The Italian National Strategy for Adaptation to Climate Change: a focus on rural areas

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Paris, 15th June 2015

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REGIONE AUTONOMA DELLA SARDEGNA

Centro Euro-Mediterraneo sui Cambiamenti Climatici

Rural areas

There is not a univocal definition of “rural areas”

Rural generally refers to areas of **open country** and small settlements (IPCC, WGII AR5)

Ultimately rural is defined as the inverse or the **residual of urban areas** (Lerner and Eakin, 2010)

Urban and rural areas should be considered as a whole system with synergies and interconnections

Need for a link and equilibrium between cities and countryside

Rural areas

Account for:

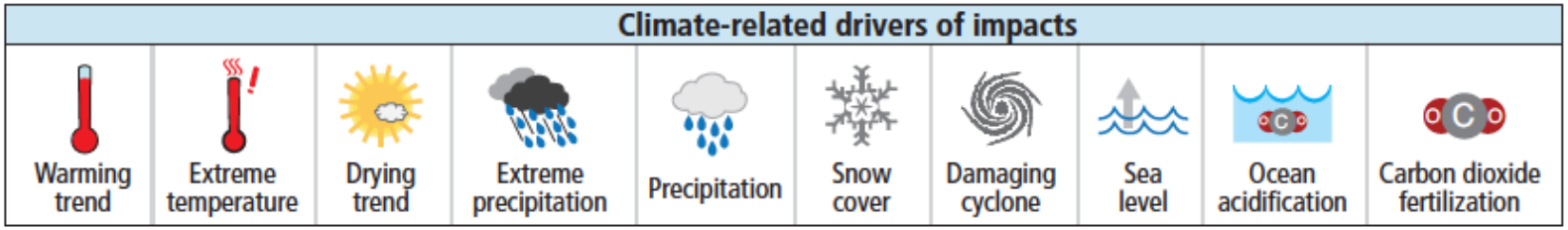
- half of the world's population (47.9%)
- 70% of the developing world's poor people

Rural areas include:

1. **Agriculture**
2. **Fisheries**
3. **Water**
4. **Livestock**
5. **Infrastructure**

Rural areas

Climatic drivers



Major risks

1. **Flooding**
2. **Decrease in water resources**
3. **Extreme events** (heat waves)

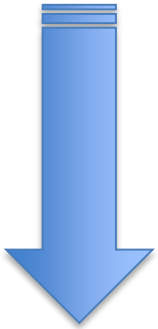
Major impacts

- Water supply
- Food security
- Agriculture incomes
- Fires

Adaptation in rural areas

Important to assess the impacts of climate change and the prospects for adaptation in such area

ADAPTATION + **MITIGATION**



1. **DISASTER RISK MANAGEMENT**
2. **INCREASE RESILIENCE**

Adaptation in rural areas

At European level, a series of options have been identified as a priority to be included into the *Rural Development Plans* (RDPs) for the programming period (2014-2020)

Three categories of options:

-land management
-physical infrastructure
-advice and training

Need to re-apply these options at **national/regional level** and determine the local priorities for climate adaptation

Adaptation in rural areas

At national level, adaptation policy is formulated in different ways:

- Broad strategies supported by individual packages of legislation focusing on different policy areas
- Specific adaptation legislation

Diversity per Country in:

Challenges to be faced

Sectors of interest for adaptation policy (e.g. water, agriculture, or forestry)

National/regional role to coordinate the implementation of adaptation measures

Italian National Strategy on Climate Change (SNAC)

Italian Ministry for the Environment, Land and Sea

Euro-Mediterranean Centre on Climate Change (CMCC)

National Strategy for Adaptation to Change Climate (SNAC)
2014

Italian National Strategy on Climate Change (SNAC)

It includes:

1. State of the art of the **scientific knowledge** on climate change impacts

2. **Vulnerability analysis** per each sector

3. Proposals for **actions** to be taken based on priority for homeland security

4. Main **deadlines** (by 2020 and more than 2050)

5. Ways of actions for the **implementation** of the climate change adaptation issues in national, regional and local sectorial plans and programs

Italian National Strategy on Climate Change (SNAC)

Objectives

1. Develop a **national vision** on how to address the impacts of climate change, including climatic variations and extreme climate events

2. Identify a set of **actions and guidelines** to address them

Outcomes

- Minimize the risks posed by climate change
- Maintain or improve the adaptability of natural, social and economic systems
- Take advantage of any opportunity deriving from new climate conditions

Italian National Strategy on Climate Change (SNAC)

Adaptation option categories:

1. ’**Grey**' options: technological and engineering solution

2. ’**Green**' options: ecosystem-based approaches that use multiple services of nature

3. ‘**Soft**' options: managerial, legal and policy approaches that aim at altering human behavior and styles of governance

Implementing a combination of these measures is an effective way to **ensure resilience**

Interconnections between sectors is essential to increase options efficiency

Italian National Strategy on Climate Change (SNAC)

Major impacts of CC in Rural Areas are due to impacts on:

- **Water resources**
- **Agriculture and Livestock**
- **Fire risk**
- Fishering and Aquaculture
- Hydrogeological risk
- Inland water ecosystems
- Coastal areas
- Tourism
- Health
- Urban settlements
- Industries
- Energy

SNAC- Water Resources

Grey	Green	Soft
Water recycle and re-use	**Improve soil water storage**	Promote collective water use for irrigation
Infrustructure for water storage	Buffer zones between cultivated areas and rivers	**Promote farm planning and innovation**
Infrastructure for major efficiency in the distribution network	Protection and conservation of forested areas and coastal vegetation	Promote activities diversification
Irrigation efficiency	River redevelopment	Insurance for climate risk

SNAC – Agriculture and Livestock

Grey	Green	Soft
Improve agro-meteorological monitoring	**Reduce pesticides and nutrient inputs**	Early warning system for pests and diseases
Identify indicators for climate change impact monitoring	**Crop rotation and use of more adaptive varieties**	Improve research and farm knowledge on agronomic practices and new technologies
Improve efficiency in irrigation systems and soil tillage practices	Promote innovative systems to reduce the impact of livestock systems on environment	**New varieties, practices, and irrigation systems**
Innovation in machines and promote sharing forms	Promote traditional practices (e.g. wooded pastures)	**Plan irrigation based on effective water demand**

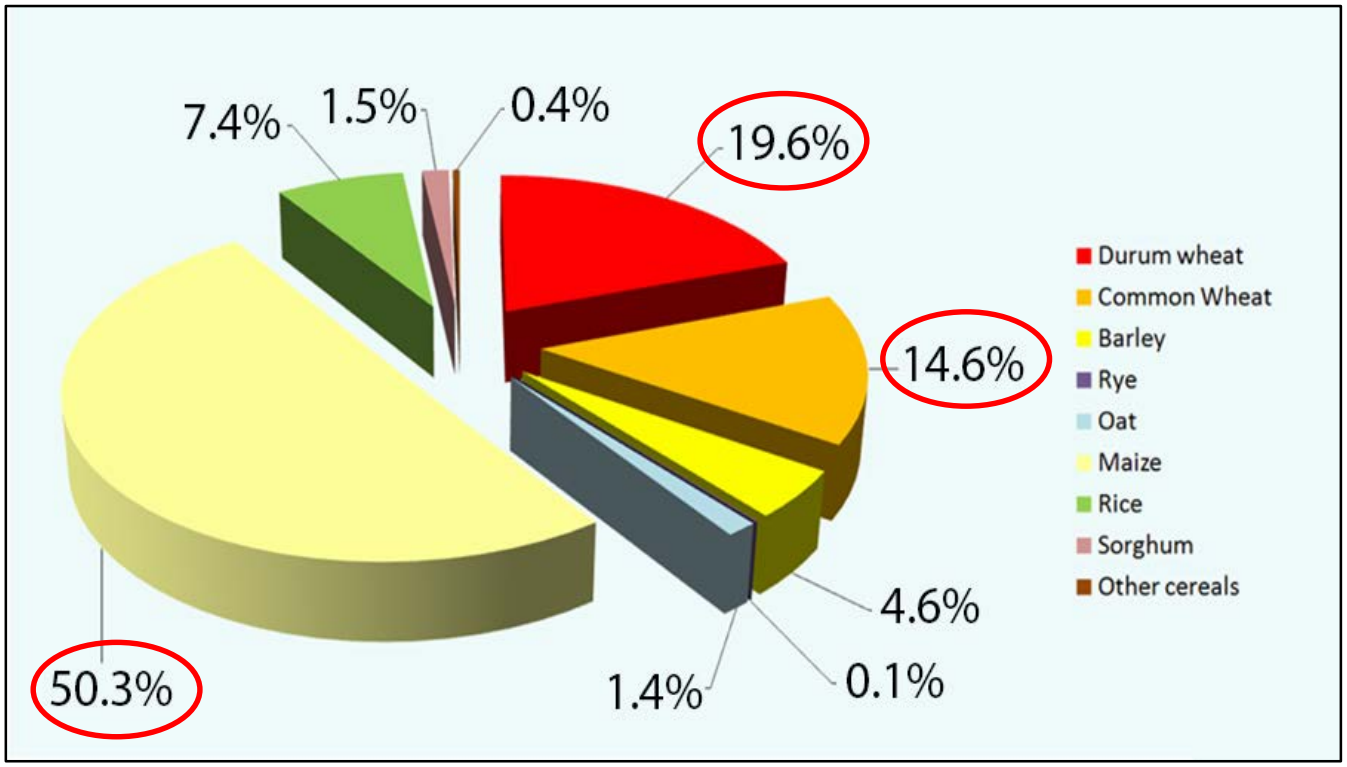
SNAC – Fire

Grey	Green	Soft
Identify indicators for climate change impact monitoring	**Fuel management**	**Early warning systems**
Improve efficiency in fire prevention, management and education	Selection of fire-resilient or fire-tolerant species	**Territorial planning**
Innovation and research	Creation of low fire risk zones in strategic areas	**Identification of areas more susceptible to severe forest fires**

Agriculture sector at regional level in Italy

Cereals are the main source of food supply for direct food consumption

Cereal production in Italy:



84% = Wheat + Maize

Agriculture sector at regional level in Italy

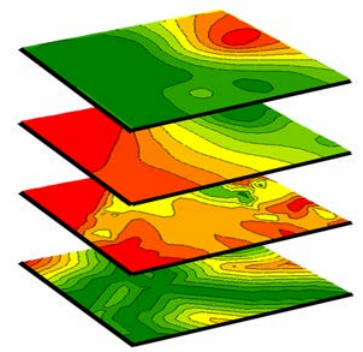
Adaptation strategies analyzed:

- Shifting in sowing date
- Changes in fertilization pattern
- Irrigation management
- Tillage practices (conventional, reduced tillage and No-tillage)
- Crop rotation (continuous wheat, legumes-wheat crops)

GIS-DSSAT Spatial platform

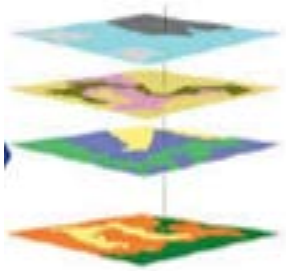
Digital platform (R v.3.0.1)

Input - Daily Climate NETCDF time series:

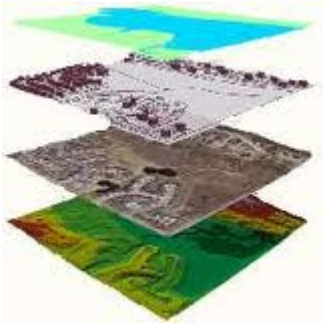


Data structure/value verification & flagging for inconsistencies

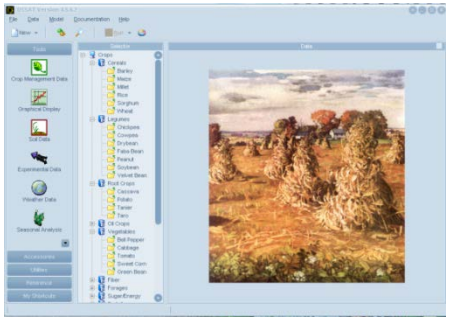
Output - Spatial crop modelling (NETCDF):



Input - soil/agronomic characterization raster:



DSSAT



Data Validation

(Trabucco A., Gallo A., Mereu V., Spano D., 2014)

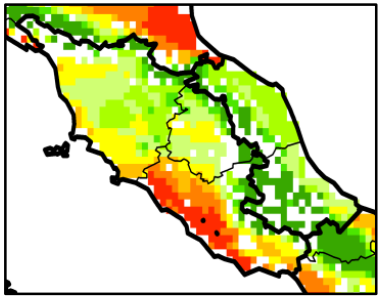
Change in average yield (%) with future CO_2 values for *Durum Wheat*

Earlier sowing date

-15 days → up to **+11-12%**

-30 days → up to **+21-23%**

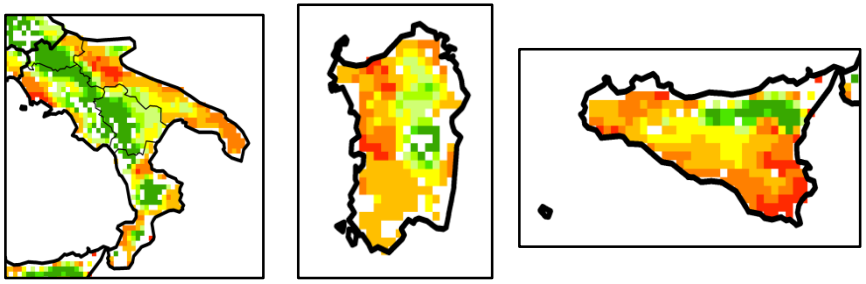
Central Italy



Irrigation

up to **+23-29%**

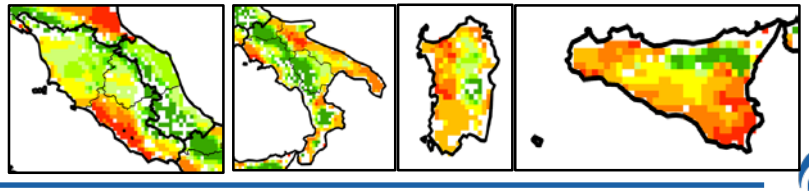
Southern Italy and Islands



+ 20% in N-P-K rates

up to **+6-7%**

Central, South and Islands



(Gallo A., Mereu V., Trabucco A., Spano D., 2014)

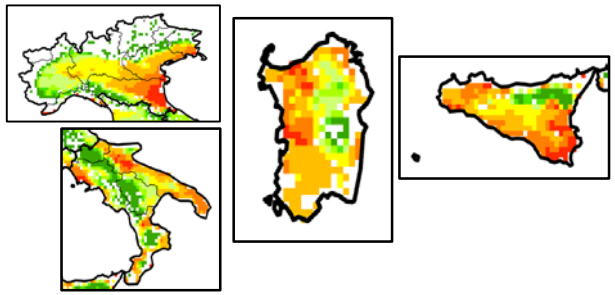
Change in average yield (%) with future CO_2 values for *Maize*

Earlier sowing date

North, South and Islands

-15 days → up to **+3-5%**

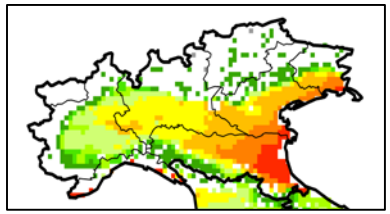
-30 days → up to **+5-7%**



+ 20% in N-P-K rates

North Italy

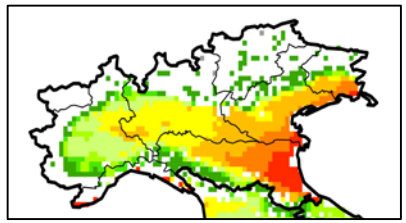
up to **+3-4%**



Crop residues incorporation (5 t ha^{-1})

North Italy

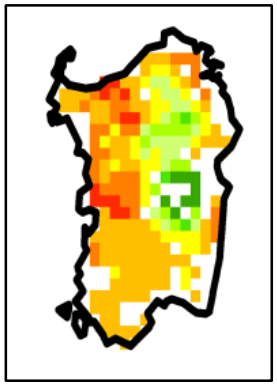
up to **+7%**

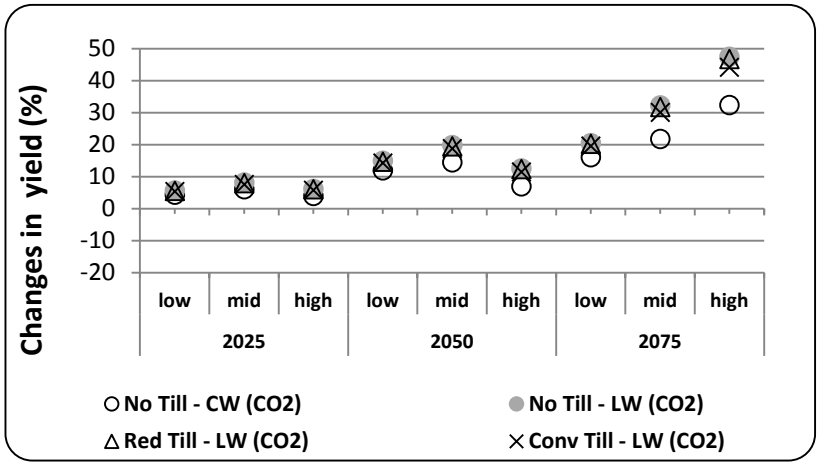


(Gallo A., Mereu V., Trabucco A., Spano D., 2014)

Change in average yield (%) with future CO_2 values for *Durum Wheat*

- Tillage systems (conventional, reduced tillage and No-tillage)
- Crop rotation (continuous wheat, legumes-wheat crops)





- **NO differences between tillage practices**
- **Significant beneficial effect of legumes as previous crop**

CW = continuous wheat

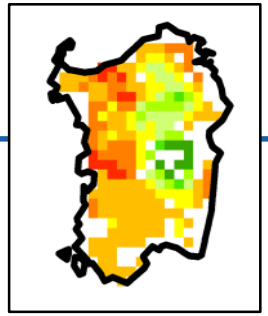
LW = legumes - wheat

Tillage (SOM in the 0-5 cm layer):

conventional	reduced	no-tillage
1.16	1.37	2.07

(Carboni G., 2011 and 2015)

Water demand at regional level



CITRUS

CURRENT CROP MANAGEMENT
- Micro-sprinkler
- Full irrigation
- Every four days

ADAPTATION STRATEGIES
- Drip system
- < 20% irrigation
- Every two days

RESULTS
- - 24% water in 2050
- - 3% mean yield

OLIVES

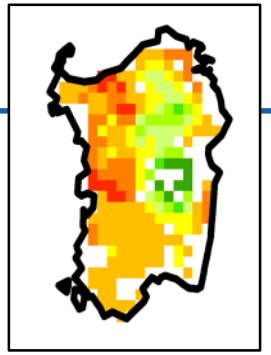
CURRENT CROP MANAGEMENT
- Drip system
- Every three days

ADAPTATION STRATEGIES
- < 20% irrigation
- Every two days

RESULTS
- Less water, from 874 to 693 mm
- - 2% mean yield

(Mancosu, 2013)

Water demand at regional level



GRAIN MAIZE

CURRENT CROP MANAGEMENT

- Sprinkler system
- Sowing = May (beginning)
- Harvest= September (end)

ADAPTATION STRATEGIES

Earlier planting date (D-30 days)

Later planting date (D+30 days)

RESULTS

- - 6% Irrigation requirement (earlier planting date)
- - 16% Irrigation requirement (delayed growing season)

(Mancosu, 2013)

Wildfire Risk Assessment and Management

Increased frequency of extreme weather

Lengthening of fire seasons

Increment of fire suppression budgets

Loss of confidence in using agricultural fires

MEDITERRANEAN AREAS: INCREASE IN FIRE RISK AND MEGA-FIRE FREQUENCY

Land use / land cover changes

Ageing population in forest/rural areas

Lacking land management and build-up of unmanaged fuelbeds

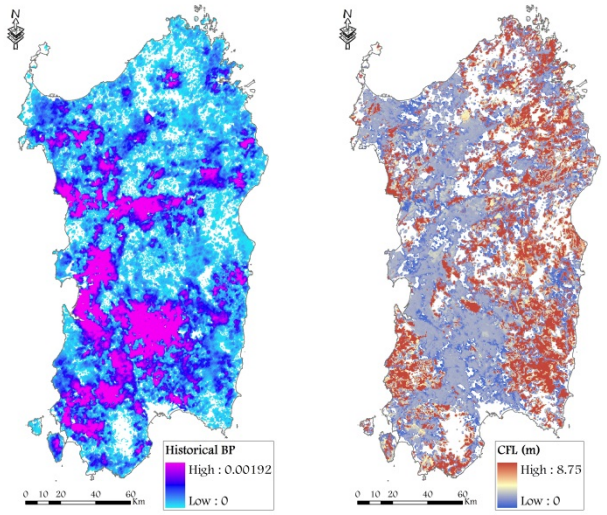
Increased pressure in coastal and urban areas

(Salis 2015)

Landscape Management: Risk Assessment vs. Mitigation

Assessment

Map risk factors and how they contribute to overall fire exposure or risk



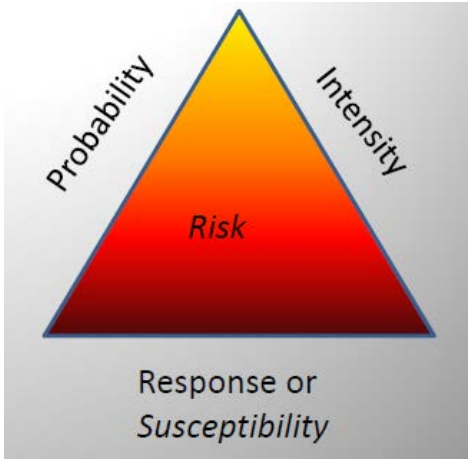
Mitigation

Changing the expected output (risk):

a) Reducing wildfire probability

b) Reducing wildfire intensity

c) Reducing the landscape response or susceptibility



Mitigation strategies need to be informed by preliminary risk assessment

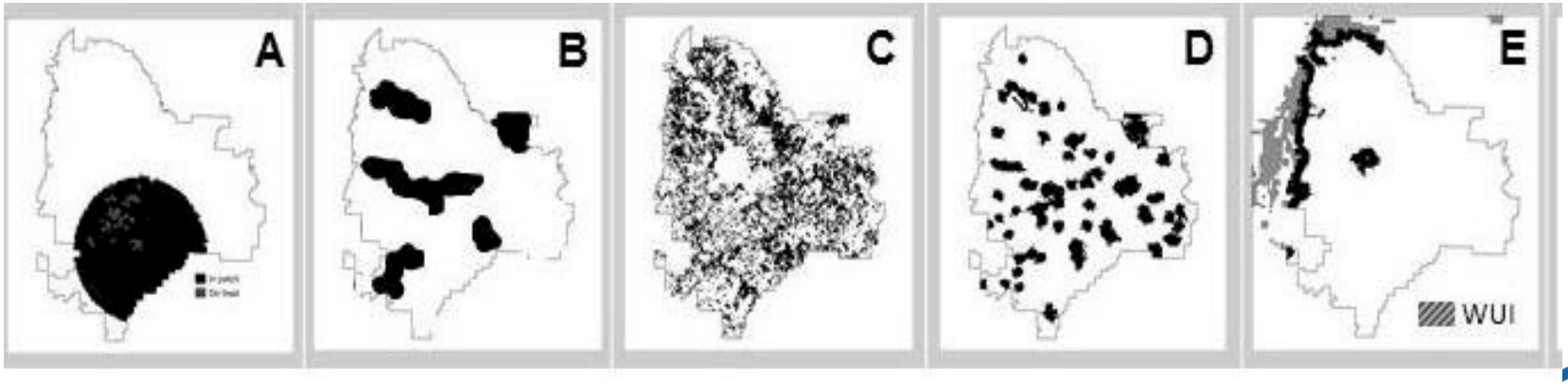
(Salis 2015)

Fuel Management Strategies

There are many fuel management strategies

Restoration of fire adapted forests → **Protection from fire**

Low hazard fire containers	Strategic Restoration	Treatment optimization model	Dispersed fuel breaks	Focused defensible fuel breaks



Black areas represent treatment units

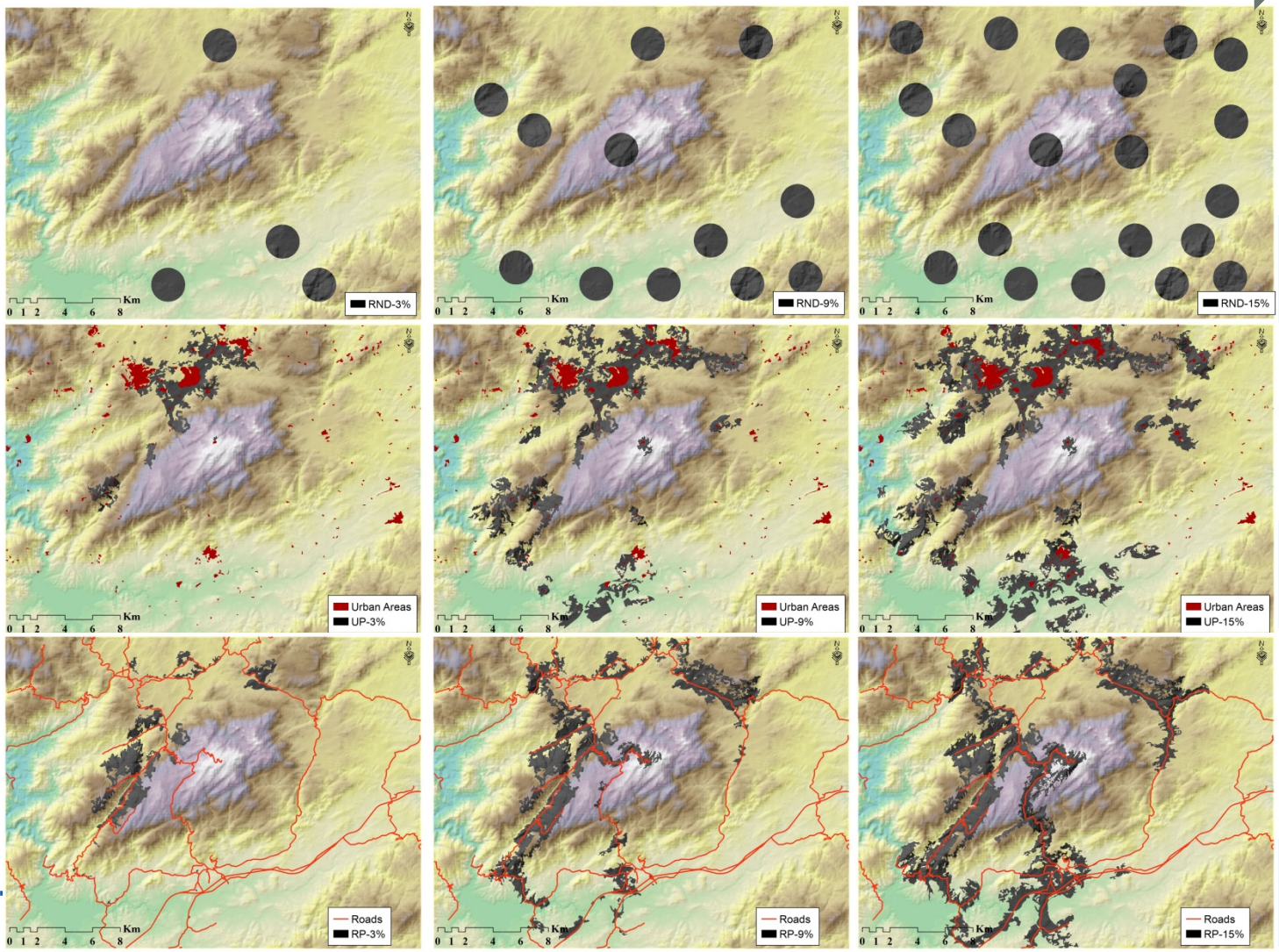
(Ager 2013)

Fire Risk Management in Sardinia

(Salis et al., in prep.)

different fuel management intensities

Area Treated, Cost, Risk reduction, Teams, Time , Work



No Priorities: Random Areas

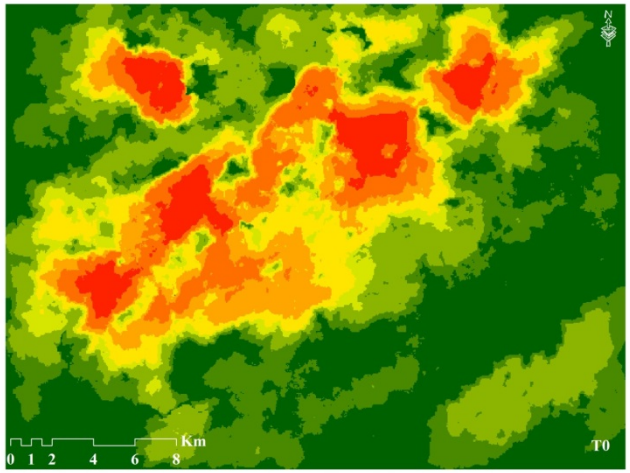
Priority: Urban Protection

Priority: Road Protection

Fire Risk Management in Sardinia

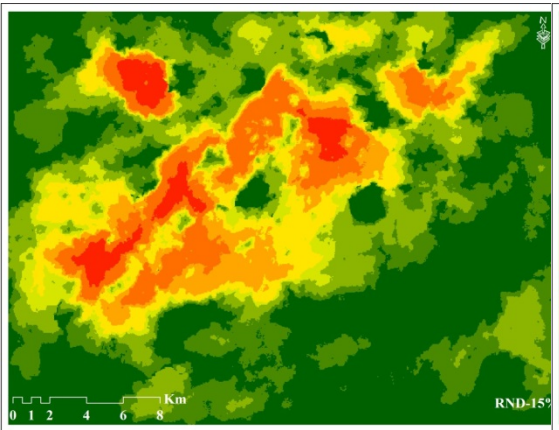
(Salis et al., in prep.)

No Treatment

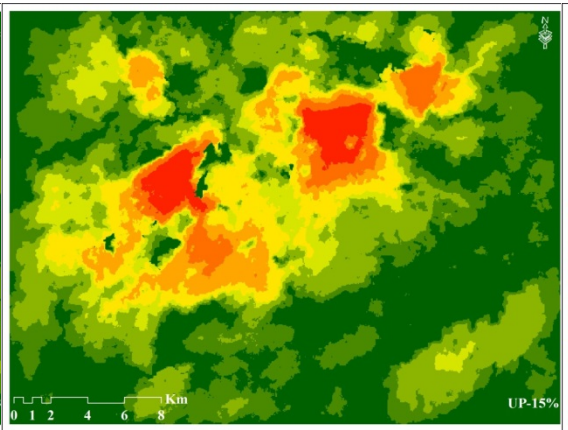


Spatial variation in burn probability (BP) with the diverse fuel treatment strategies

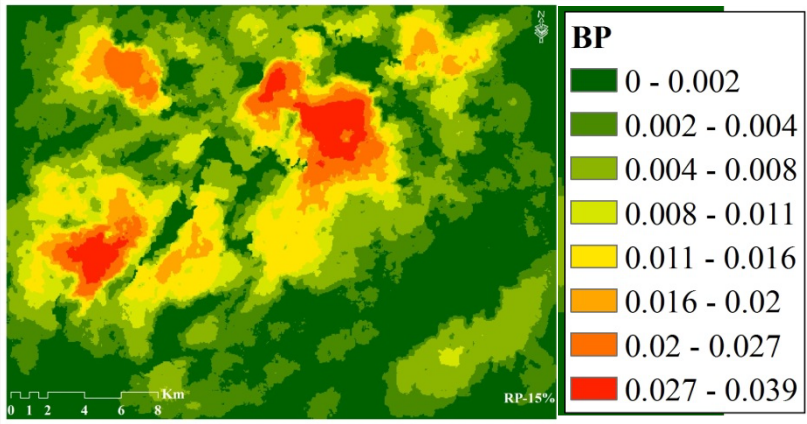
Random



Urban Protection



Road Protection



Final remarks

1. Impacts of climate change are **extremely varied** between and within regions

2. **Regional risk** as**sessment** is essential and needs the contribution of the different sectors

3. Adaptation options need to be developed at **regional/local scale** based on detailed *Climate Resilience Studies*

4. Involvement of **citizens** is the key for the development of successfully adaptation plans

Finale remarks

- **Cooperation** between different regions

- Integration of different **levels of governance** (European, national, regional, local) and different economic and social sectors

‘**Horizontal**' and '**vertical**' **integration** of policies to include adaptation measures in its sectoral policies

Final remarks

Board for interregional coordination on the National Strategy for Adaptation to Climate Change (SNAC)

Main objectives

- Support the adaptation initiatives of regional and local government to align strategies and plans to the National Strategy
- Ensure that the national plan on adaptation strategy takes account the specific regional needs
- Carry out the monitoring and evaluation of the effectiveness of the implemented actions

Final remarks

Sardinia Region was identified as the coordinator of the Interregional Board

In this process it is required the permanent involvement of the Central Government and the Regional Authorities through the network of local environmental authorities

Development of **National Plans** ⇔ Development of **Regional Plans**

⇓

1. Identification of shared and interconnected policies
2. Guidelines and dissemination of best practices

Thanks

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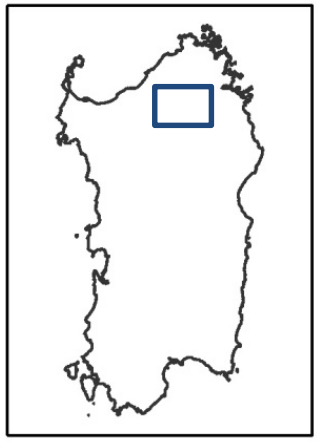
sui Cambiamenti Climatici

Fire Risk Management in Sardinia

(Salis et al., in prep.)



SIMULATIONS

Randig, MTT algorithm (Finney 2002)

Data resolution: 50 m over 700 km2 (North Sardinia)

Simulation of 25,000 fires, randomly sampling from historical conditions

Diverse treatment strategies and intensities tested, with the goal of minimizing BP and FPI

Treatment strategies created in GIS environment coupling spatial values and fire exposure outputs