

Rural-Urban interfaces and improvement of forest fire prevention and preparedness

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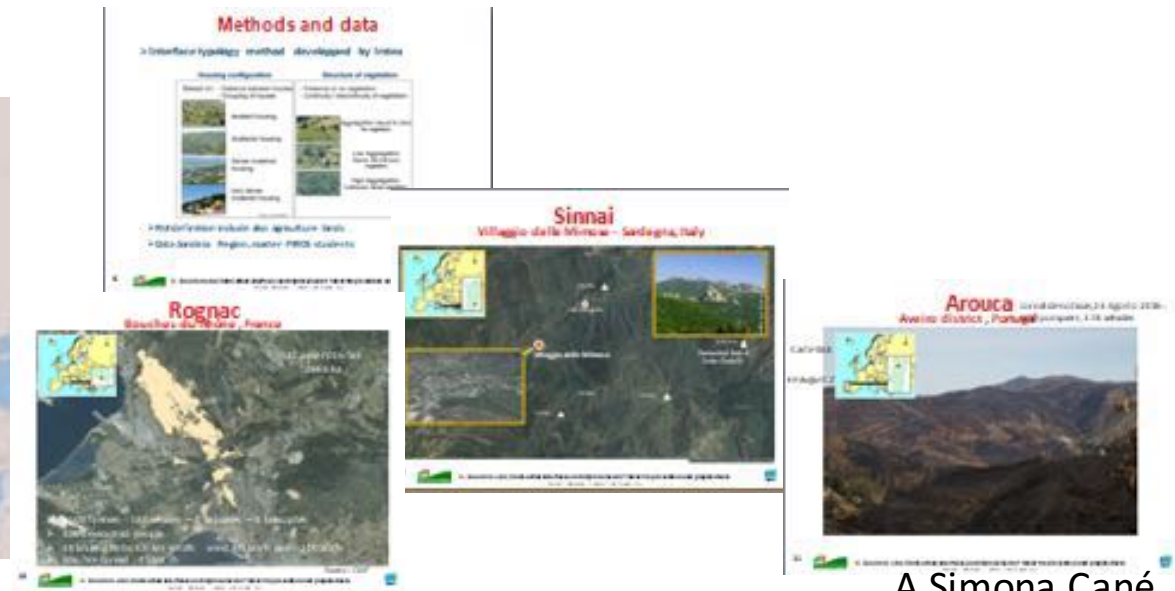
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(h) Université de Lille



Summary

- Using RUI method and software
- Research results and applications
- Study cases in Italy, France and Portugal
- Questions, lacks, problems and propositions



A Simona Cané

RUI : a key role

- **RUI mapping** : to improve knowledge of the territory
 - - Location of human vulnerabilities
 - - To make actions for prevention
 - - To prepare people, stakeholders and firefighters
 - - To deliver easy-to-use information

Methods and data

Irstea method : WUI definition

WUI is defined within a maximum radius of 100 metres around every house located in a distance inferior to 200 metres from forests .










Source :C. Bouillon / IRSTEA

In this space 50m brush clearing is mandatory by French law













➤ **The RUI definition include also agriculture and others natural areas**

Methods and data

➤ Interface typology method developed by Irstea

Housing configuration		Structure of vegetation	
Based on : - Distance between houses - Grouping of houses		- Presence or no vegetation - Continuity / discontinuity of vegetation	
	Isolated housing		Aggregation equal to zero No vegetation
	Scattered housing		Low Aggregation Some discontinuous vegetation
	Dense clustered housing		High Aggregation Continuous, dense vegetation
	Very dense clustered housing		

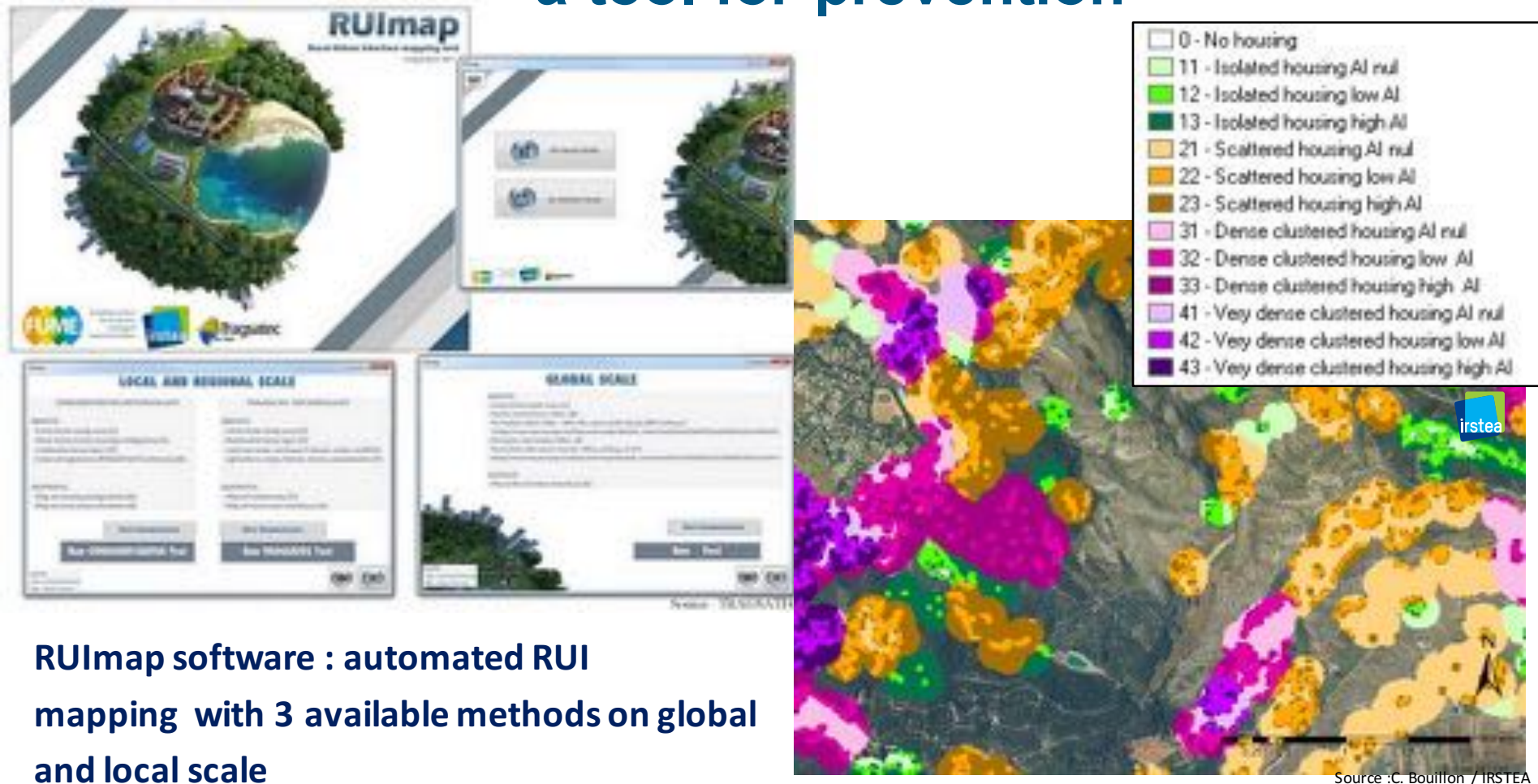
Source :C. Lampin-Maillet / IRSTEA

Rural Urban Interface typology		Vegetation Structure		
		No vegetation in contact	Discontinuous vegetation	Continuous vegetation
Isolated housing				
Scattered housing				
Dense clustered housing				
Very dense clustered housing				

Source :C. Lampin-Maillet / IRSTEA

Methods and data

RUI mapping method and software: a tool for prevention



RUImap software : automated RUI mapping with 3 available methods on global and local scale

Irstea local scale method RUI map sample

Source : C. Bouillon / IRSTEA

Methods and data

Location of houses in the RUI

Isolated



Scattered



Dense



Very dense



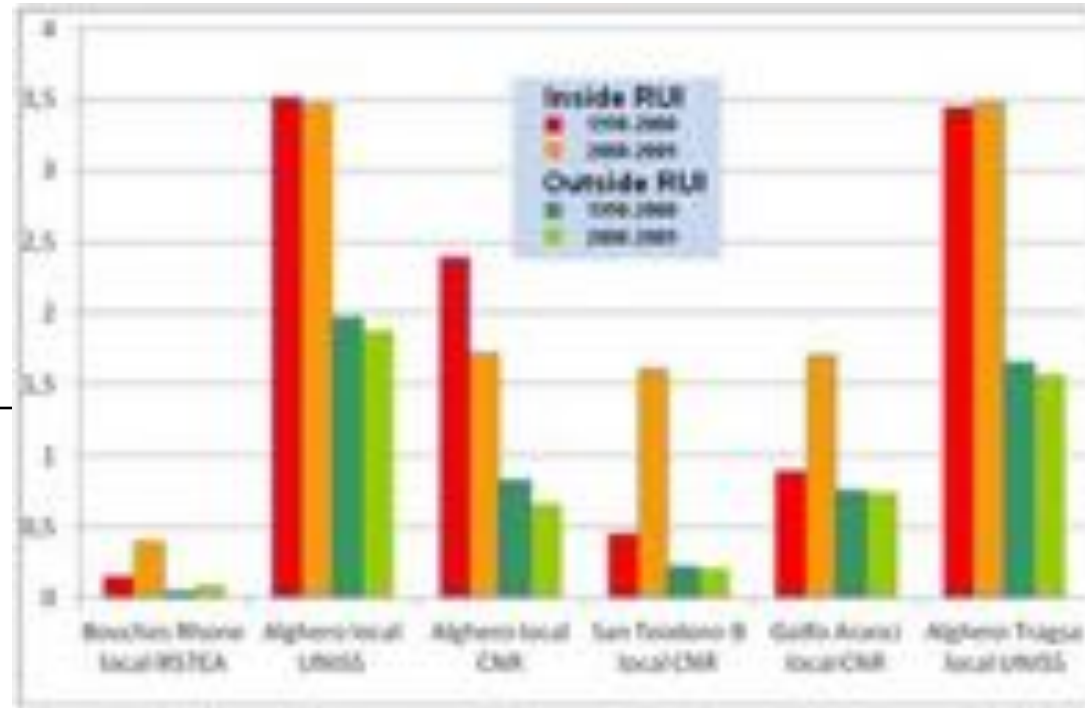
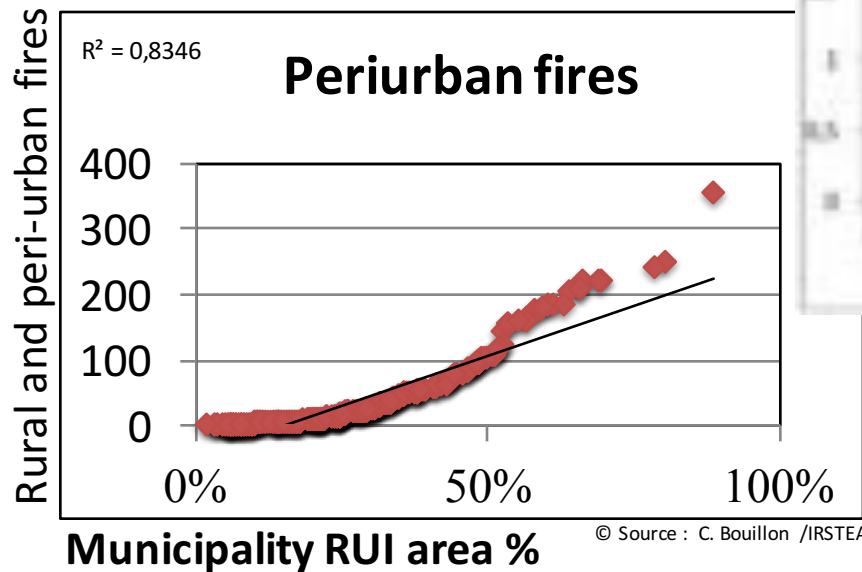
- 0 - No housing
- 11 - Isolated housing AI nul
- 12 - Isolated housing low AI
- 13 - Isolated housing high AI
- 21 - Scattered housing AI nul
- 22 - Scattered housing low AI
- 23 - Scattered housing high AI
- 31 - Dense clustered housing AI nul
- 32 - Dense clustered housing low AI
- 33 - Dense clustered housing high AI
- 41 - Very dense clustered housing AI nul
- 42 - Very dense clustered housing low AI
- 43 - Very dense clustered housing high AI

© Photos : C. Bouillon

RUI and fires

High density of fire ignition in Rui

RUI area is still growing in all mediterranean regions, with about an annual rate from 2% to 5%



© Source : FUME/ C. Bouillon /IRSTEA

- Ignition per km² greater in Rui

Managing the territory

Uses of RUI maps

Improve knowledge of the territory : RUI location, distribution and vulnerability

On a local scale..

Pixel 2,5m



© Source : C. Bouillon / IRSTEA

On a global scale

Pixel 100 m



© Source : UNISS

Managing the territory



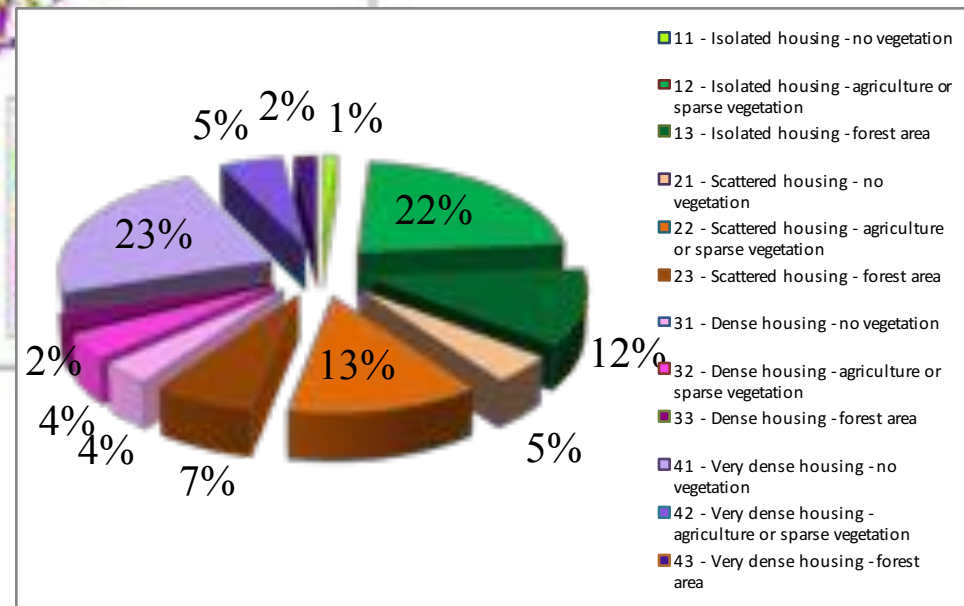
© Source : K Djazouli / C. Bouillon /IRSTEA

Isolated : 35%
Scattered : 25%
Dense : 10%
Very dense : 30%

Importance of RUI

Département de l'Hérault -
France

**RUI area : 146600 ha
(23% of total area)**



© Source : K Djazouli / C. Bouillon /IRSTEA

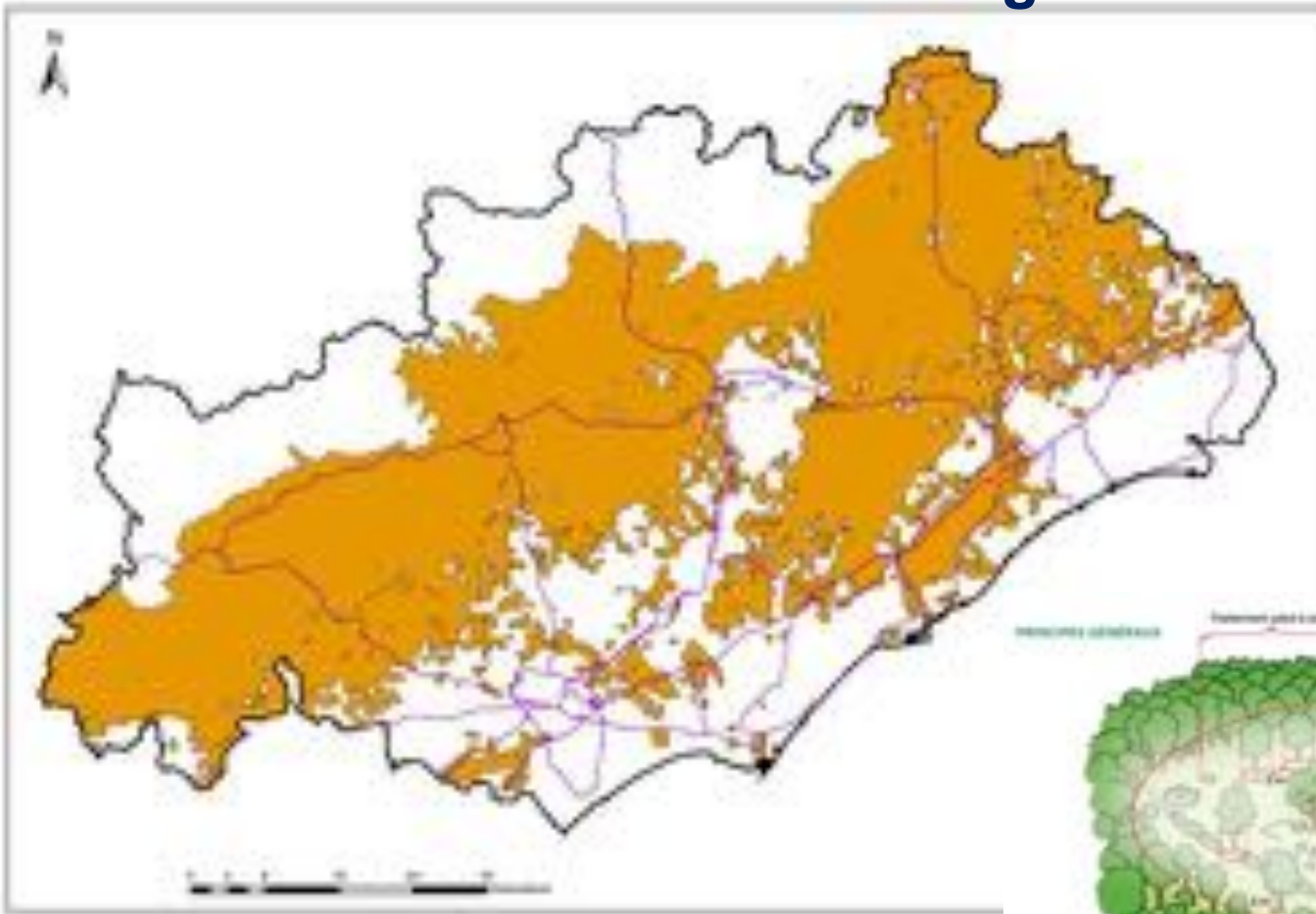
Managing the territory

Brush clearing zone

Brush clearing around
buildings : 50m radius

Mandatory by law

Integrated in the
planning documents



© Source : K Djazouli / C. Bouillon /IRSTEA

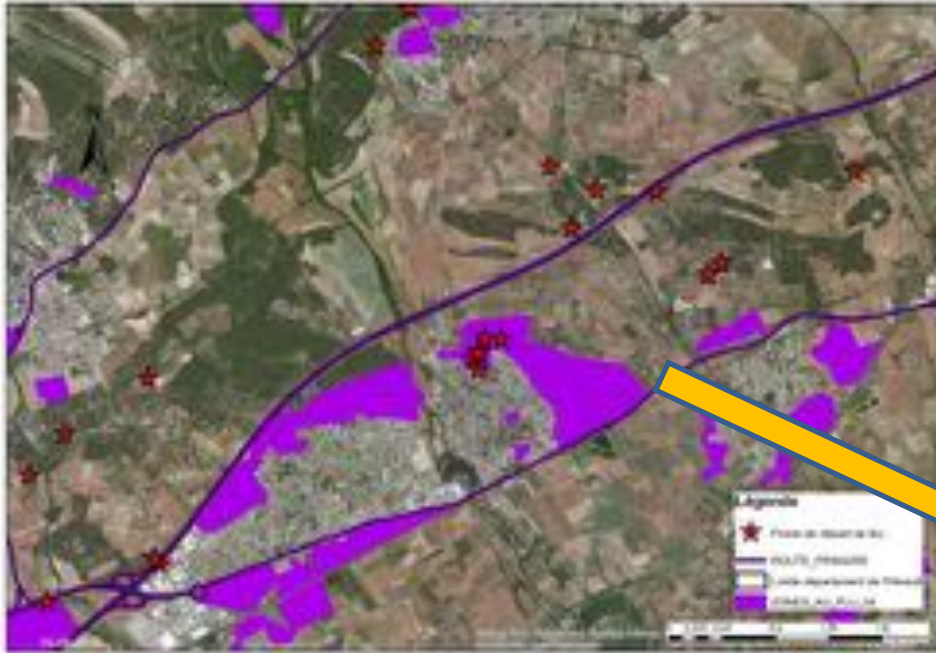
Brush clearing is regulated in 32 départements of south of France
régions Nouvelle Aquitaine, Corse, Occitanie, Provence, plus Ardèche
and Drôme.



Source : SETEC

Managing the territory

Impact of land planning policies



Creation of a new fire prone area : case of AU zoning



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community; Sources: Esri, DeLorme, USGS, NPS

Managing the territory

Land planning and risk

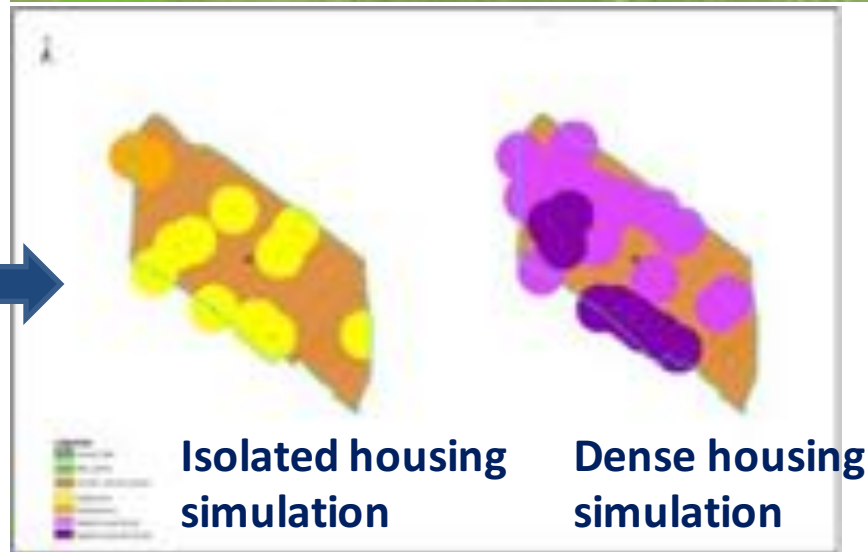
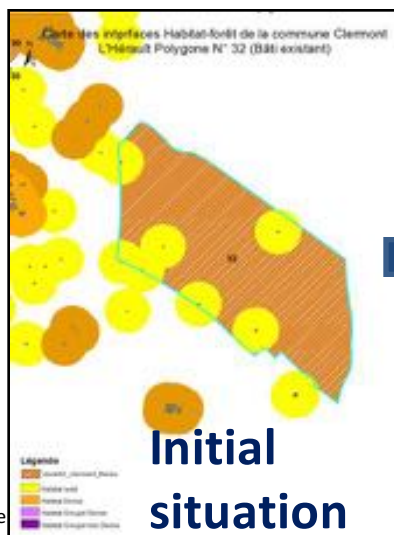
Commune de Brissac (Hérault)



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community; Sources: Esri, DeLorme, USGS, NPS

**Decision
support
tool
Consequences
of zoning
changes on RUI**

© Source : Adélie



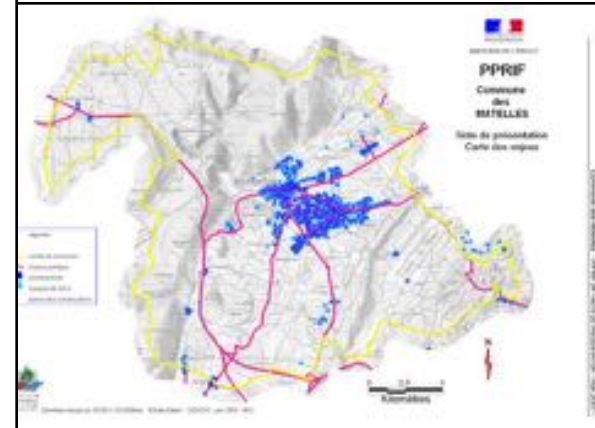
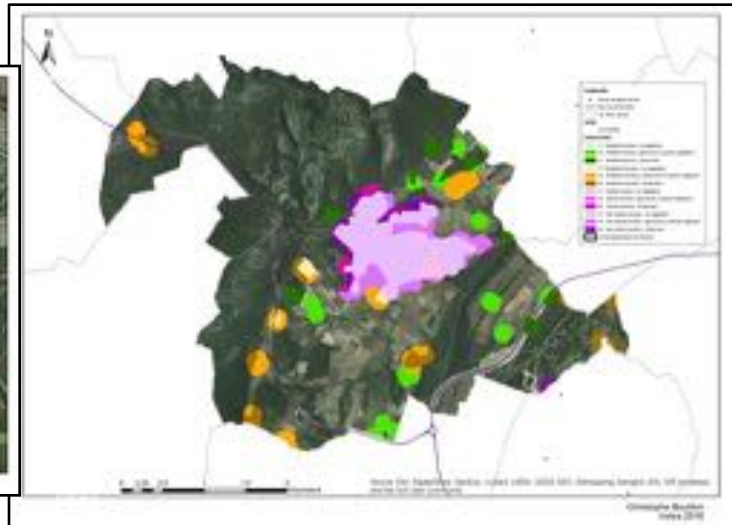
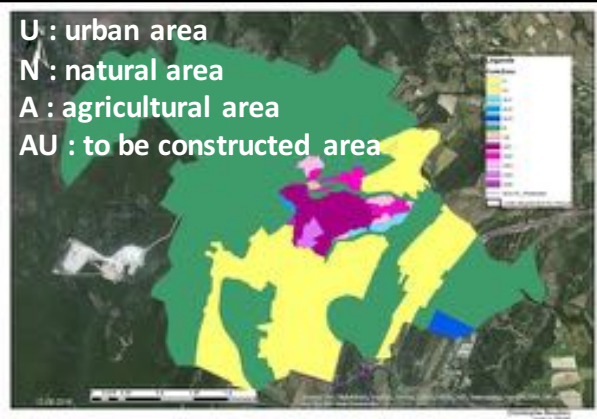
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C. Bouillon et al, Rural-urban interfaces and improvement of forest fire prevention and preparedness

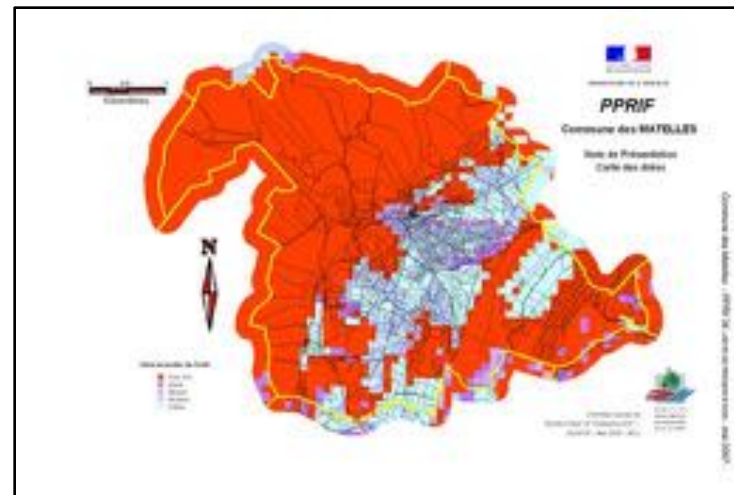
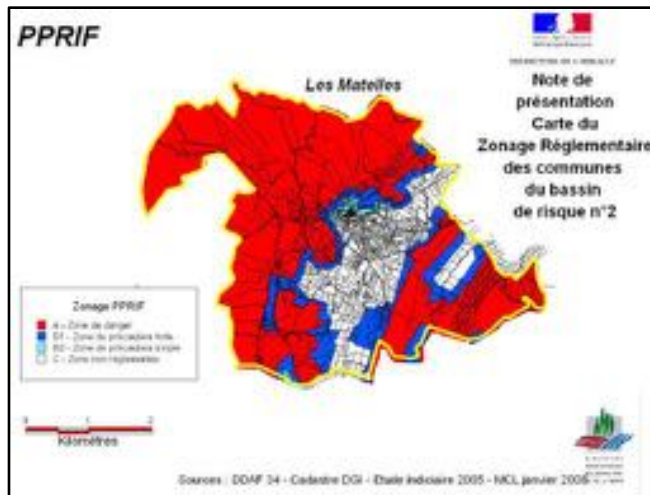
AF3 CNVV workshop - Rome, Italy 22 june, 2017

Managing the territory

Prevention and risk managing



Municipality Les Matelles – RUI and issue map



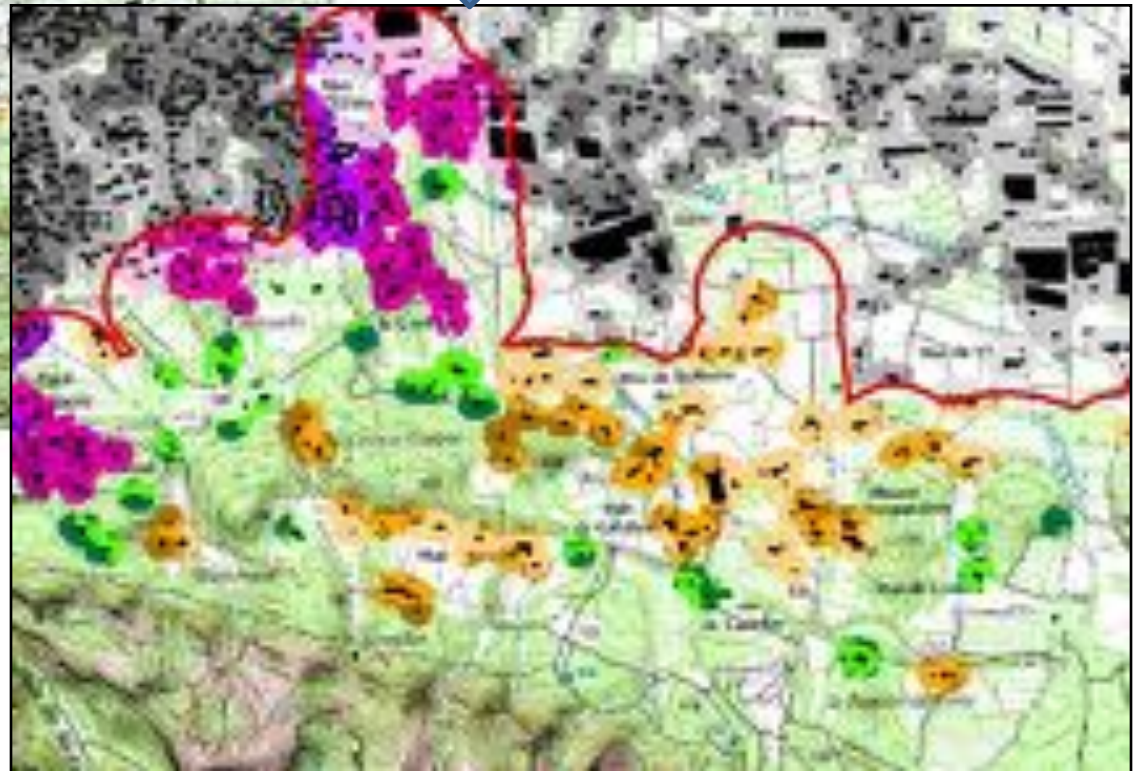
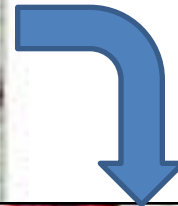
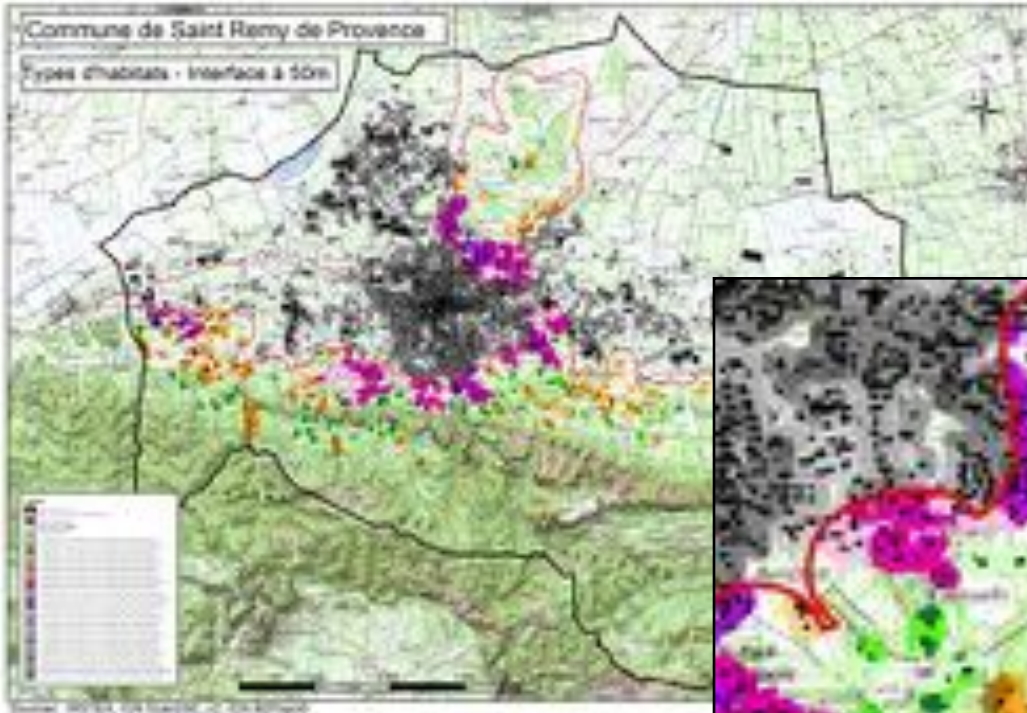
C. Bouillon et al, Rural-urban interfaces and improvement of forest fire prevention and preparedness

AF3 CNVV workshop - Rome, Italy 22 June, 2017

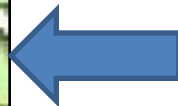
Managing the territory

Prevention and brush clearing control

ST Remy-de-Provence municipality



© Source : C. Bouillon / IRSTEA/ IGN Scan25 © IGN BDTopo ©



Managing the territory

RUI map on building level

vegetation

- estimation of fire propagation
- brush clearing control



Managing the territory

Advising the homeowners : home and surroundings

**Vegetation, burnable
elements , materials...**



mpin
Bouillon / C Lampin /



Managing the territory

Advising the stakeholders, firefighters

Prevention and equipment in the RUI, accessibility; hydrants

Brush clearing,
fuel breaks



Access



Water availability



Managing the territory

Advising the stakeholders, firefighters



Brush clearing as
major
prevention role
even along
urban area

Re open agriculture zones as
fuel breaks



© Photo : C. Bouillon

Study cases

- Uses of RUI maps
- Collected information
- Questions, lacks, problems and propositions

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Villaggio delle Mimose – Sardegna, Italy



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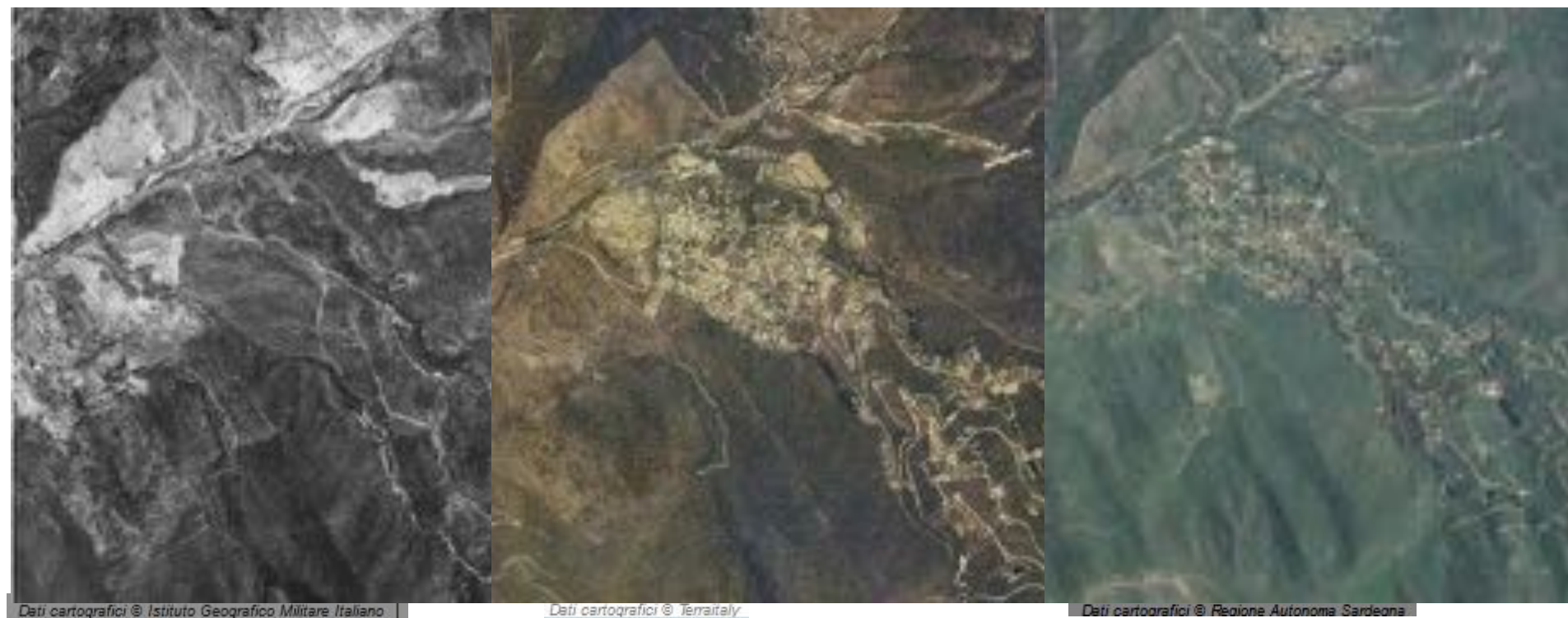
Villaggio delle Mimose – Sardegna, Italy

Land use evolution – New RUI in natural area

1954

1977

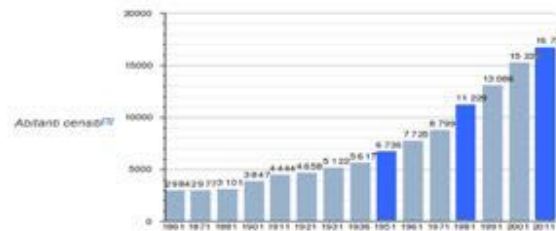
2010



Dati cartografici © Istituto Geografico Militare Italiano

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Dati cartografici © Regione Autonoma Sardegna



[Sinnai](#)

[Statistiche I.Stat - ISTAT;](#)

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Villaggio delle Mimose – Sardegna, Italy



RUI :432 ha

610 Buildings

30 isolated	5%	85 ha
200 scattered	33%	151 ha
208 dense	34%	151 ha
172 very dense	28%	45 ha

250 permanent inhabitants

In winter.

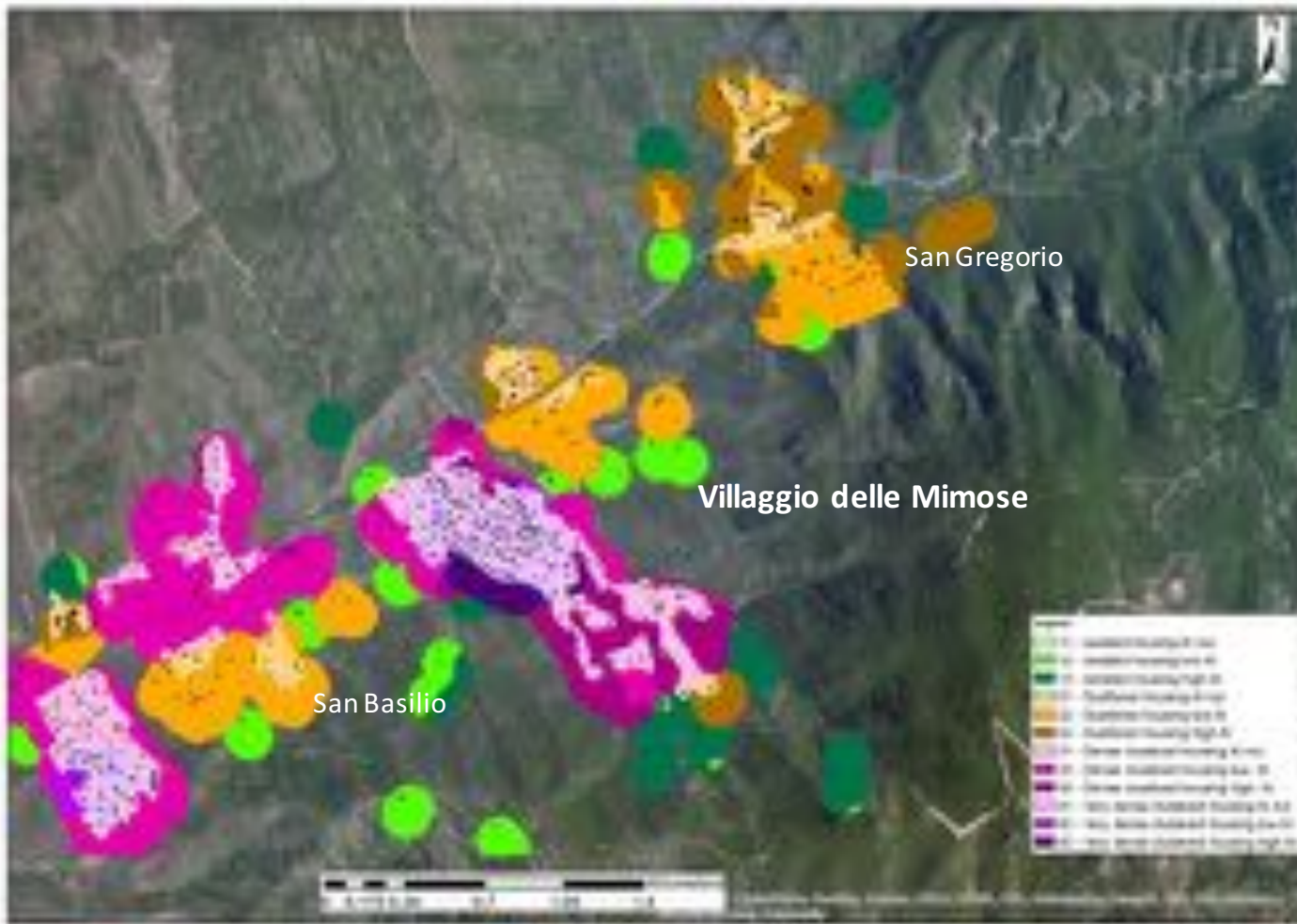
Up to 800 in summer



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Villaggio delle Mimose – Sardegna, Italy

RUI map



Housing types

Isolated

20% 85 ha

Scattered

35% 151 ha

Dense

35% 151 ha

Very dense

10% 45 ha

Vegetation AI

High AI 28%

Low AI 47 %

AI nul 25%

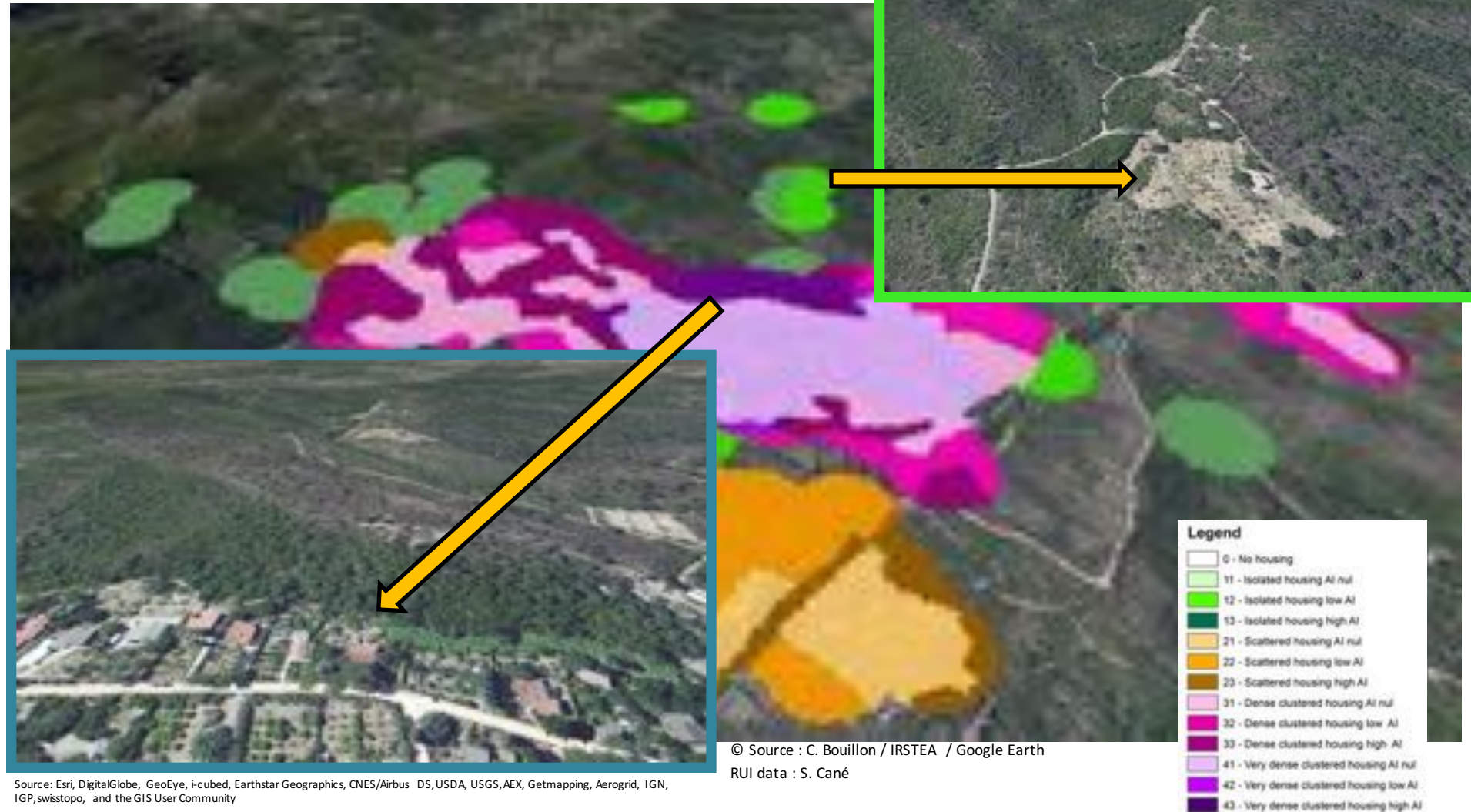
Study zone 1664 ha

RUI zone 432 ha

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Villaggio delle Mimose – Sardegna, Italy

RUI map detail and situation



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Villaggio delle Mimose – Sardegna, Italy

The 07/08/2013 fire

Facts

415 ha (126 ha + 289 ha)

Inversion of wind from
Scirocco (SE) to Maestrale
(NO)

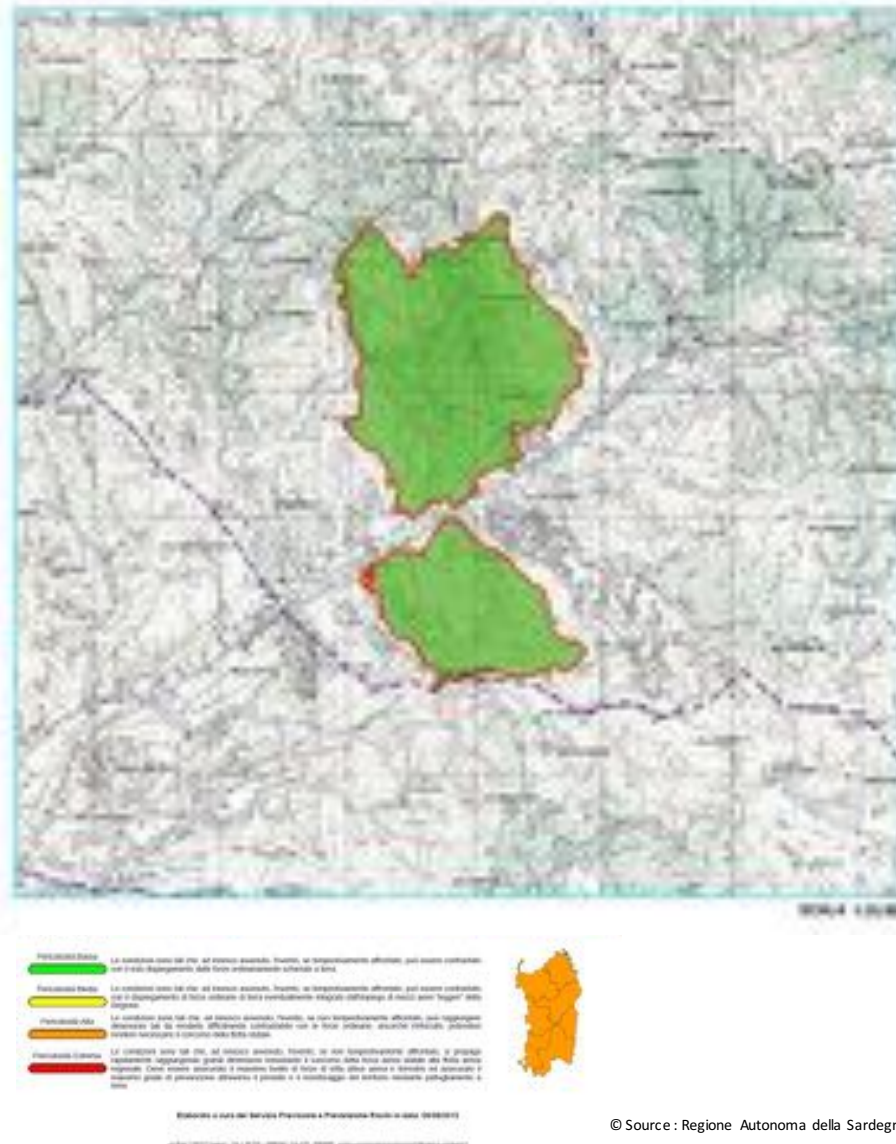
Wind max= 51,5 km/h

Temp max 37,5°C

Relative humidity = 11%

2005-2015 9 fires 431 ha

612 buildings in area
26 inside fire perimeter



© Source : Regione Autonoma della Sardegna

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Villaggio delle Mimose – Sardegna, Italy

The 07/08/2013 fire

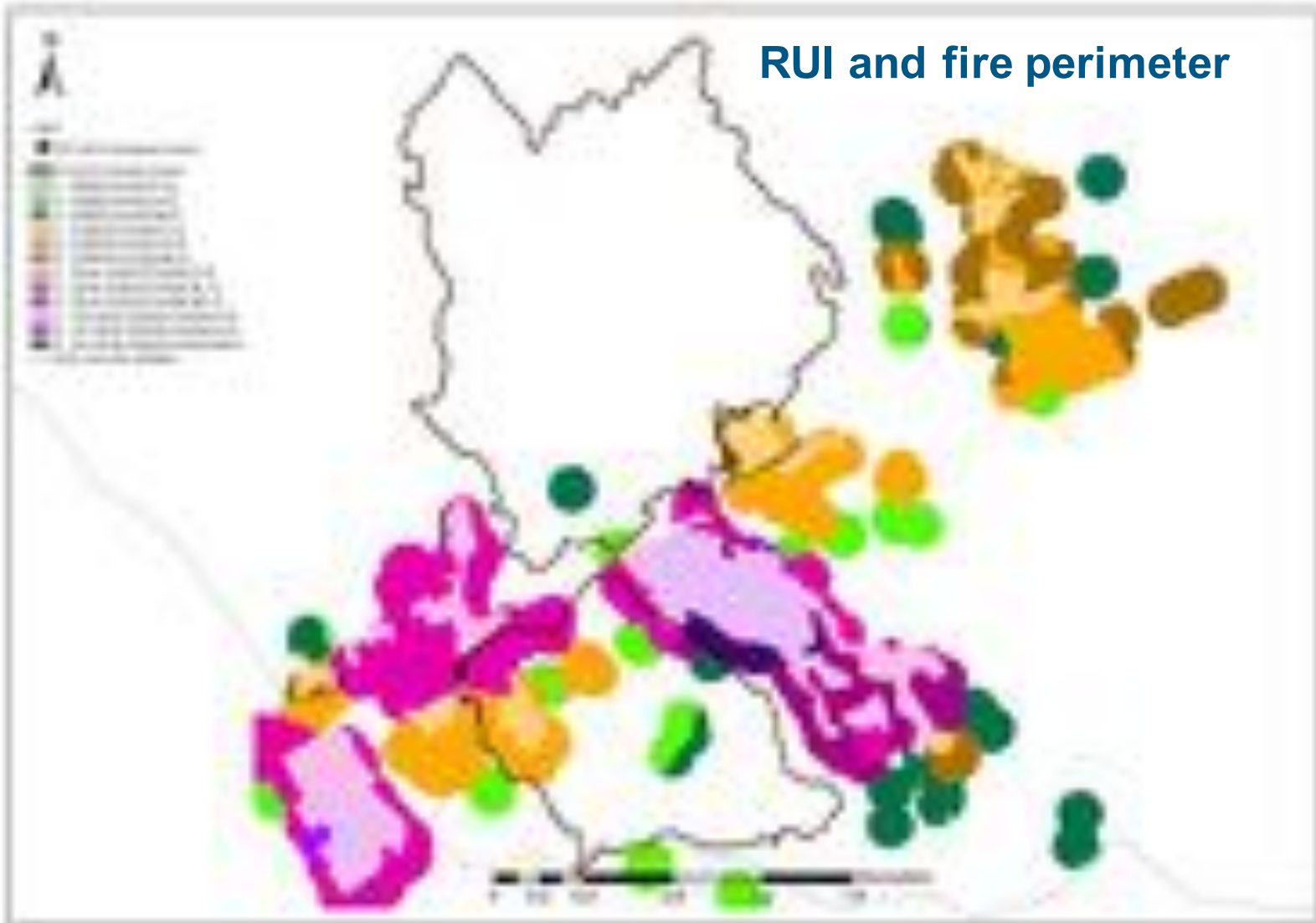


Photos : S. Cané / YouTube /

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Villaggio delle Mimose – Sardegna, Italy

RUI and fire perimeter



© Source : Regione Autonoma della Sardegna /S.Cané/ C. Bouillon / IRSTEA

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Villaggio delle Mimose – Sardegna, Italy



© Source : Google Earth

- Agriculture land on the western part of the settlement play a protection role of fuel break.
- No fuel break around all the settlements.
- Some lacks of brush clearing in private properties
- Vegetation Inside RUI area connected with large dense vegetation of the natural land.

- Possible propagation to a large wilderness area (20 000ha) with high quality ecosystems (Domanial forest of Sette Fratelli 9000 ha)
- One exit street
- Tracks in the surrounded wildland to be improved



© Source : Google Earth



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Arouca

Aveiro district, Portugal



07/08/2016 30 000 ha

600 firefighters, 178 vehicles

© Source : Jornal de noticias,13 Agosto 2016, photo : C.Bouillon

© Source : Regione Autonoma della Sardegna /S.Cané/ C. Bouillon / IRSTEA

Arouca

Aveiro district, Portugal



© Source : photos : C. Bouillon / IRSTEA

Arouca

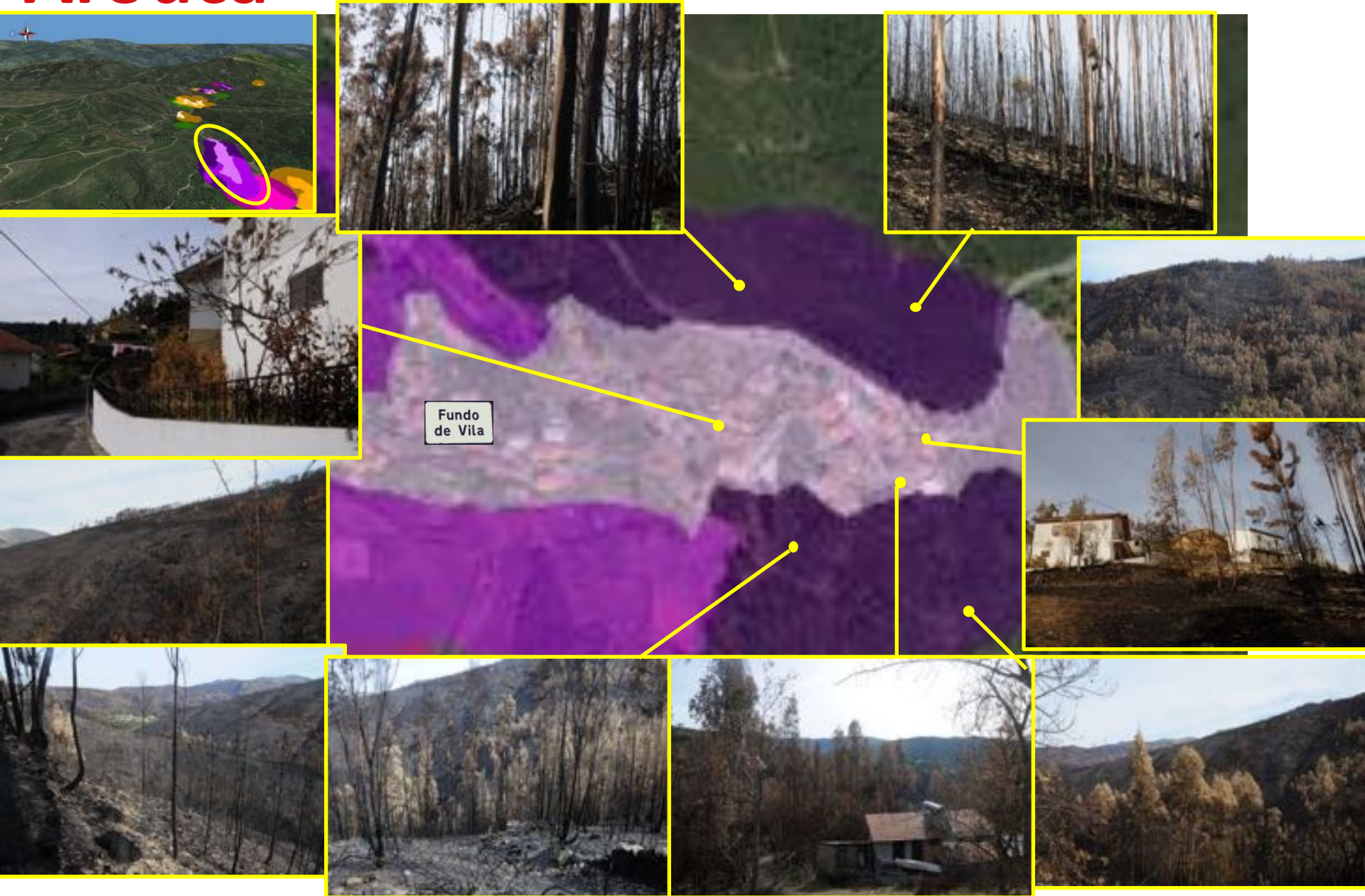
Aveiro district, Portugal

RUI in the fire perimeter



© Source : photos C. Bouillon / IRSTEA-Data Universidade do Porto / FIREXTR project

Arouca Aveiro district, Portugal RUI « Fundo da Vila »



Arouca

Aveiro district, Portugal



© Source : photos C. Bouillon / IRSTEA–Data Universidade do Porto / FIREXTR project

Arouca

Aveiro district, Portugal



© Source : photos C. Bouillon / IRSTEA - Data Universidade do Porto / FIREXTR project

Arouca

Aveiro district, Portugal

- On-going activities
- Interviews of inhabitants, stakeholders, firefighters.
- Research of new ways to improve resilience of the territory including people's experience, know-how, contact with researchers.
- To extend again gardens and agriculture around houses
- Prescribe burning decrease intensity and spread
- Defining improved interface map and definition adapted to Portugal

Rognac

Bouches-du-Rhône , France



10 june 2016 fire
2663 ha

- 1500 firemen - 180 vehicles – 7 airplanes – 1 helicopter
- 1000 evacuated people
- 14 km length by 3.5 km width wind :80 km/h gusts 100 km/h
- Max fire spread : 4,5km /h

© Source : C. Bouillon / IRSTEA–Data ONF

Rognac

Bouches-du-Rhône , France - RUI map



© Source : C. Bouillon / IRSTEA- IGN Bd Topo © , ONF

Rognac

Bouches-du-Rhône , France

Ignition point location

Interfaces vulnerability



© Photos : F. Guerra / Irstea

Rognac

Bouches-du-Rhône , France

10/08/2016



© Source : Go-Met.com



Source : Skyrock.com



© Source : Boris Horvat AFP



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Rognac

Bouches-du-Rhône , France

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Rognac

Bouches-du-Rhône , France

- RUI area = Increase of ignitions
- Rural and peri-urban fire increase risk of forest fire
- Planning plays role in land cover evolution in particular around urban zones increasing zones at fire risk.

Results & perspectives

✓ The main goal : Improving knowledge about RUI in area at risk

For stakeholders

- ✓ Urban planning and risk prevention
- ✓ Social analysis : living in RUI
- ✓ RUI historical dynamics
- ✓ Planning policy
- ✓ Cultural heritage
- ✓ Links with ecosystems services

For firefighters

- ✓ Quick territory access information
- ✓ Knowledge of vegetation connectivity (fire propagation)
- ✓ Access and position of buildings in RUI

To be developed

- ✓ Integration of data on people living in the area and mobility status
- ✓ Water availability (pools)

Conclusion

RUI maps : a challenge to the future and a way to collect data (People and mobility, water supply, surviving zone,...)

For

- defining and to prioritizing actions of prevention
- preparing firefighting : accessibility, defendability
- evaluating costs : brush clearing , water supply
- Improving planning and governance
- Informing and promoting the participation of residents

On going action

- **FIRE SMART TERRITORY project (Portugal) to construct a fire resilient territory.**

Thank you very much for your attention !

Grazie mille di avermi ascoltato!



Contact : christophe.bouillon@irstea.fr



Parts of the research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) FUME program (Forest Fires under Climate, Social and Economic changes in Europe, the Mediterranean and other fire-affected areas of the world) under grant agreement n°FP7-243888, MOVE program under agreement n°FP7-211590 and Sixth Framework Programme. (FP6/2002-2006) FIRE PARADOX program under contract no°FP6-018505.



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