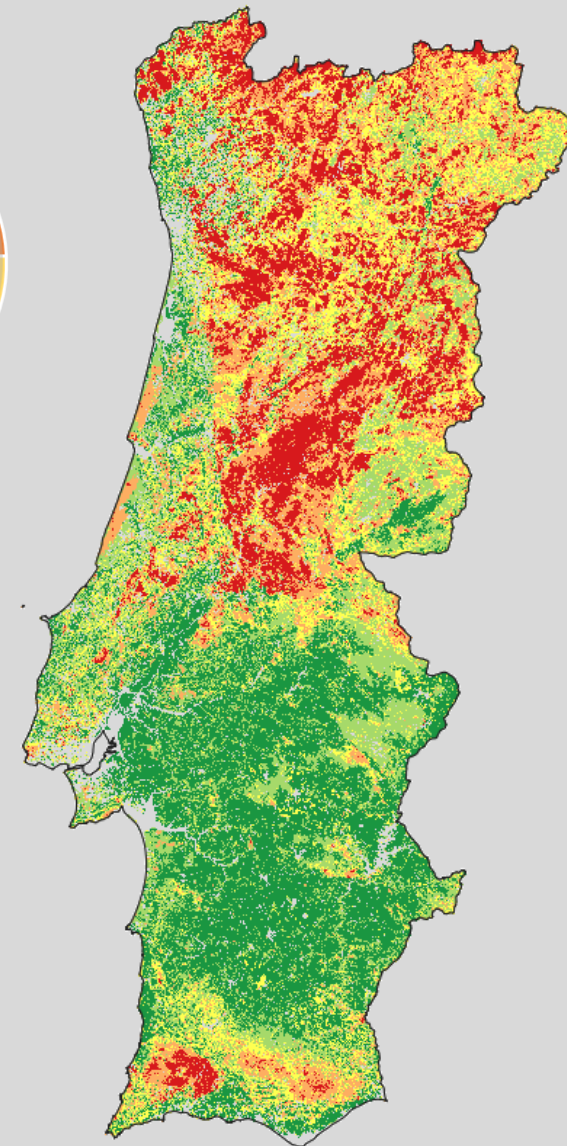
THE WILDFIRE ISSUE IN PORTUGAL

- Extensive area of forest and shrublands
- Long growing season, ample precipitation
- Dry, very fire-prone summers
- Private land ownership, small parcels
- Decreasing landuse and maintenance

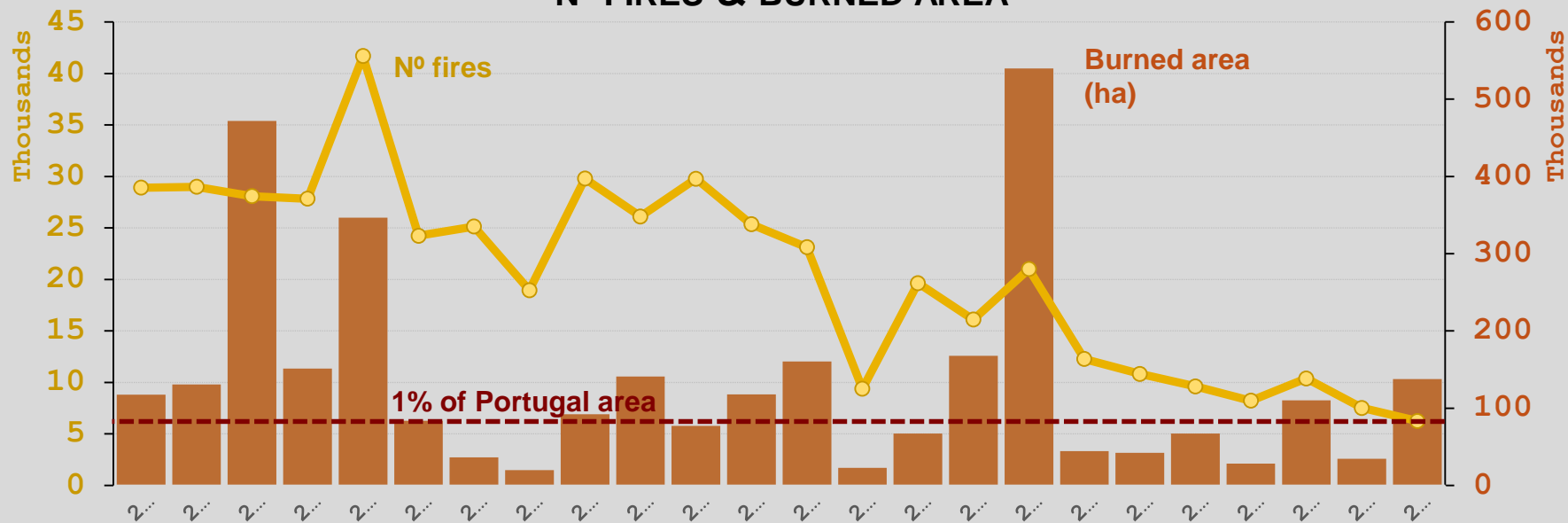
CAUSALITY



WILDLAND FIRE HAZARD



N° FIRES & BURNED AREA



THE NEW NATIONAL STRATEGY FOR INTEGRATED RURAL FIRE MANAGEMENT 2020-30

2017 FIRES

1.2 million acres, 116 fatalities



- AGIF was created to define a new fire management strategy and coordinate its implementation within the Integrated Rural Fire Management System.

Objetivos Estratégicos
Programas

Conhecer a ocupação do território e infraestruturas
Refinanciamento da propriedade

FUEL MANAGEMENT IN THE WILDLAND-URBAN
2.2.1.3

OBJECTIVES INTERFACE

Reduzir os efeitos da passagem de incêndios, protegendo de forma passiva vias de comunicação, infraestruturas e equipamentos de interesse público

- 625.900 ha com gestão efetiva da rede
- Gestão e conservação da rede secundária, preparada para a prevenção e combate de incêndios

Normas técnicas de gestão da Rede Secundária publicada

RESPONSIBILITIES

Função	Entidade
Coordenador	MAI/ ANEPC
Responsável	ICNF, Municípios, REN, EDP, AdP, EGF, CLC, MP, ML, IP, IMT, empresas do setor florestal, proprietários e gestores florestais, gestores de infraestruturas
Fiscaliza	GNR, PSP

DELIVERABLE

- Identificar áreas prioritárias para a gestão de combustível de acordo com o potencial de grandes incêndios e a vulnerabilidade dos elementos a proteger
- Rever normas técnicas para a gestão de combustível em Rede Secundária
- Executar e monitorizar a gestão de combustível na rede secundária de faixas

MONITORING INDICATORS

- Mapa de prioridades de intervenção (periodicidade anual- janeiro)
- Área da Rede Secundária com gestão efetiva de combustível de acordo com mapa de prioridades
- Taxa de execução nas áreas prioritárias

TIMELINE

- 2020-2030: 56.900 ha/ano com gestão efetiva da rede
- 2022: Taxa de cumprimento superior a 90% nas áreas prioritárias
- 2030: Taxa de cumprimento superior a 95% nas áreas prioritárias

EFFICIENTLY

Aumentar a qualificação dos Agentes SGIFR

Implementar o programa nacional de qualificação dos Agentes SGIFR

Programa de Intercâmbio de Peritos Internacionais

Gestão do conhecimento



International Landscape Fire Governance Framework
 Guiding Principles for Adjusting Strategies, Policies, and Management, to Global
 Supported by FAO, UNEP, UNFF, OECD, OSCE, Council of Europe, United States, Brazil, Australia, etc.
 Stooft, C., Ribau, M. C., Moore, P. F., & Boustras, G. (2025). Readers respond.
 Nature, 637, 2

THE WILDLAND-URBAN INTERFACE IN THE NATIONAL STRATEGY

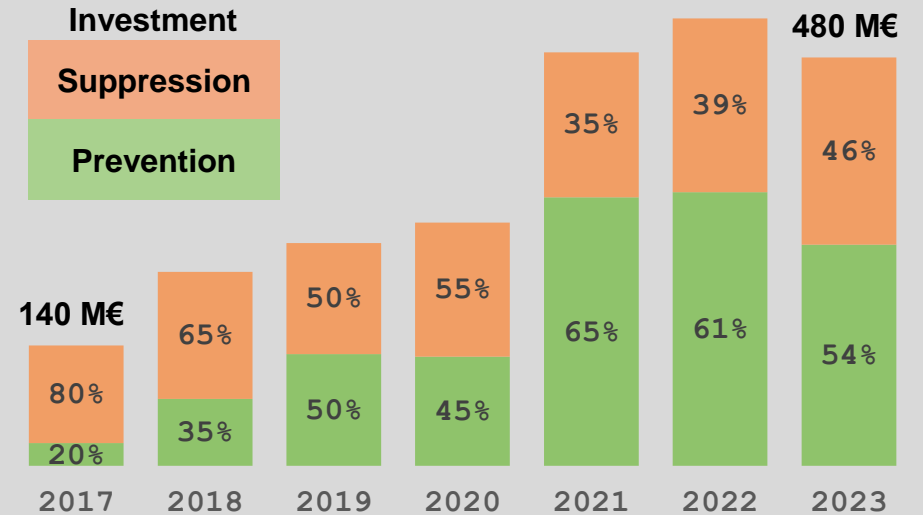
➤ Explicitly integrates two branches of fire management:

- Wildland fire management
- Protection of people & built-up areas

➤ Dedicates >50% of the budget to prevention.

➤ Specific programs to address risk in the WUI:

- Territorial planning for resilient landscapes
- Revitalize and diversify rural economic sectors
- Community-scale administration of preparedness
- Awareness and guidelines communication campaigns
- Control and enforcement of fuel management by authorities
- Early warnings and efficient pre-suppression & suppression

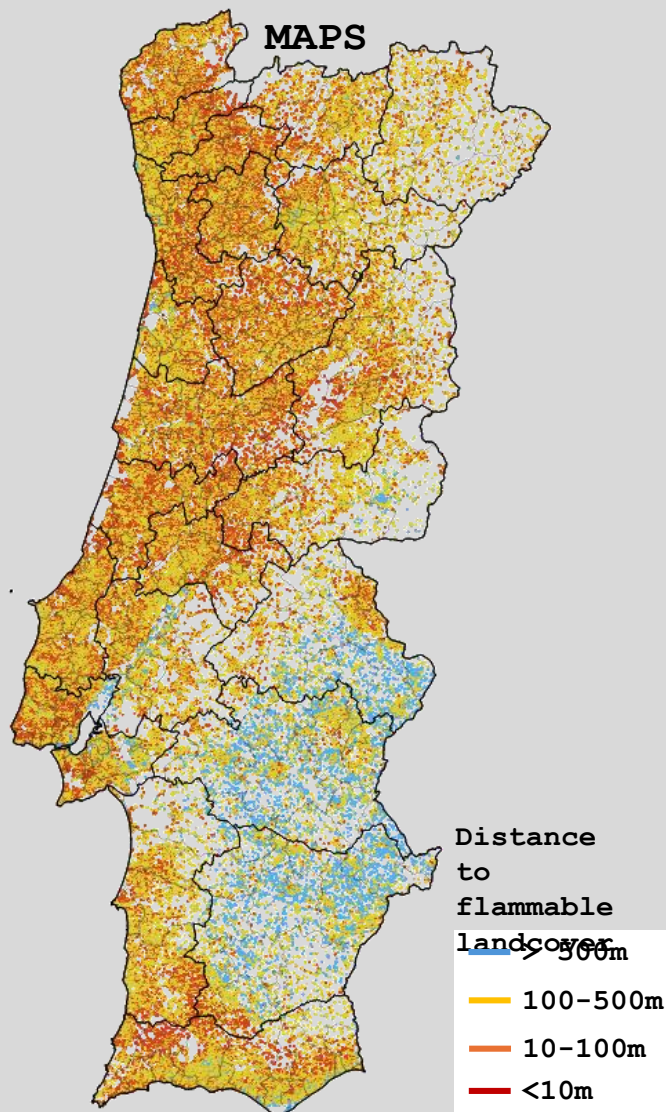


RISK ASSESSMENT

PRELIMINARY WUI RISK ASSESSMENTS AND LESSONS LEARNED

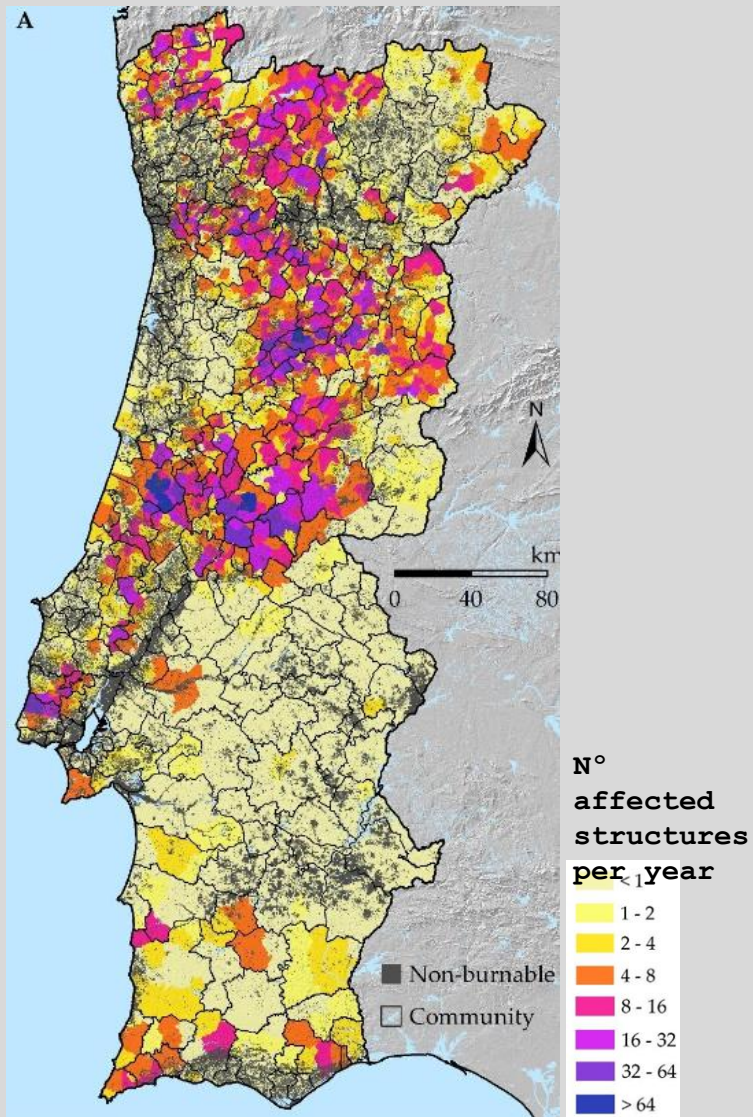
NATIONAL BUILT-UP & WUI

MAPS



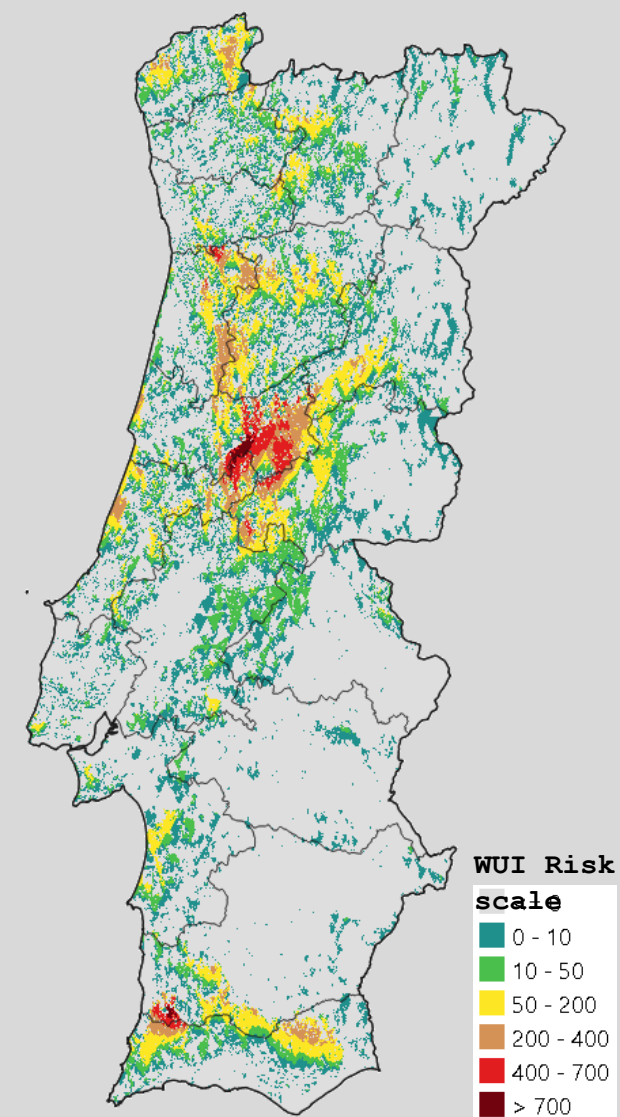
Directorate General for the Territory (2020)

MTT SIMULATIONS



Alcasena, F., Ager, A., Le Page, Y., Bessa, P., Loureiro, C., & Oliveira, T. (2021). Assessing wildfire exposure to

CELLULAR AUTOMATON



AGIF, 2022.

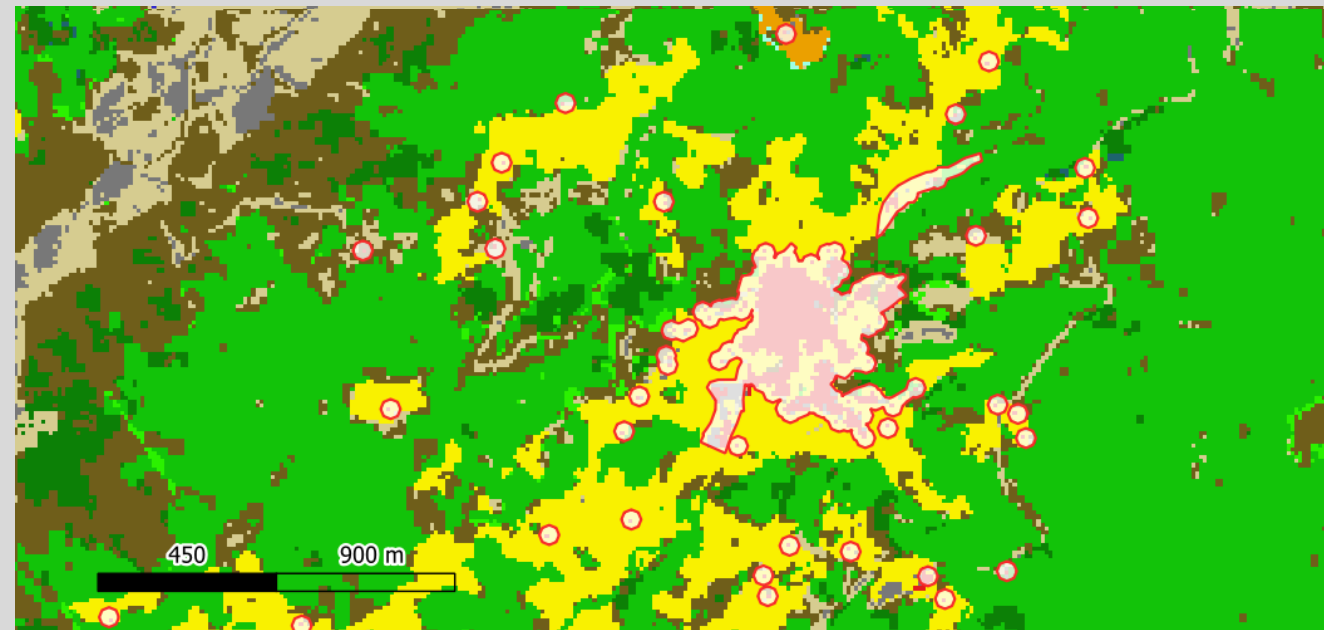
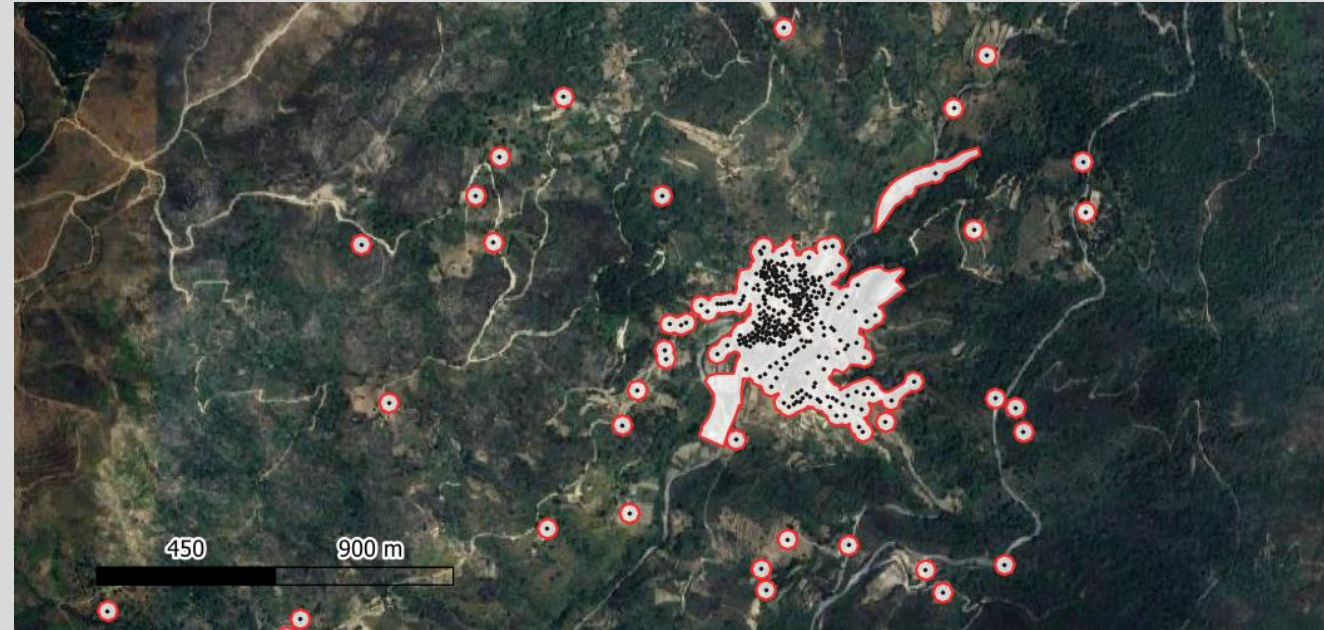
WUI RISK ASSESSMENT: NEEDS AND AVAILABLE ASSETS

NEEDS

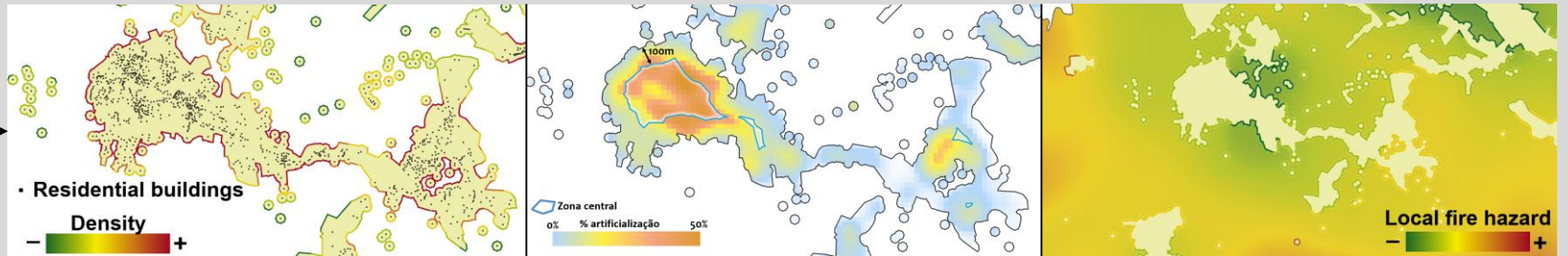
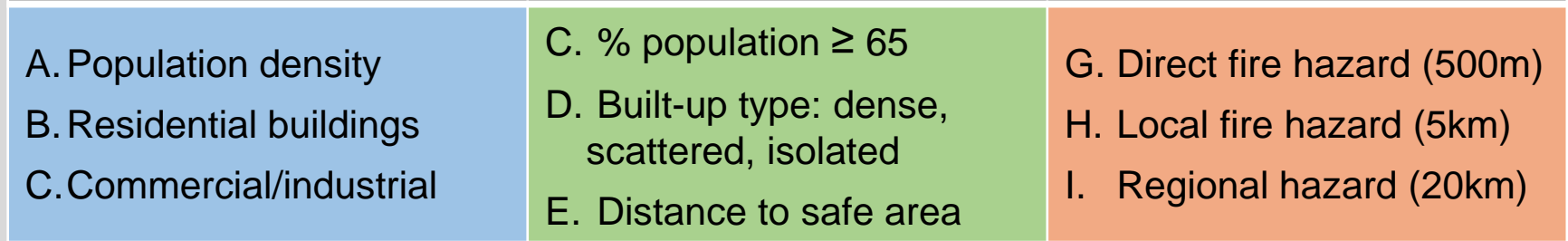
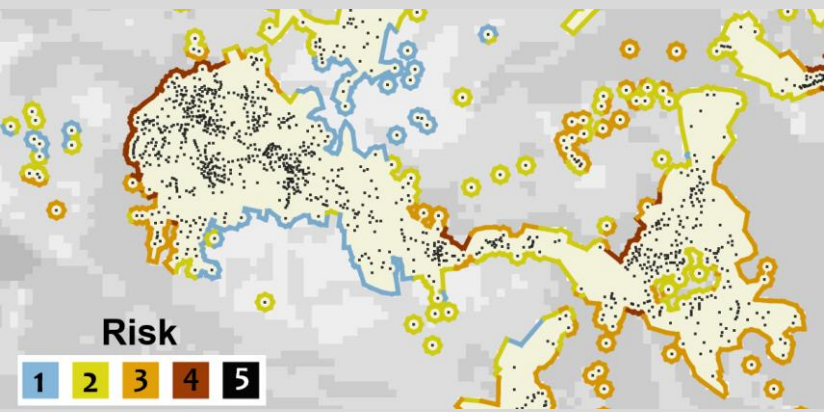
- Solid assessment supported by evaluation analysis
- Adequate spatial resolution for support at all governance levels → fine-scale
- Adequate temporal resolution for monitoring → annual and pre-summer assessment

ASSETS

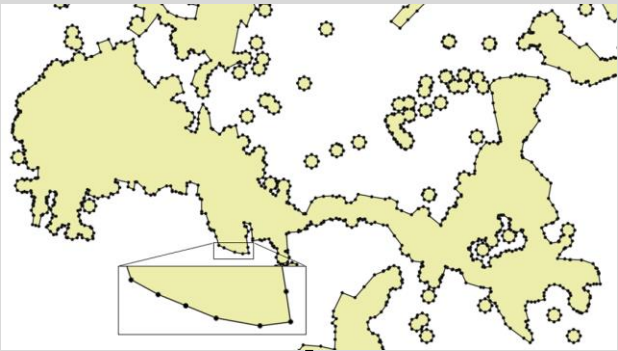
- Intelligible and supporting knowledge building
- Cartography of built-up areas & interface
- Flexible & evolutive interface
- Annual cartography of wildland fire hazard
- Annual and pre-summer cartography of landcover
- Location & construction type of residential buildings
- Population census



METHODOLOGY



1. Interface segmentation (25m)



2. Compute relevant segment-level variables

Examples

METHODOLOGY: HAZARD ASSESSMENT TO PRIORITIZE AND MONITOR PREVENTION

HAZARD

1. Direct fire hazard (500m)
2. Local fire hazard (5km)
3. Regional hazard (20km)

➤ Based on the WUI and landcover cartography,

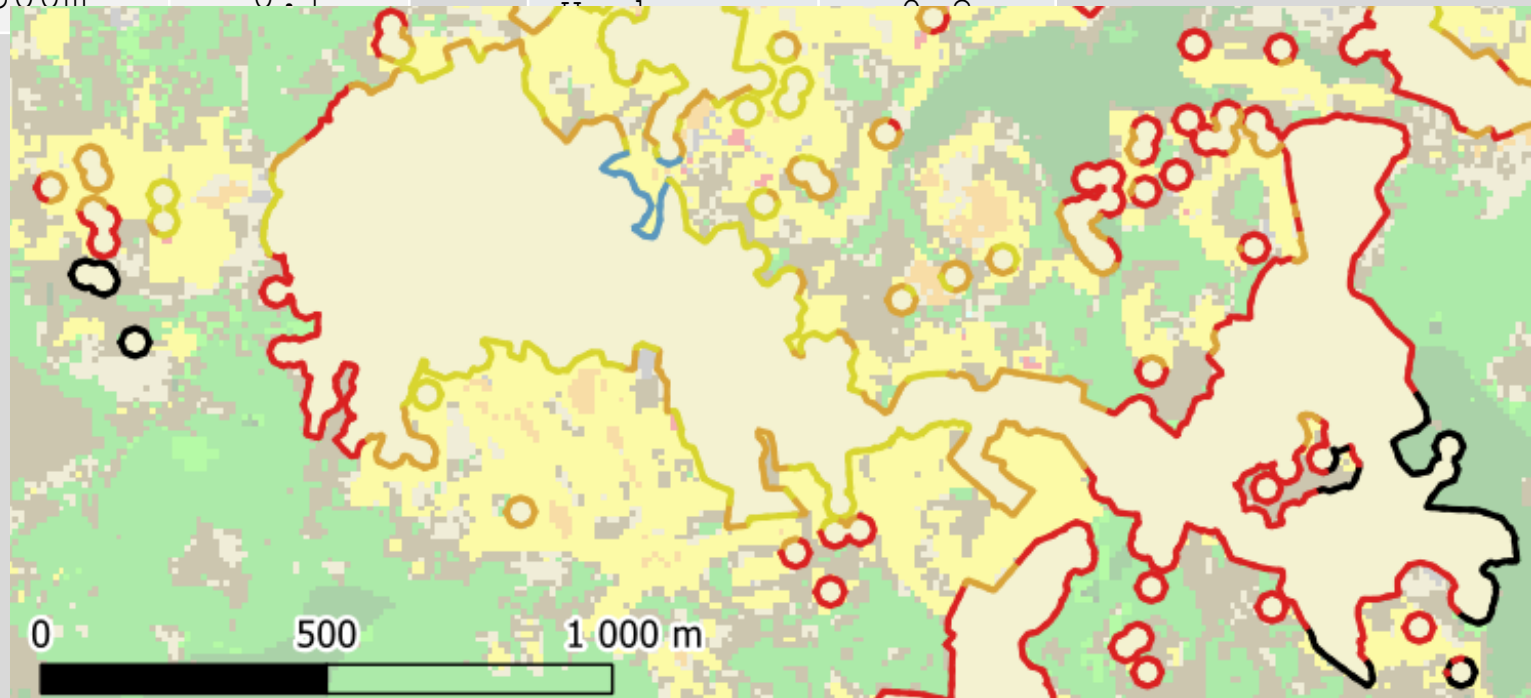
Proximity to flammable landcover	Direct Hazard score
Direct contact	1
>500m	0.1

X

Dominant landcover within 500m	Direct Hazard score
Forest	1
Shrublands	1
Open forest	0.3

X

% flammable landcover within 500m	Direct Hazard score
100%	1
0%	0.1



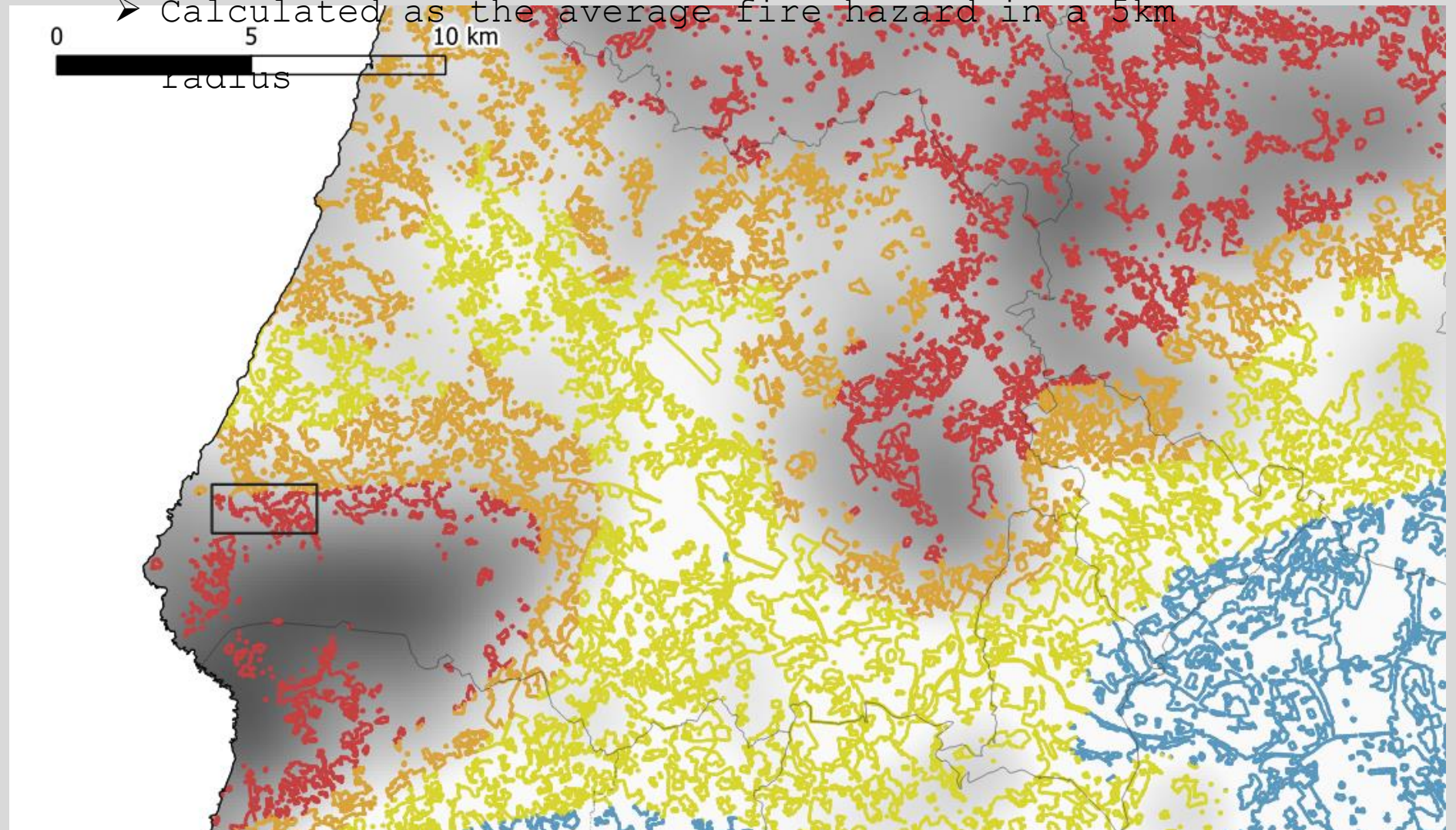
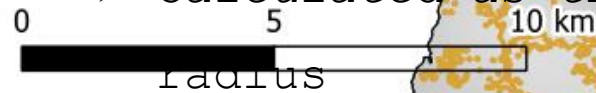
METHODOLOGY: HAZARD ASSESSMENT TO PRIORITIZE AND MONITOR PREVENTION

HAZARD

1. Direct fire hazard (500m)
- 2. Local fire hazard (5km)**
3. Regional hazard (20km)

➤ Based on the wildland fire hazard map, updated annually

➤ Calculated as the average fire hazard in a 5km



Local hazard

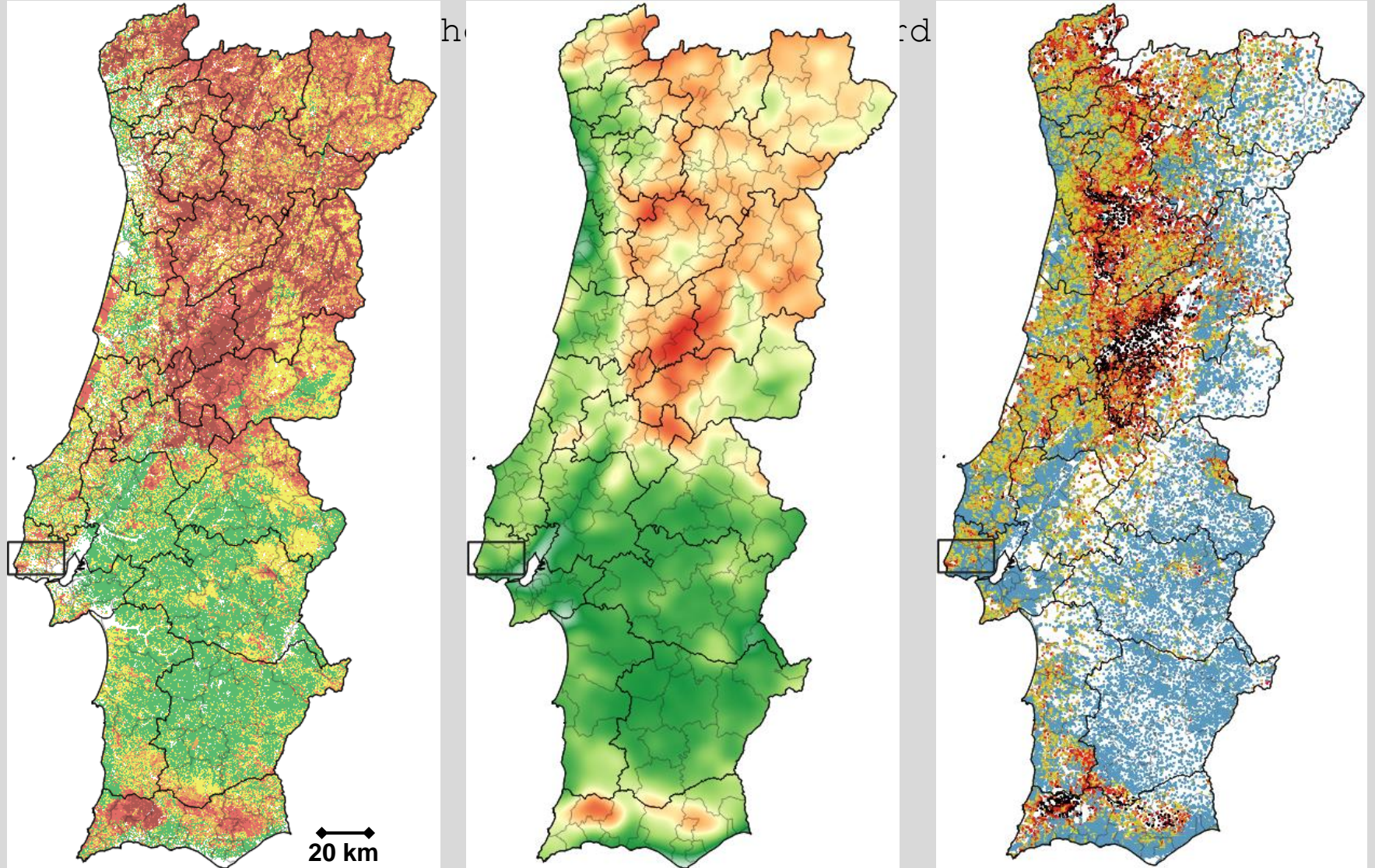


METHODOLOGY: HAZARD ASSESSMENT TO PRIORITIZE AND MONITOR PREVENTION

HAZARD

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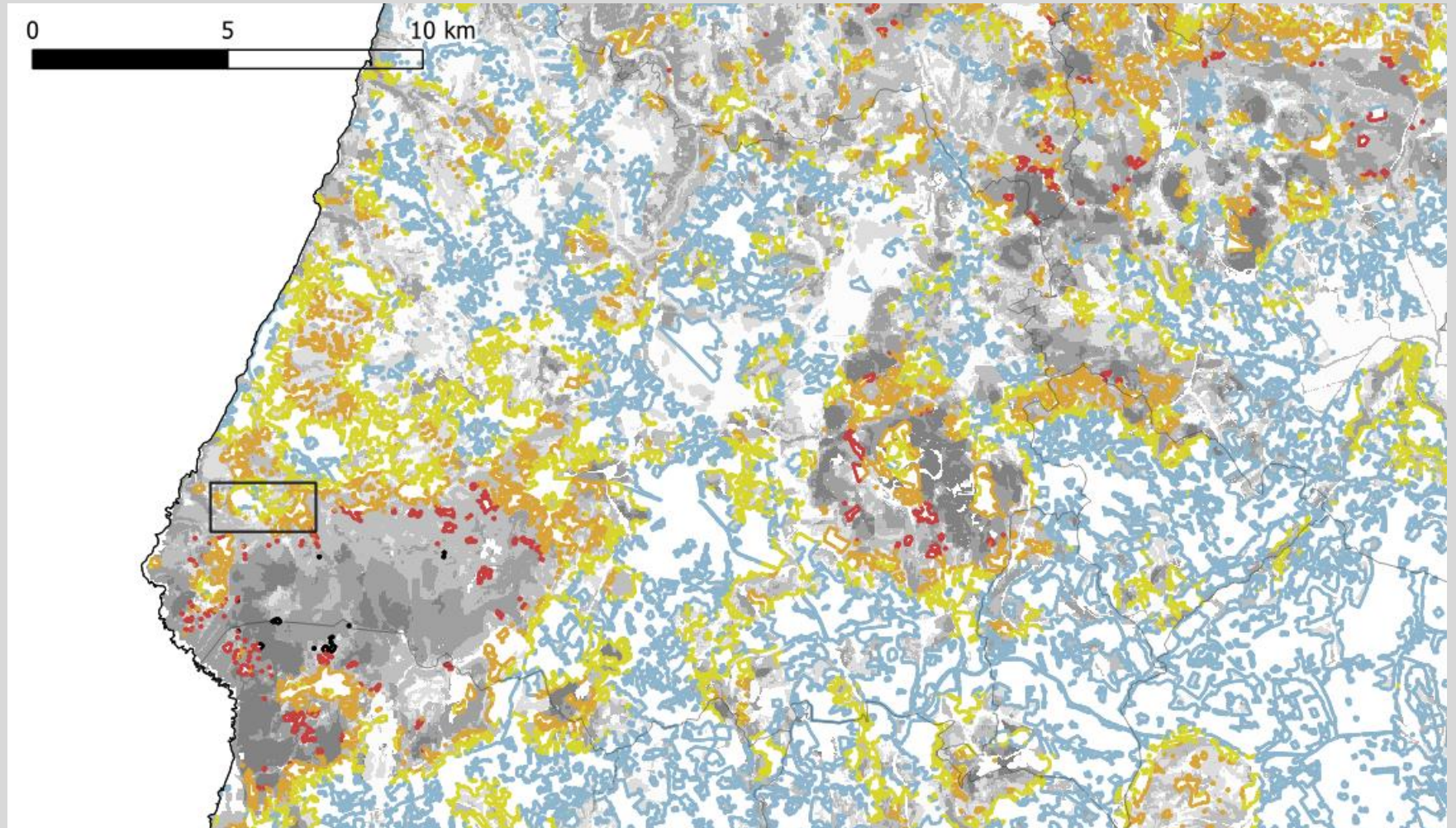


METHODOLOGY: HAZARD ASSESSMENT TO PRIORITIZE AND MONITOR PREVENTION

HAZARD

1. Direct fire hazard (500m)
2. Local fire hazard (5km)
3. Regional hazard (20km)

$$\text{Hazard} = \text{Direct hazard } 500\text{m} + \text{Direct hazard } 500\text{m} \times \left[\text{Local hazard } 5 \text{ km} + \text{Regional hazard } 20 \text{ km} \right]$$



WUI hazard



Wildland fire hazard



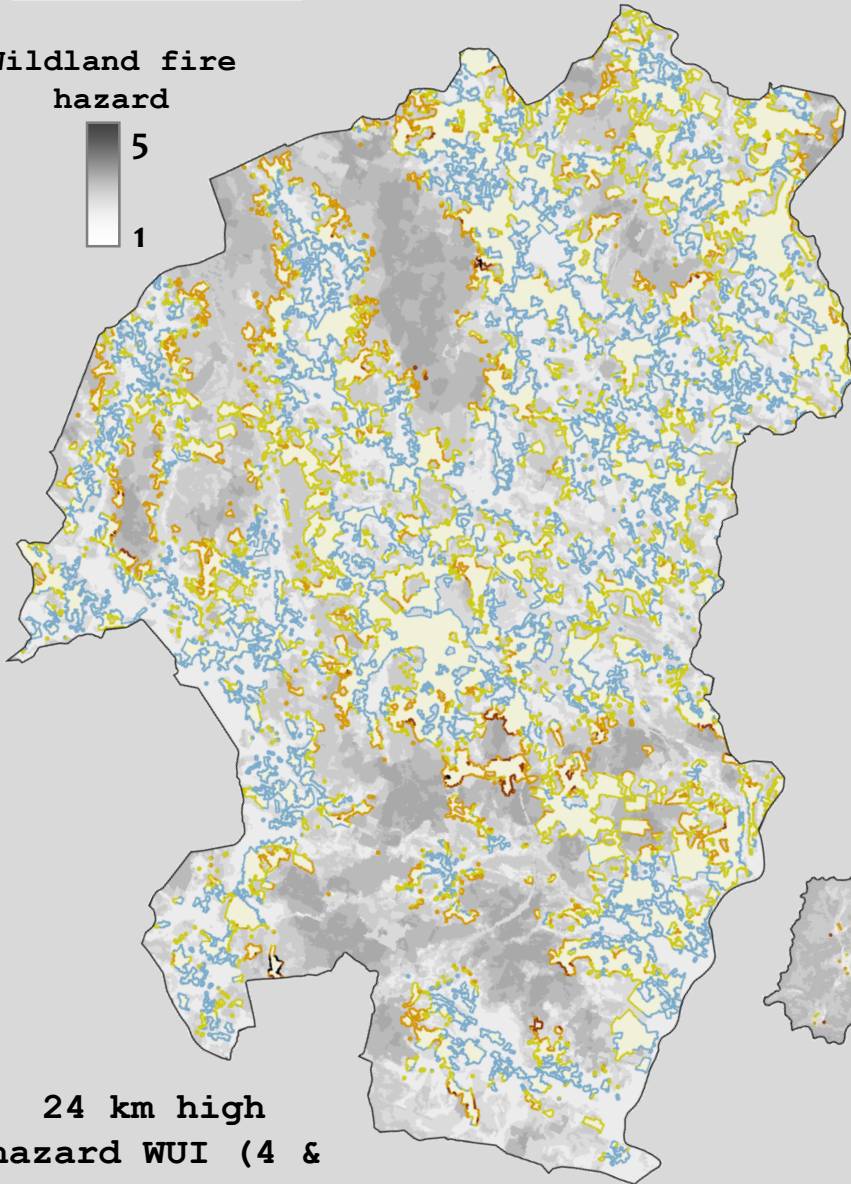
EVALUATION OF DIFFERENT TERRITORIAL

REALITIES

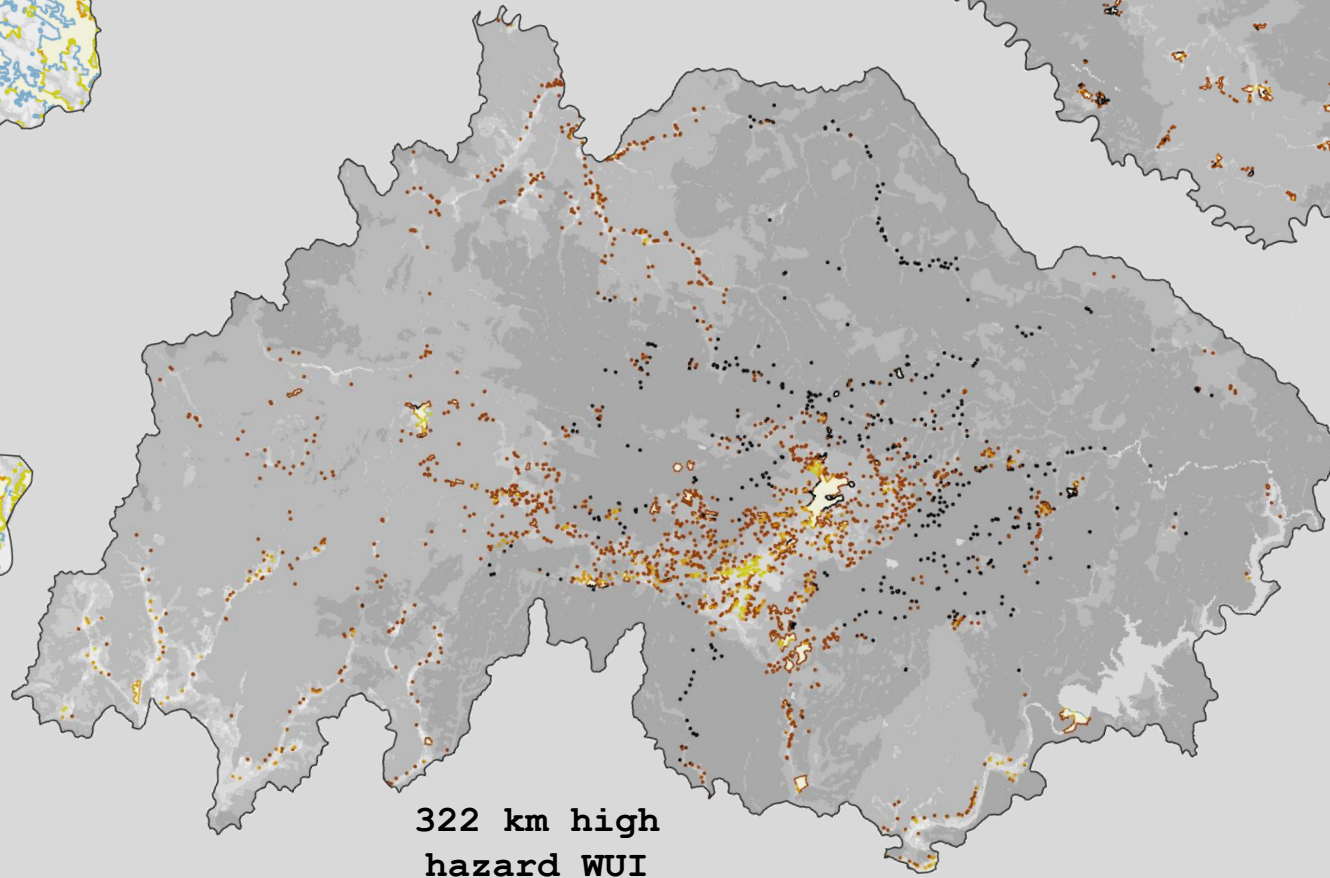
WUI



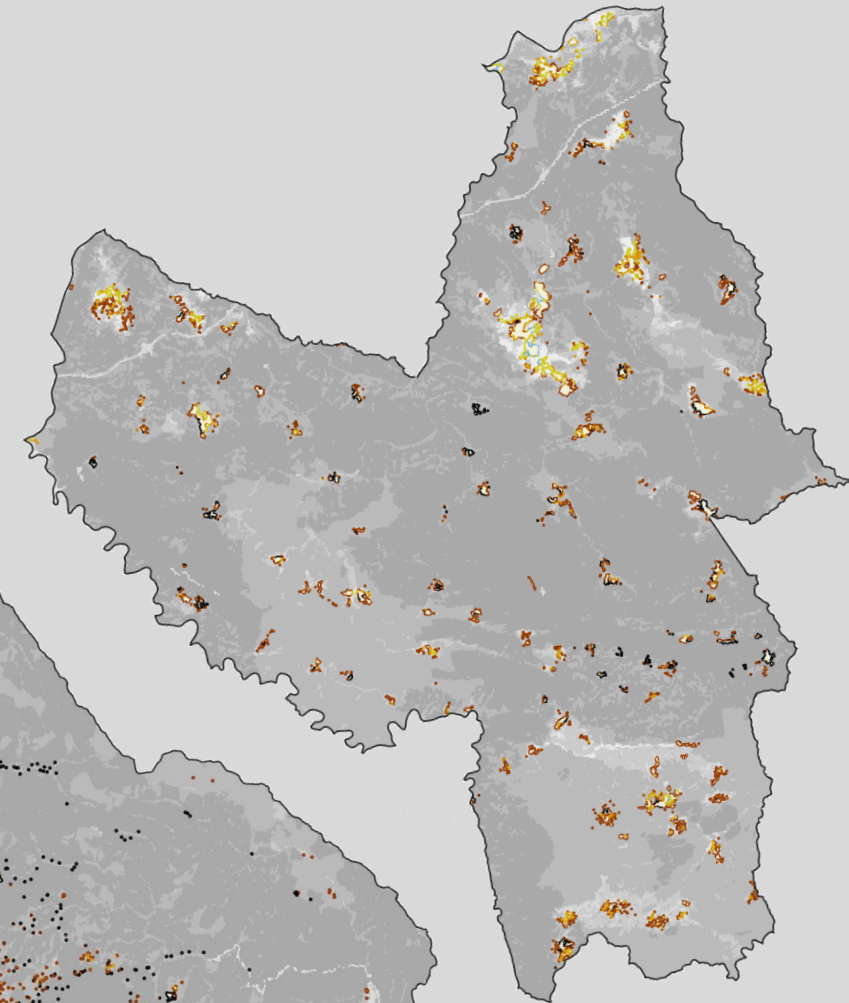
Wildland fire hazard



24 km high hazard WUI (4 & 5)



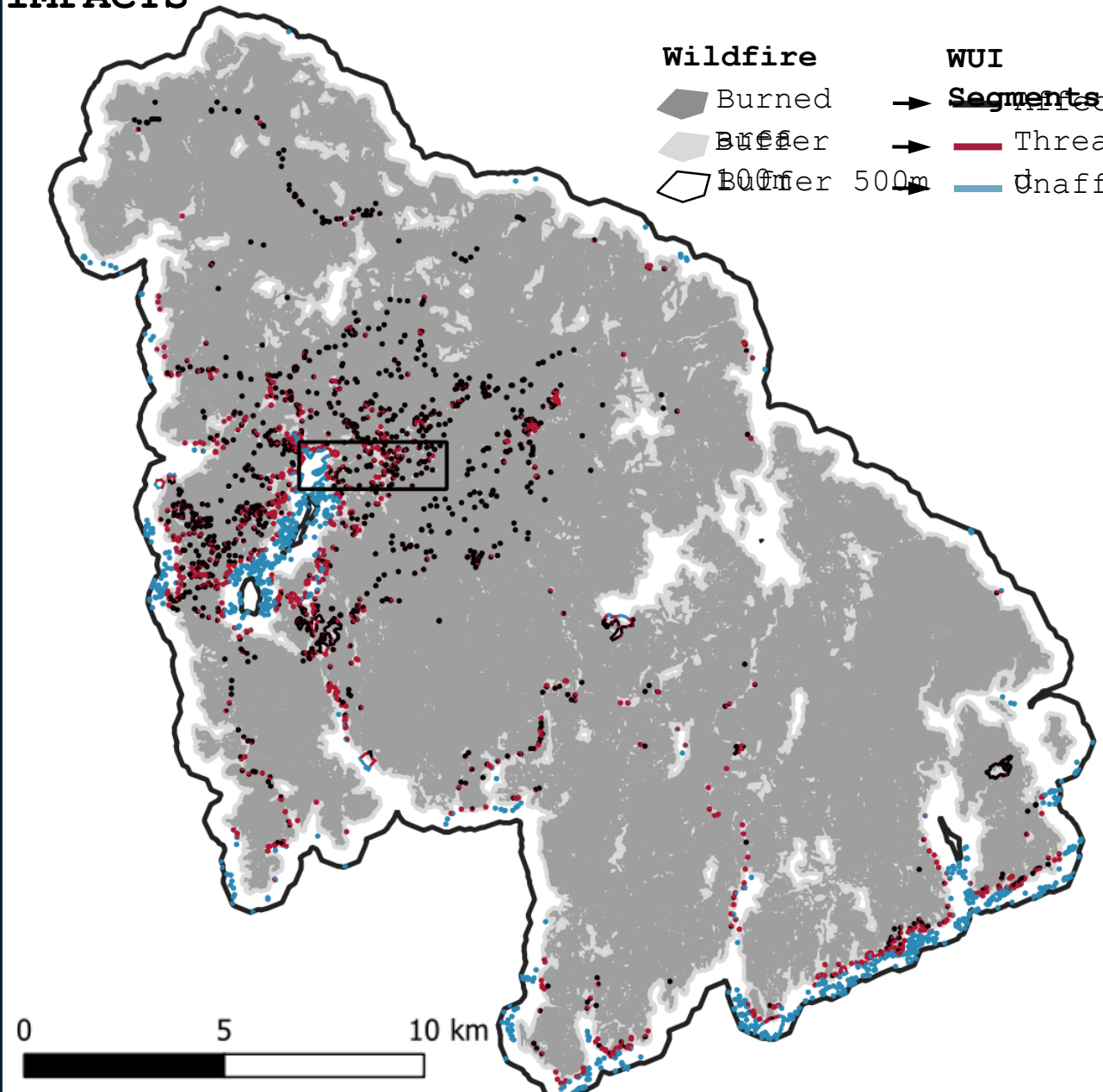
322 km high hazard WUI



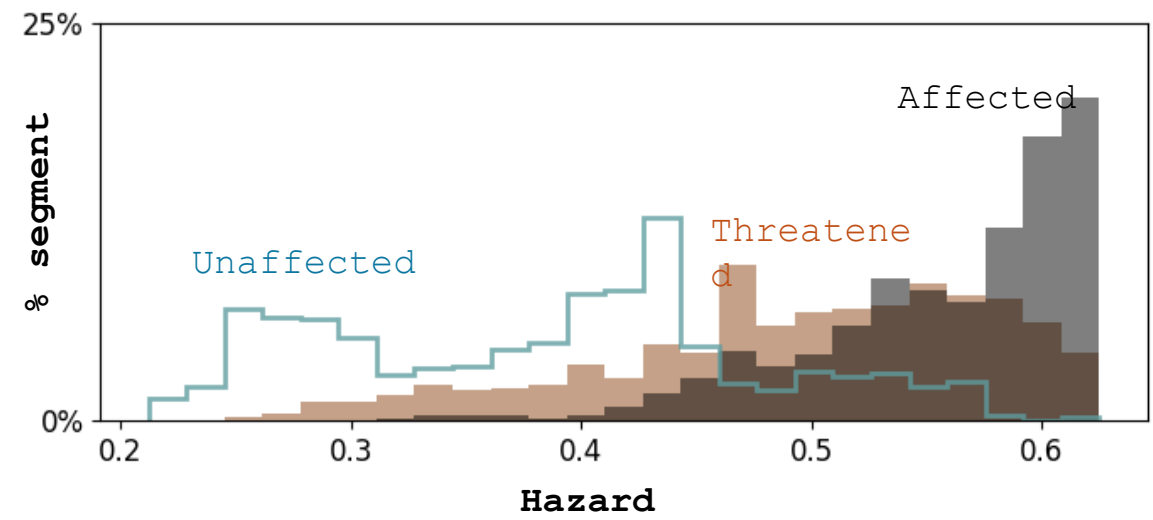
96 km high hazard WUI

EVALUATION OF HISTORICAL FIRE IMPACTS

IMPACTS



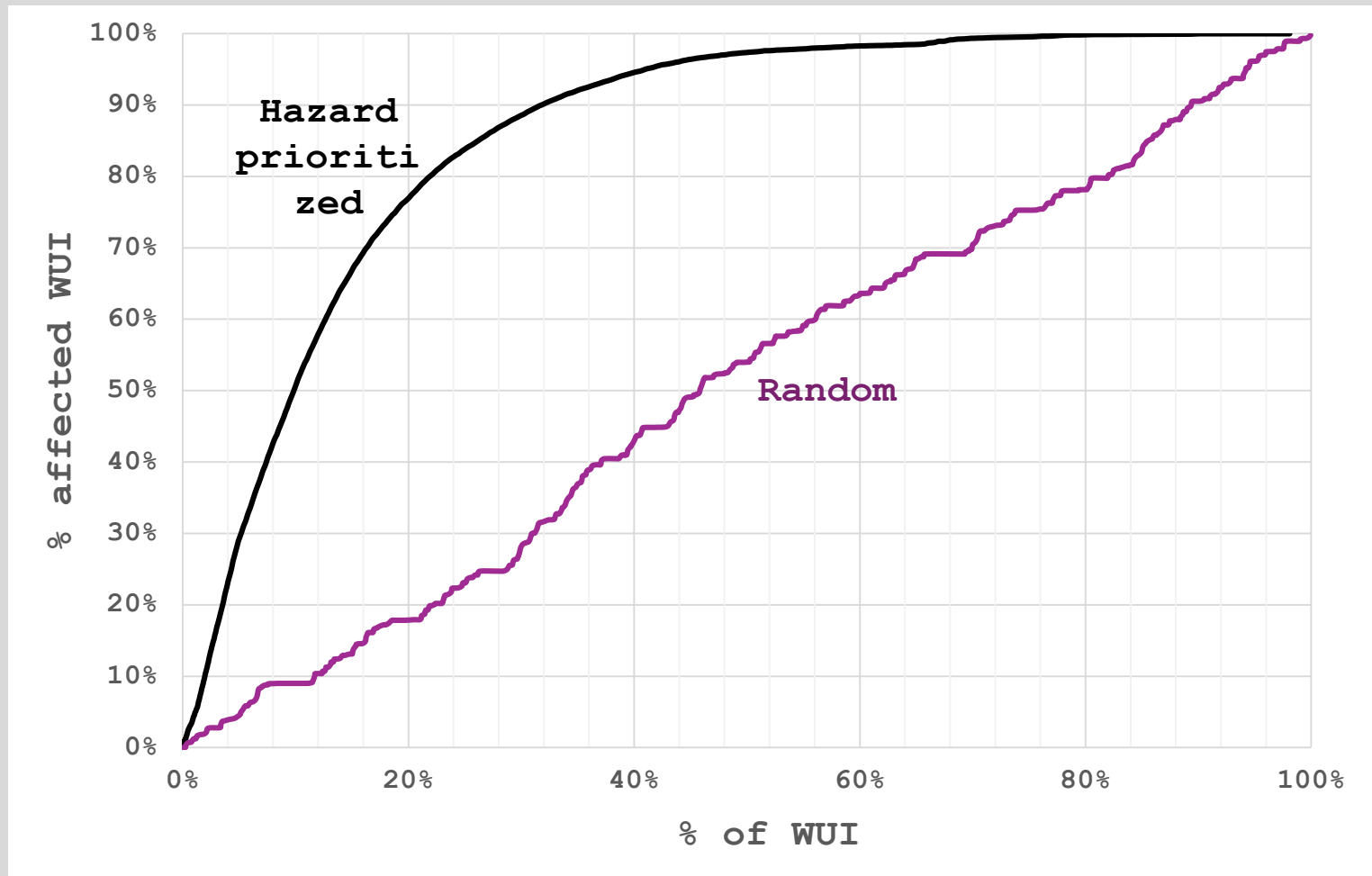
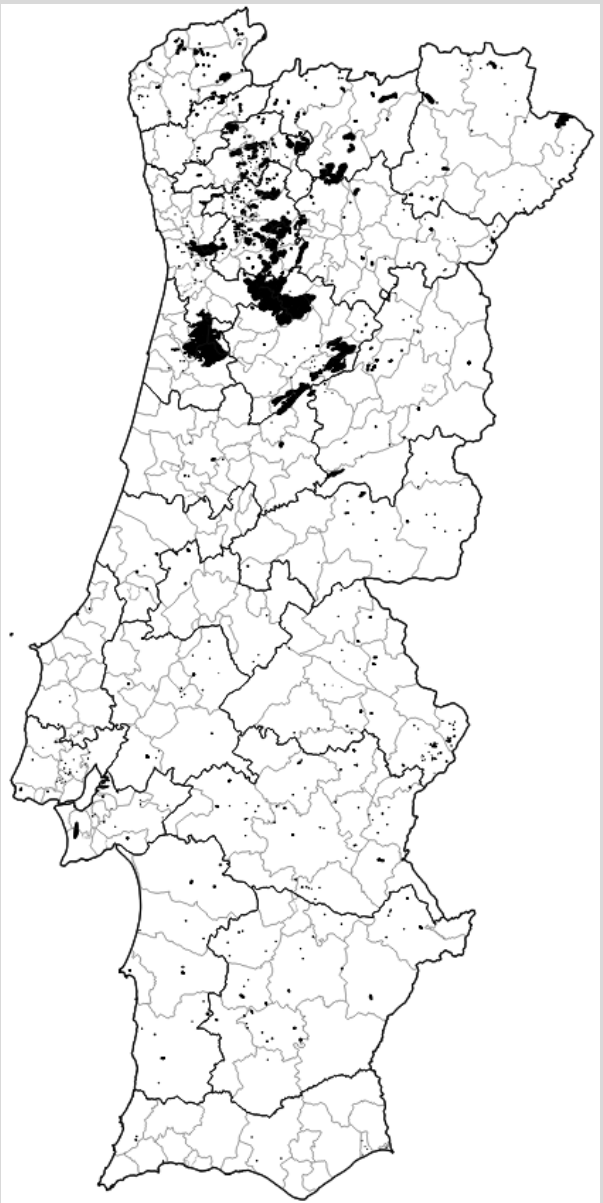
- | | |
|-----------------|---------------------|
| Wildfire | WUI |
| Burned | Segments |
| Buffer | Threatened |
| Buffer 500m | Unaffected |



EVALUATION OF HISTORICAL FIRE

IMPACTS

WILDFIRE OF 15-18TH SEPTEMBER 2024



THOUGHTS & PERSPECTIVES

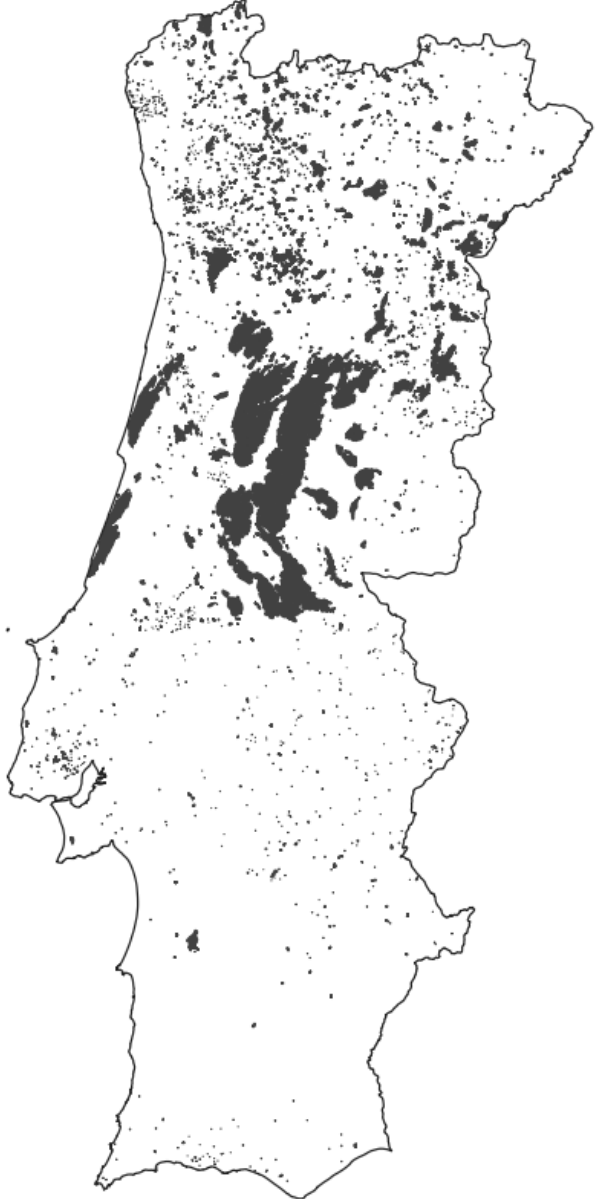
- Advantages of this type of risk assessment:
 - Straightforward implementation to swiftly address a critical gap of the fire management plan.
 - Intelligible, based on tangible territorial variables users can relate with, and
 - Explicit: promotes better knowledge of risk components to support effective risk management.
 - Applicable to a wide range of operational needs: prevention, suppression, evacuation.
 - Enables monitoring of spatio-temporal WUI risk dynamics.
 - Perspectives:
 - Implementation across governance levels.
 - Overcome institutional challenges to update planning and operational processes.
 - Methodological improvement - vulnerability, vegetation indices, refine WUI delineation, evaluation analysis.
- Obrigado !

BACKUP SLIDES

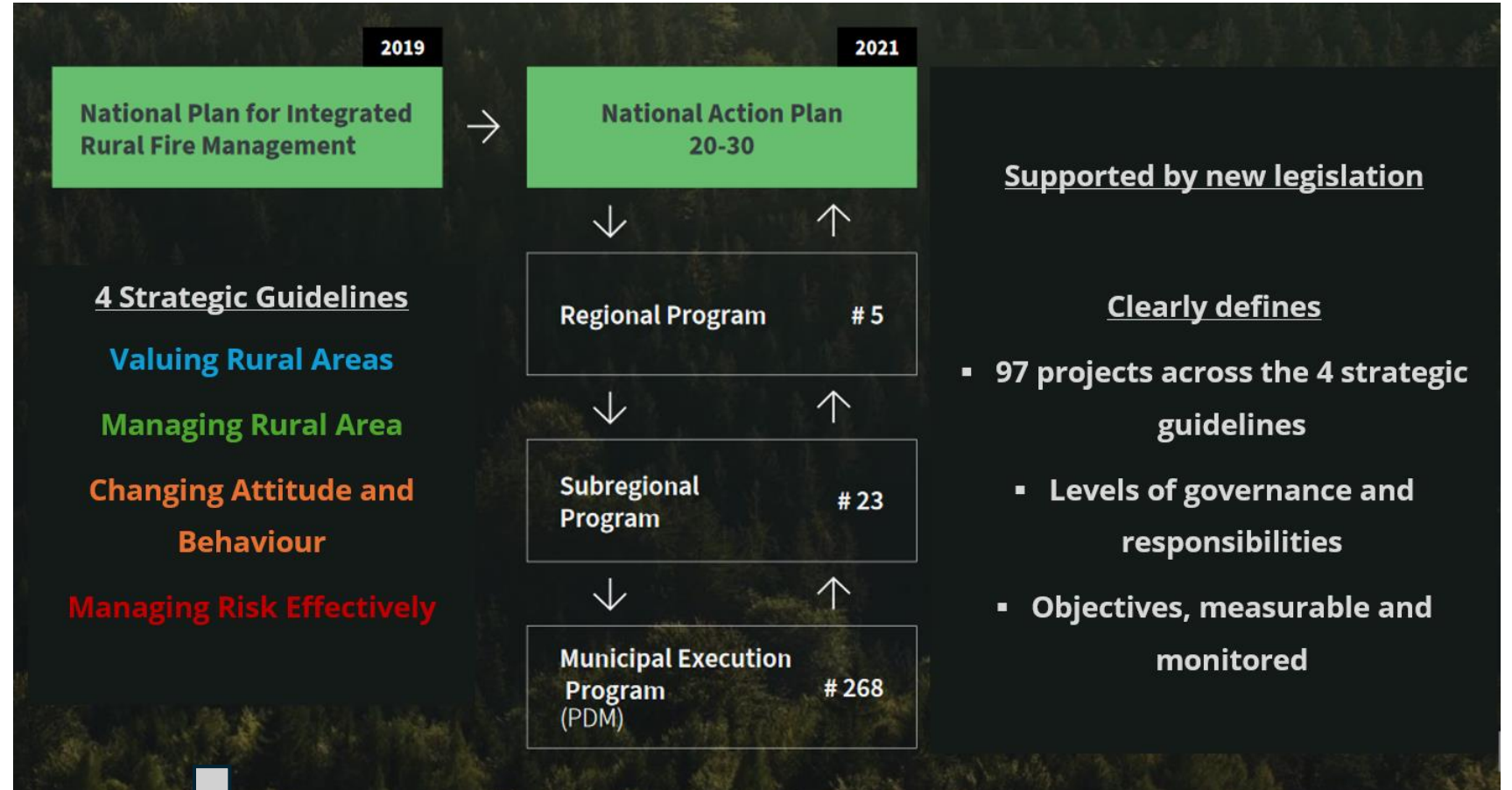
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