

Pro Silva International Meeting 2025



Forest fire fighting in Sardinia

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Introduction.

A growing threat in many parts of the world, also in many of those until yesterday not threatened, are **wildfires**.
With their growing **risk** to human life, goods, economy, and, not least, natural environment.

Recently, ¹ wildfires have increased their negative impact, due to climate change, land-use change patterns, human activities.

In many cases wildfires have changed their typical **fire regime**, moving from **agricultural** fires to **WUI** fires.

Due to epochal changes in the structure of Western society (from the countryside to the cities),
Traditional Ecological knowledges (**T.E.K.**) have been partially lost

¹ AA.VV., "A global outlook on increasing wildfire risk: Current policy situation and future pathways"
<https://doi.org/10.1016/j.tfp.2023.100431>

If we consider how Italy manages the complex forestry problem (and wildfires:)

- 1.- "Forest Law," (**or T.U.F.F.**) which was last updated in 2018 (D. L.vo 03/04/2018) which replaced an important law (**Legislative Decree 3267/23**) which mainly dealt with soil conservation, marginally with fires
- 2.- "Wildfire National Framework **Law 353/00**", implemented in 2021 (with **Law 155/21**)
- 3.- **Legislative Decree n° 1** of January 2, **2018 "Civil Protection Code"**
- 4.- Many **regional laws** try to integrate and coordinate those important laws.(i.e. **Tuscany Region**..... but:

"Normal" (?) emphasis is given to **emergency situations**

Policy making is typically forced by moments of urgency or crisis (**panic, deaths, damages**).

This leads to the real causes of change being postponed indefinitely, preferring immediate and forceful solutions to more thoughtful ones.

Considering the "**risk equation**" ²

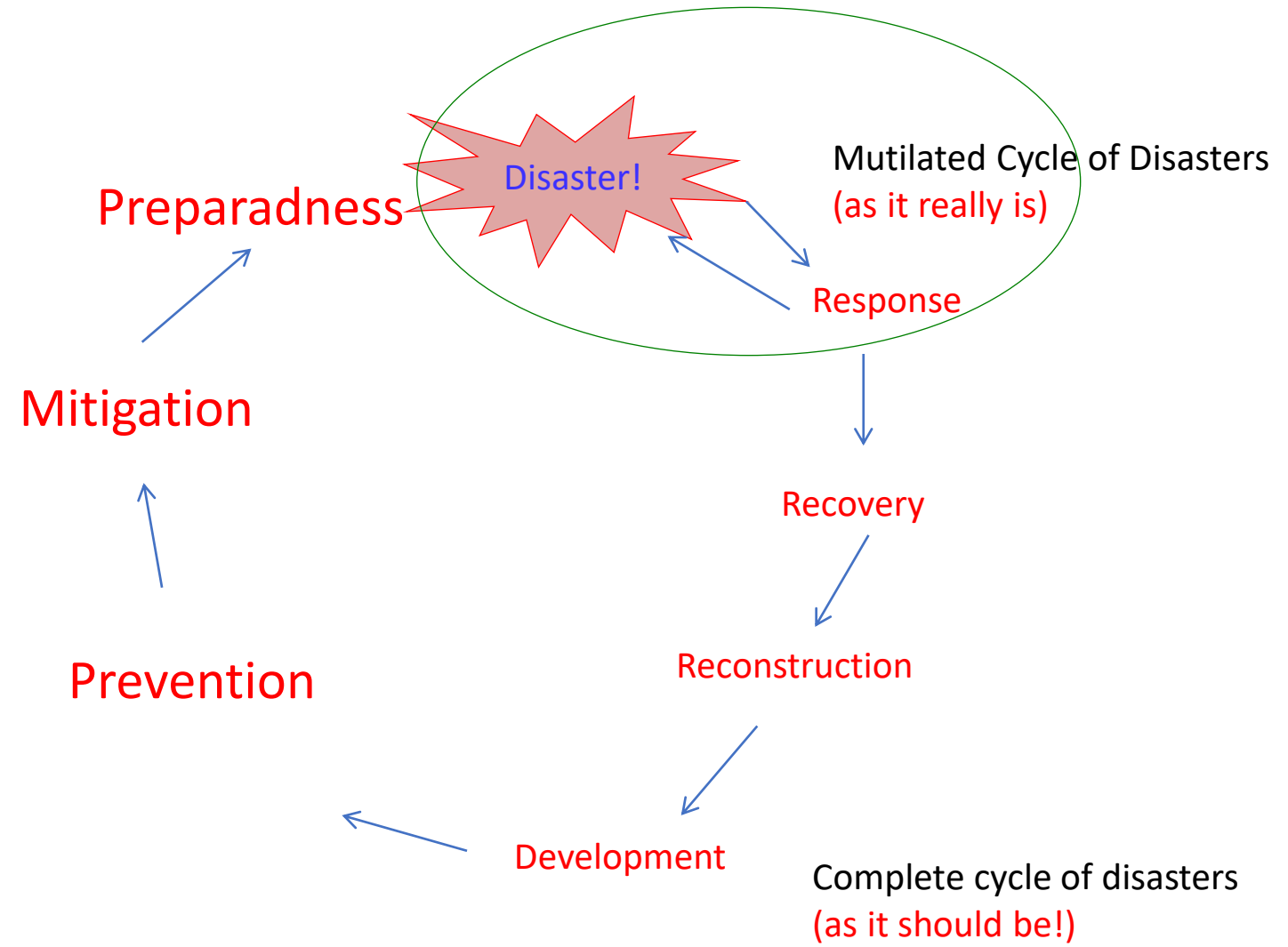
$$R=H*V*E^1$$

The general response to risk is of an **emergency** nature, acting above all on attention to **vulnerability** and **exposure**, very little on reducing the **hazard**.

The typical expression is: **Disaster!**

¹ R=risk; H = hazard; V= vulnerability; E= Exposition

² A. Pasini: L'Equazione del Rischio, Cambiamenti climatici su territori fragili", Codice ed., Torino 2020



In this framework, unfortunately, the Sardinia Region **does NOT have** an organic law for the prevention and fight against forest wildfires

Sardinia has addressed the issue with amendments to general laws (financial and similar).

We cite for example L.R. 3/1989 on civil protection and subsequent amendments.

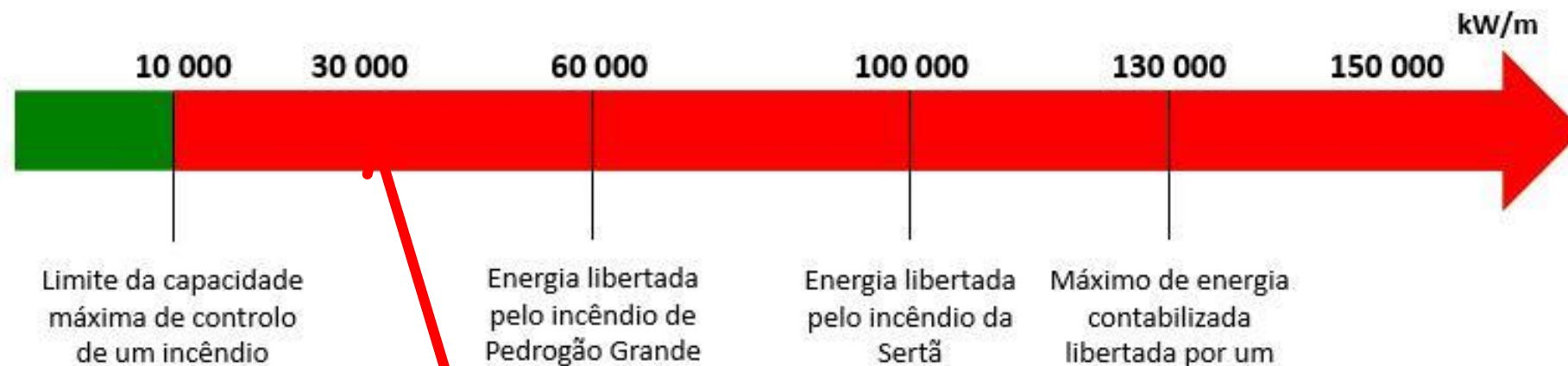
The latest is **L.R. 8/2016**, which actually anticipated the **T.U.F.F.** but regarding the fight against fires it refers simply to the Regional Plan

Wildfires are changing - to change our vision it's a must

Table 3. Wildfire events classification based on fire behavior and capacity of control.

Fire Category	Real Time Measurable Behavior Parameters				Real Time Observable Manifestations of EFB				Type of Fire and Capacity of Control *
	FLI* (kWm ⁻¹)	ROS (m/min)	FL (m)	PyroCb	Downdrafts	Spotting Activity	Spotting Distance (m)		
Normal Fires	1	<500	<5 ^a <15 ^b	<1.5	Absent	Absent	Absent	0	Surface fire Fairly easy
	2	500–2000	<15 ^a <30 ^b	<2.5	Absent	Absent	Low	<100	Surface fire Moderately difficult
	3	2000–4000	<20 ^c <50 ^d	2.5–3.5	Absent	Absent	High	≥100	Surface fire, torching possible Very difficult
	4	4000–10,000	<50 ^c <100 ^d	3.5–10	Unlikely	In some localized cases	Prolific	500–1000	Surface fire, crowning likely depending on vegetation type and stand structure Extremely difficult
Extreme Wildfire Events	5	10,000–30,000	<150 ^c <250 ^d	10–50	Possible	Present	Prolific	>1000	Crown fire, either wind- or plume-driven Spotting plays a relevant role in fire growth Possible fire breaching across an extended obstacle to local spread Chaotic and unpredictable fire spread Virtually impossible
	6	30,000–100,000	<300	50–100	Probable	Present	Massive Spotting	>2000	Plume-driven, highly turbulent fire Chaotic and unpredictable fire spread Spotting, including long distance, plays a relevant role in fire growth Possible fire breaching across an extended obstacle to local spread Impossible
	7	>100,000 (possible)	>300 (possible)	>100 (possible)	Present	Present	Massive Spotting	>5000	Plume-driven, highly turbulent fire Area-wide ignition and firestorm development non-organized flame fronts because of extreme turbulence/vorticity and massive spotting Impossible

Note: ^a Forest and shrubland; ^b grassland; ^c forest; ^d shrubland and grassland; *FLI classes 1–4 follow the classification by Alexander and Lanoville [125].

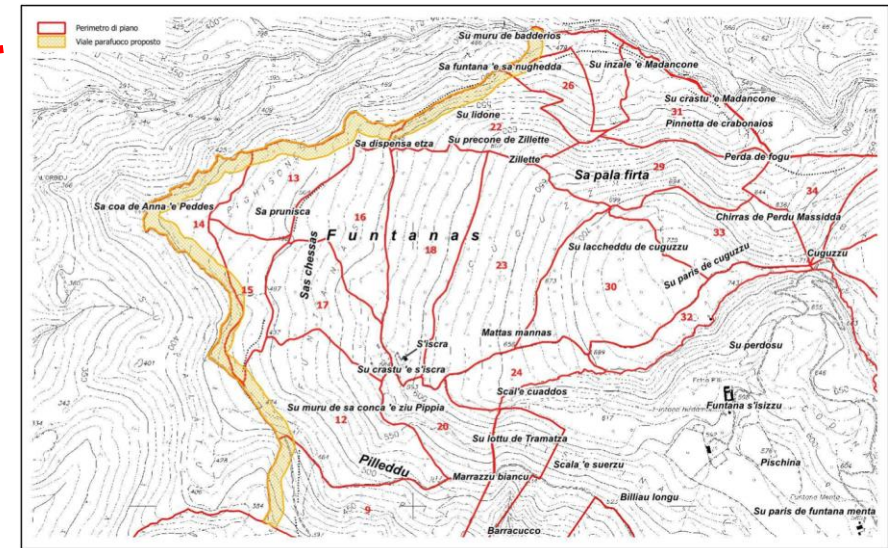


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Montiferru wildfire:
 Crown wildfire, wind driven and/or plume driven
 Spotting plays a relevant role
 Caotic propagation e (downdraft, PyroCb)
 impossible to extinguish



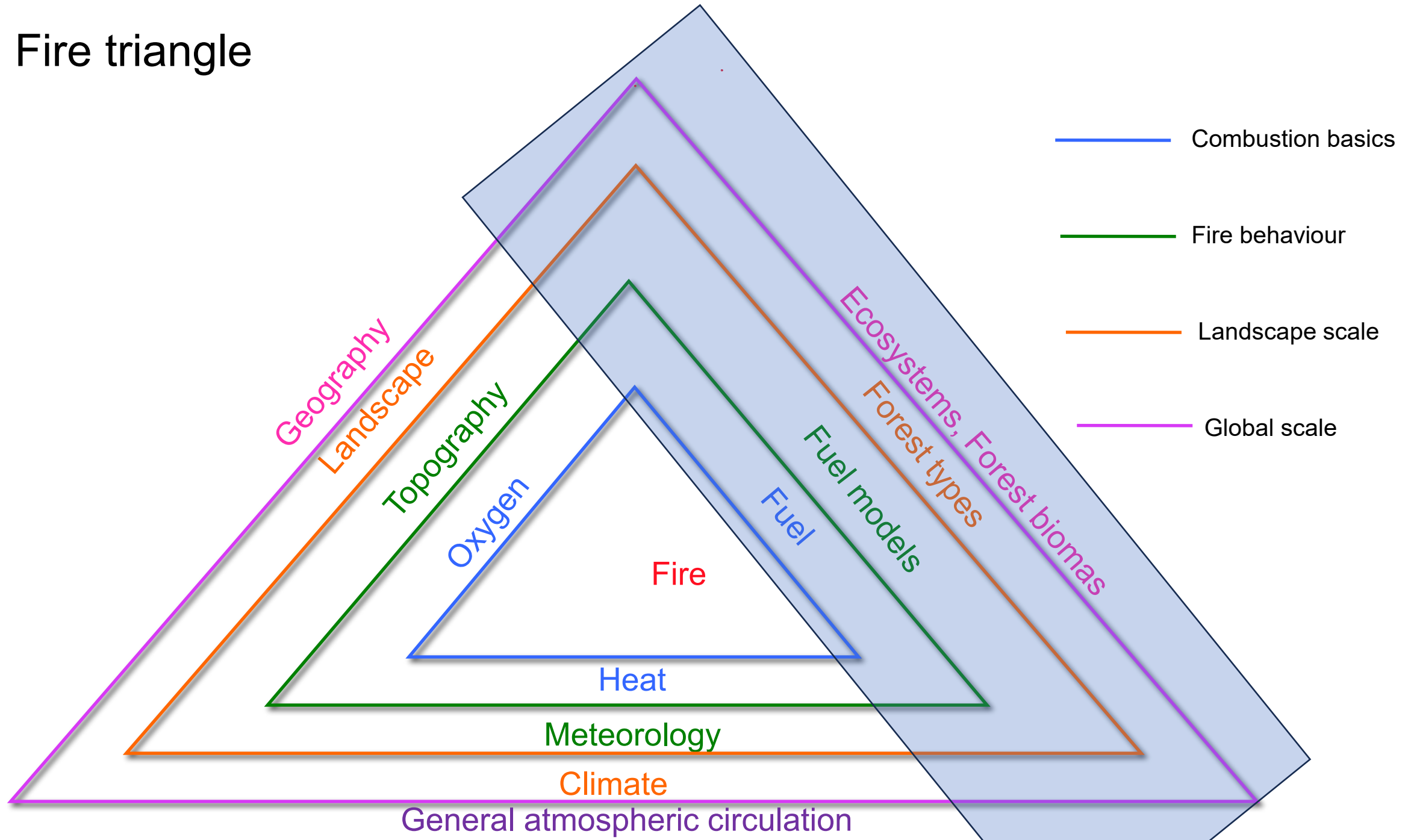
As we will see later, for wildfires of this type it is necessary to plan an attack 15-30 km beforehand with the compartmentalization of the territory on a landscape scale, not just local.



Montiferru wildfire (in green 2021, in red 1994)
 Crown wildfire, wind driven and/or plume driven
 Spotting plays a relevant role
 Chaotic propagation (downdraft, PyroCb)
 impossible to extinguish

The only way to reduce the hazard is to act on the fuel component (since we cannot directly act on the **climate** or the **morphology**)

Fire triangle



Today, the prevention and management of forest fires is not only a technical problem but above all – due to the impacts on human systems – a social one.

1) Wildfires produce in Sardinia approximately 400,000 tons/year of GHG, half of which is CO₂. ^{1,2}

Structural prevention of agro-forestry sectors is a key factor for adequate safety also of urban settlements and scattered rural ones; an **improvement in the organisational network** in the direction of a common, **shared and standardised method** as far as possible would allow for greater effectiveness in interventions, **reducing the damage** to people, their property and the **natural environment**.

Ultimately, improving a system of “**management**” of fires and **not simply of “fighting fires”**.

¹ AA.VV. “Estimating annual GHG and particulate matter emissions from rural and forest fires based on an integrated modelling approach” in Science of the Total Environment, Elsevier, 2023, <https://doi.org/10.1016/j.scitotenv.2023.167960>

² In “Modelling Fire Behaviour and Risk,” Proterina C, Alghero 2011 ISBN 978-88-904409-7-7

The adoption of a **shared method** (languages, protocols, typology of intervention groups) would enable the **interchangeability** of experiences and **mutual contribution** in the event of emergencies of a supra-regional or international exchanges. (see recent ITA EU Modex 2025)



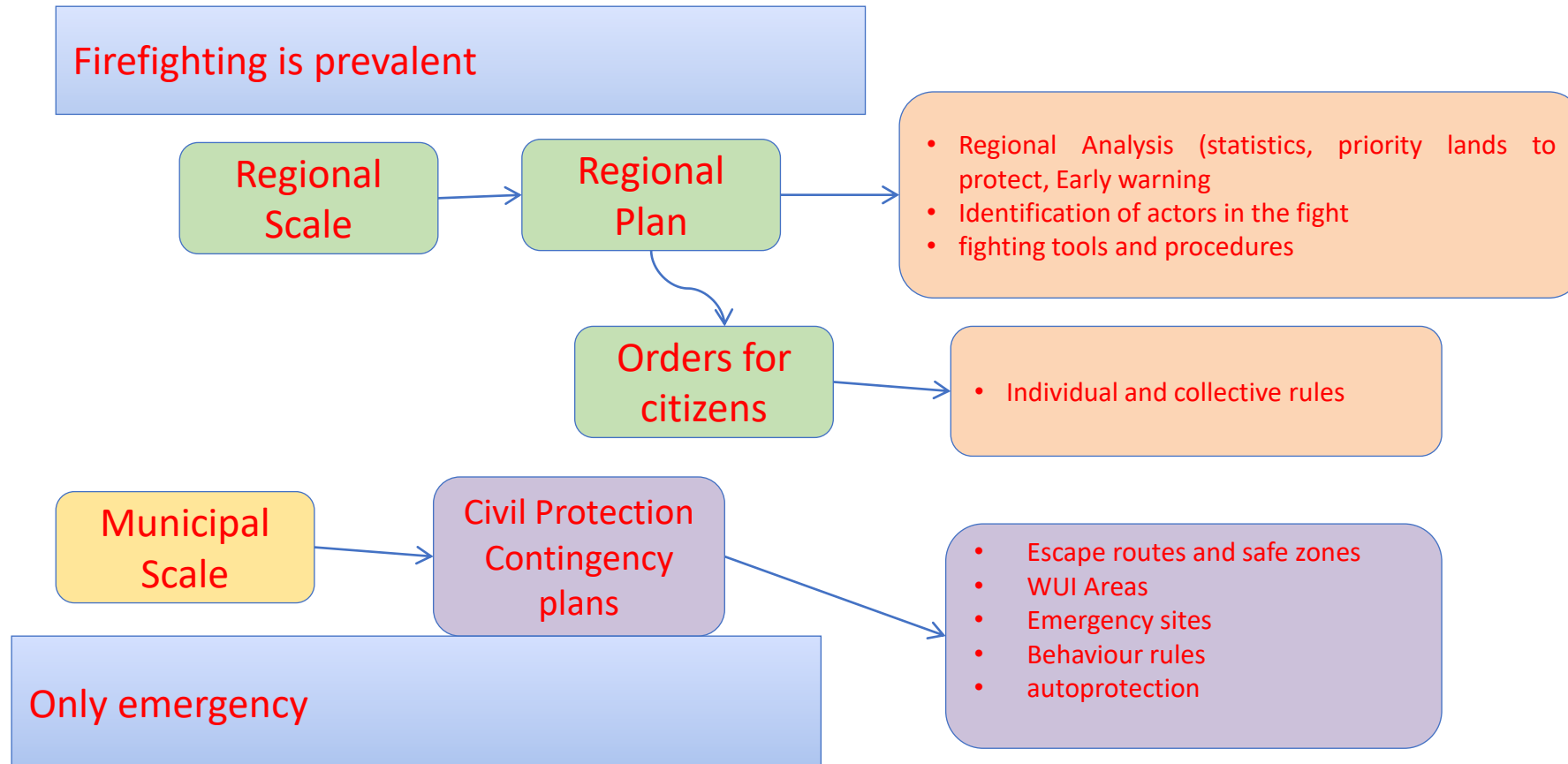
National and Regional synoptic law framework

Reference laws	TUFF	L.155/21	L.R.8/16
Actions (Regional scale)	Regional forest program	Coordination between forest plans and prevention plans	Regional Forest Plan
(Country scale)	Landscape oriented plans	idem	Landscape oriented plans
(Local scale)	Municipality plans	idem	Detailed plans

In theory: in practice there is a **decoupling** in management

General Scenario of Firefighting regional plan and Contingency Municipal plans

As it is:

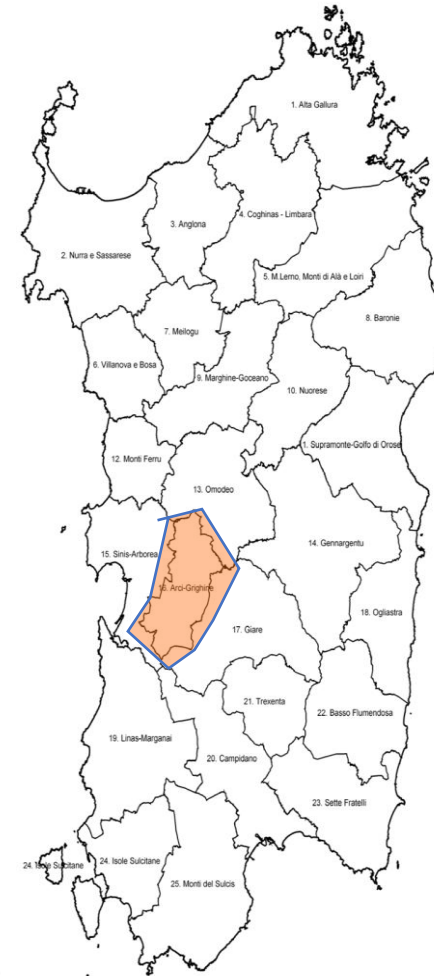


Forest Landscape planification

The unique example

Only a little number of municipalities are planning their forest land (Seneghe, Macomer, Ala dei sardi)

Fig. 25.5 Carta regionale dei distretti forestali.

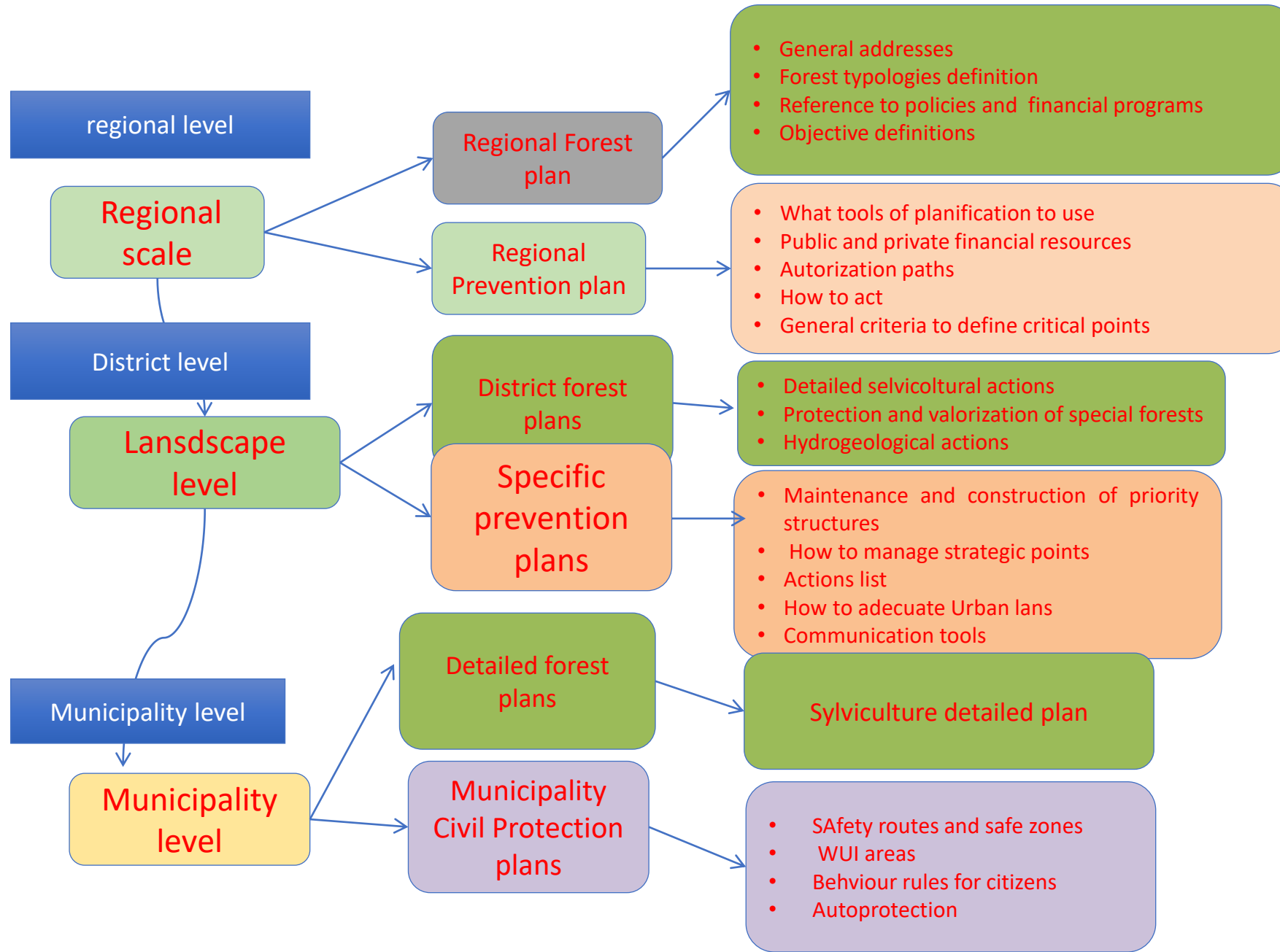


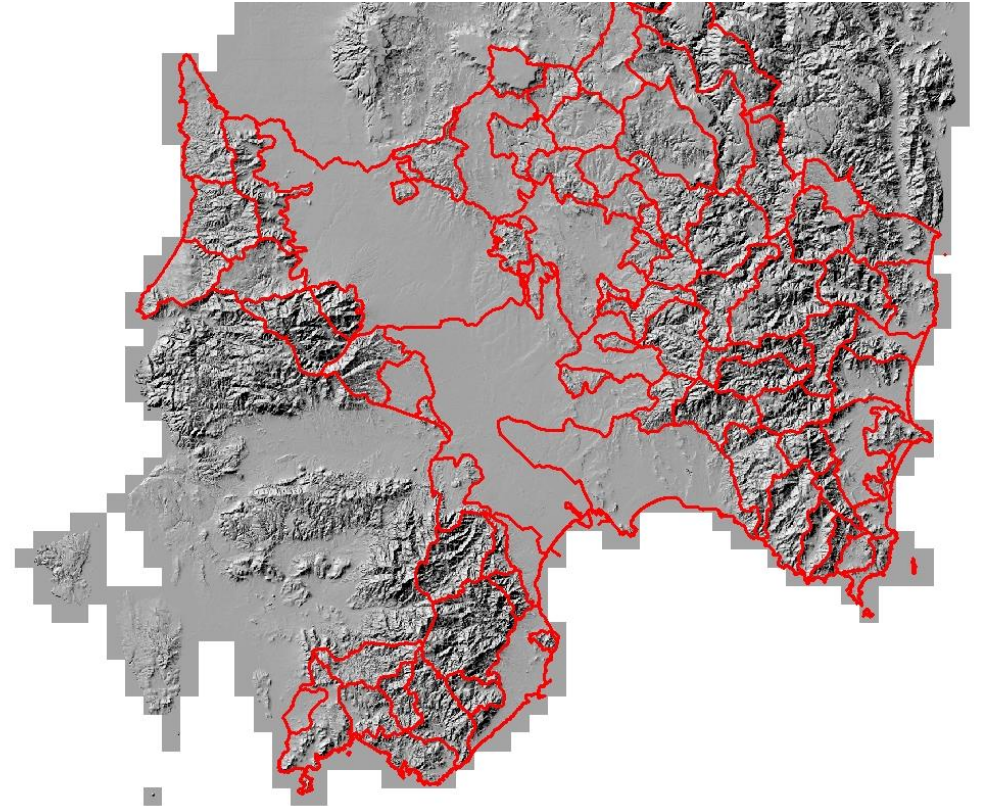
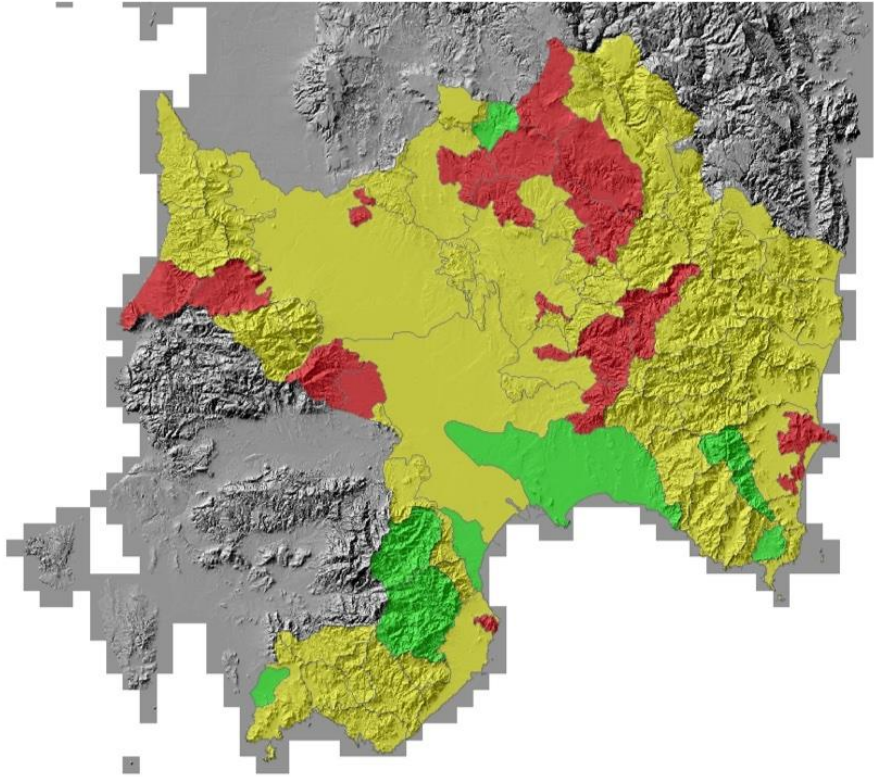
- **Local communities aren't involved in structural planning**
(only contingency plans are activated in case of sudden emergency)

**Integrated Coordination of forest planning and wildfire prevention
at regional, district, local prevention is not active**

- **Effective actions of rural and land development are not linked to wildfire prevention**

As it should be:



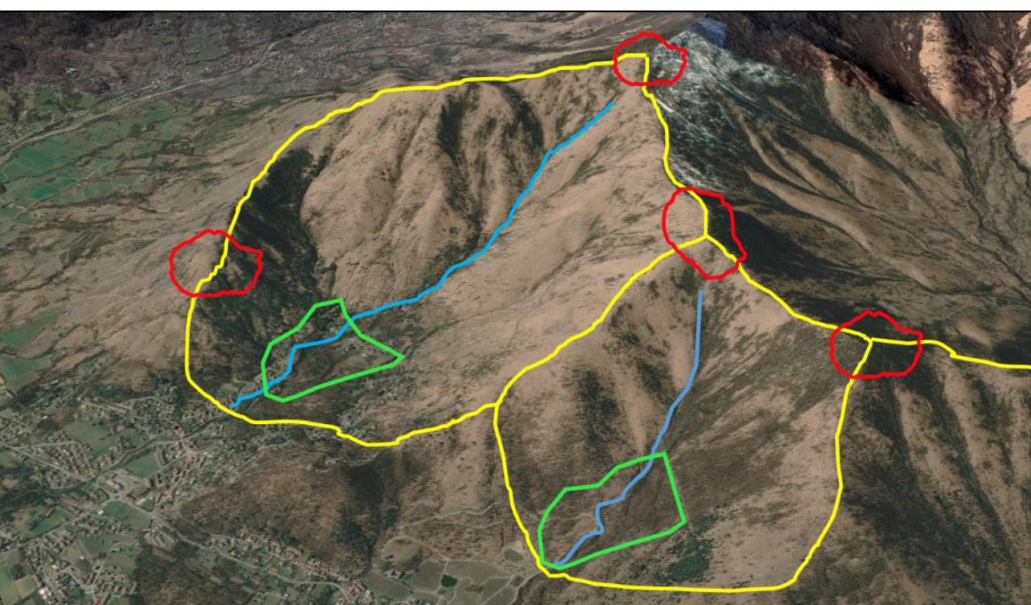


Knowing our fire history it's possible

(Different kind of wildfire are essential to an effective response)

- **initial attack, tipe a)** slow propagation, weak intensity, local crews could attack rapidly
 - **extended attack tipe b)** rapid propagation, medium intensity, aerial support needed
 - **extended attack tipe c)** high propagation and intensity, strong aerial support needed
 - and local activation of **Advanced Command Post** and municipal Civil protection Center.
 - **extended attack tipe d)** WUI is under threat; evacuation procedures are needed
- Advanced Command Post assumes the **Unified Command** modality





«“**Strategic management points**” are the areas on which targeted structural prevention actions should be carried out during the planning stage (prescribed grazing, prescribed burning, community gardens and other associated agricultural activities, firebreaks, etc.) in order to interrupt the possible paths of fire propagation.

Figura 5. Esempi di nodo di impluvio (verde) e nodi di cresta (rosso) da trattare per ridurre l'inflammabilità e le probabilità di incanalamento delle fiamme lungo l'impluvio (in azzurro la linea di impluvio), e per evitare la moltiplicazione dei fronti di fiamma in più bacini (evidenziati in giallo).



*“**prescribed fire**”, the expert application of fire on planned surfaces, through the use of personnel specifically trained in the use of fire and by adopting previously defined prescriptions and operating procedures as specified in L. 155/21*

In the video GAUF-CFVA (Mastros de fogu) intervention to realize a firebreack in Mandas (CA)



“Backfire”, the technical use of fire through the use of personnel specifically trained in its use during fire attack and extinguishing operations;

As best Practices is needed a "**Fire Prevention Mark**" for the support of marketing in favour of economic activities agro-forestry carried out within the strategic management points and in general as planned actions to reduce the fuel load, such as **prescribed grazing**, **viticulture**, **horticulture** etc.



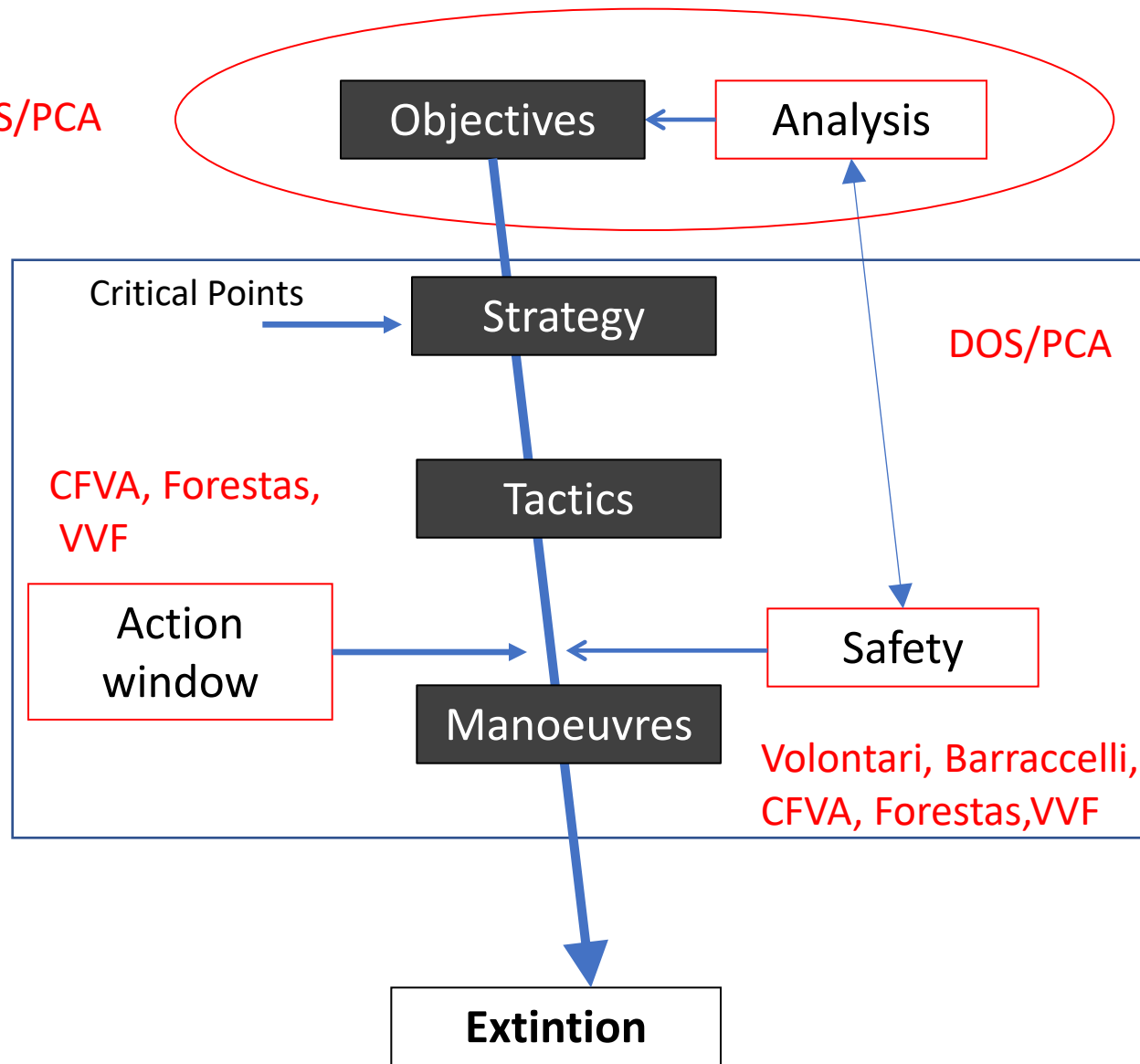


Figura 8. Nucleo aggregato e rispettive fasce di protezione: fascia perimetrale del centro abitato (in blu), la fascia di protezione dello spazio urbano (arancione) e la zona buffer (verde).



Is needed also a complete **Urban planning** to prevent WUI Risk

DOS/PCA



Thank you!