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

Christophe Bouillon\textsuperscript{a*}, Simona Cane\textsuperscript{b}, Felicina Trebini\textsuperscript{b}, Alessandro Derudas\textsuperscript{b}, Mónica Maria Fernández Ramiro\textsuperscript{c}, Costantino Sirca\textsuperscript{bd}, Bélen Fierro García\textsuperscript{e}, Franco Casula\textsuperscript{b}, Marlène Long-Fournel\textsuperscript{a}, Grazia Pellizzaro\textsuperscript{e}, Bachisio Arca\textsuperscript{e}, Fantina Tedim\textsuperscript{f} Khalil djazouli\textsuperscript{g}, Chaimaa Ennes\textsuperscript{h}

\textsuperscript{a}Irstea, Unité de recherche Risques Ecosystèmes Vulnérabilité Environnement Résilience (RECOVER) – équipe EMR, Aix-en-Provence, France (\textsuperscript{*}) corresponding author christophe.bouillon@irstea.fr
\textsuperscript{b}Dipartimento di Scienze della Natura e del Territorio (DIPNET), University of Sassari, Italy
\textsuperscript{c}Tragsatec, Madrid, Spain
\textsuperscript{d}CMCC, Euro-Mediterranean Centre for Climate Change, IAFENT Division, Sassari
\textsuperscript{e}Institute of Biometeorology (CNR-IBIMET), Sassari, Italy
\textsuperscript{f}Faculdade de Letras, Universidade do Porto, Portugal
\textsuperscript{g}Université de Nice Sophia-Antipolis
\textsuperscript{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
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.

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**
- Based on: Distance between houses, Grouping of houses
- Examples: Isolated housing, Scattered housing, Dense clustered housing, Very dense clustered housing

**Structure of vegetation**
- Presence or no vegetation
- Continuity / discontinuity of vegetation
- Examples: Low Aggregation, Dense, discontinuous vegetation, High Aggregation, Continuous, dense vegetation

**Rural Urban Interface typology**
- Urban vegetation in contact, Discontinuous vegetation, Continuous vegetation

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

© 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%

- 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:

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

On a global scale:

- Pixel 100 m

Uses of RUI maps

- On a local scale: Pixel 2.5 m

Source: ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS user community.

© Source: C. Bouillon / IRSTEA

© Source: UNISS
Managing the territory

Importance of RUI

Département de l’Hérault - France

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

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

© 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

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

Decision support tool

Consequences of zoning changes on RUI

Initial situation

Isolated housing simulation

Dense housing simulation

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Managing the territory
Prevention and risk managing

Municipality Les Matelles – RUI and issue map
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

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Managing the territory
Advising the homeowners: home and surroundings

Vegetation, burnable elements, materials...
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
Sinnai
Villaggio delle Mimose – Sardegna, Italy
Sinnai
Villaggio delle Mimose – Sardegna, Italy

Land use evolution – New RUI in natural area

1954
1977
2010

Sinnai
Statistiche I.Stat - ISTAT
Sinnai
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
Sinnai
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
Sinnai
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

© Source: C. Bouillon / IRSTEA / Google Earth
RUI data: S. Cané
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
Sinnai
Villaggio delle Mimose – Sardegna, Italy

The 07/08/2013 fire

Photos: S. Cané / YouTube /
Sinnai
Villaggio delle Mimose – Sardegna, Italy

RUI and fire perimeter

© Source: Regione Autonoma della Sardegna / S. Cané / C. Bouillon / IRSTE
Sinnai
Villaggio delle Mimose – Sardegna, Italy

- 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 (20,000 ha) 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
© 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
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Arouca
Aveiro district, Portugal

RUI in the fire perimeter

© Source: photos C. Bouillon / IRSTEA – Data Universidade do Porto / FIREXTR project
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Arouca Aveiro district, Portugal

RUI « Fundo da Vila »
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
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: 4.5 km/h

© Source: C. Bouillon / IRSTEA – Data ONF
Ignition point location

Interfaces vulnerability

Rognac
Bouches-du-Rhône, France
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AF3 CNVV workshop - Rome, Italy 22 June, 2017
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 firefigting: 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

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