



RECIFE

Reinforcing civil protection capabilities into multi-hazard risk assessment under climate change



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Climate Change impacts on risk management

Chiara Franciosi and Marta Giambelli
CIMA Foundation

CTFC



PAU
COSTA
FOUNDATION

protecció civil



Forest Research Institute
Baden-Württemberg

cima
OBSERVE TO PREDICT

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Austrian Research Centre for Forests



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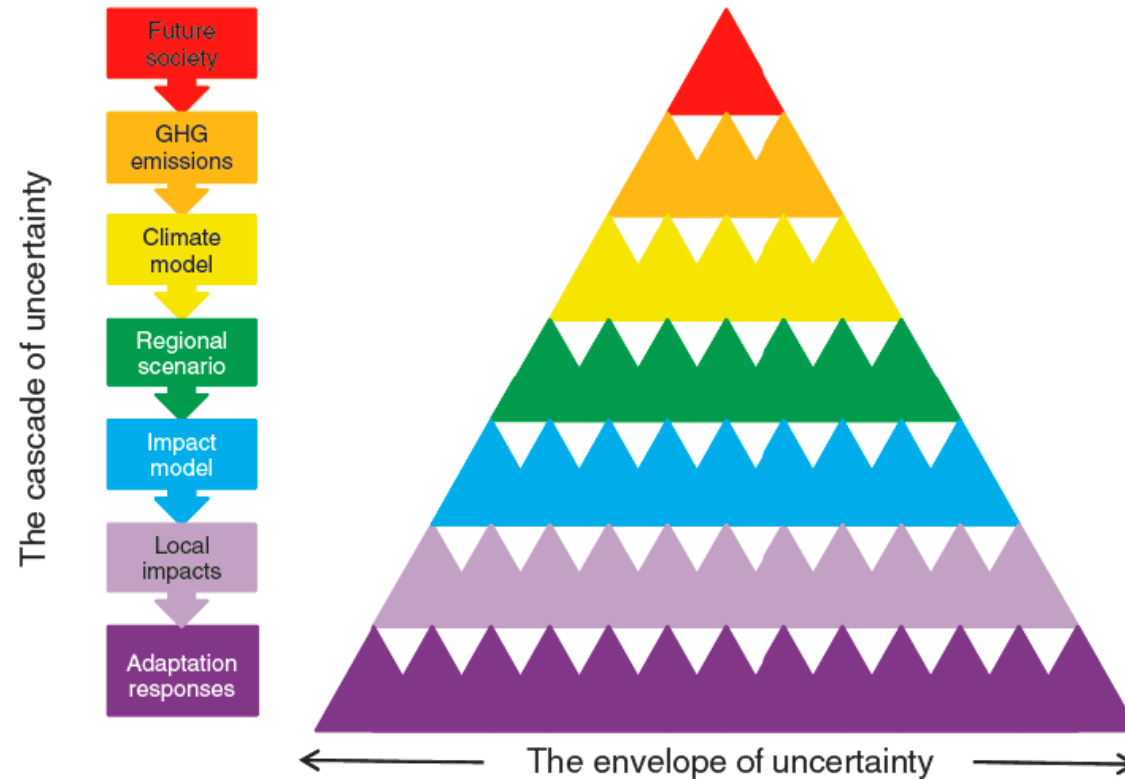
Topics

- ▶ Climate Change impacts on natural hazard: literature evidences and project challenges
- ▶ Requirements of Civil protection and risk managers for facing climate change impacts
- ▶ Preliminary results

Climate Change impacts on natural hazard: literature evidences and project challenges

Brief introduction

- ▶ Climate change models are affected by high level of uncertainty.
- ▶ Climate model outputs are used as inputs into impact models and hence the existing uncertainties are propagated further.



Climate Change impacts on natural hazard: literature evidences and project challenges

CC Impacts on hazard



Climate change will affect

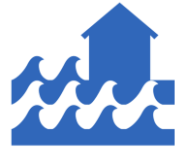
- ***wildfire occurrence and spread, thus expanding northward the areas prone to forest fires,***
- faster propagation rates
- longer flame lengths
- ***severity of the fire season***
- ***probability of large and extreme fires***

Hazard factors impacted by CC

- Heat waves
- Drought and Aridity
- Wind
- Changes in vegetation
- Forest health

Climate Change impacts on natural hazard: literature evidences and project challenges

CC Impacts on hazard



Pluvial floods and flash floods are likely to become more frequent throughout Europe, while in regions with projected reduced snow accumulation during winter, the risk of early spring flooding could decrease. (EEA, 2017)

On average, in Europe, flood peaks with return periods above 100 years are projected to double in frequency within 3 decades. (Alfieri et al., 2015)

Hazard factors

- Heavy rain fall
- Vegetation
- Rising temperature

Climate Change impacts on natural hazard: literature evidences and project challenges

CC Impacts on hazard

The intensity of winter storms will increase over the 21st century (Feser et al., 2014).

Climate change influences

- the occurrence and duration of winter storms
- the increasing of **frequency and severity** (i.e. peak wind speeds) across Europe (Donat et al. 2011).

Likely, there is a **poleward shift of midlatitude storm tracks**. Consequently, areas that were previously untouched by severe windstorms will have to face a new hazard situation.



Hazard factors

- Wind
- Precipitation
- Trees

Climate Change impacts on natural hazard: literature evidences and project challenges

CC Impacts on hazard



- High altitudes: Increased prone of landslide and rockfall because of thawing permafrost areas due to rising temperature.
- Medium to low altitude areas: more LS activity and shift of events to the winter half-year especially in Central and North Europe. No significant increase of rock fall frequency overall.
- South Europe, low to medium altitudes: the threat form LS may decline. No significant increase of rock fall frequency overall.

(Cloutier et al. 2012; Gariano and Guzzetti 2016; Hagen and Andrecs 2016; Huggel et al. 2012):

Hazard factors

- heavy precipitation sums and intensities
- permafrost (thawing)
- raising temperature

Climate Change impacts on natural hazard: literature evidences and project challenges

CC Impacts on hazard



GLOBAL: The impact of climate change on snow avalanche risk is **uneven** across territories.

PYRENEES CATALONIA:

1. An **increase** in the number and magnitude of **wet snow episodes** has been detected (3rd Report on Climate Change in Catalonia, 2016).
2. Most very large and extremely avalanches → negative phase of the NAO index
Recent decades → increase positive phases of NAOi
Interannual Variability of the NAOi → Some winter with extreme negative phase of NAOi → **EXTREME AVALANCHES** (García-Sellés, 2009).
3. Great interannual variability in duration and thickness is observed (OPCC-CTP, 2018).

Hazard factors

- Snowpack
- Terrain
- Weather (raising temperature, heavy snowfalls, etc.)

Climate Change impacts on natural hazard: literature evidences

| Disaster Risk | Areas at risk | Time | IPCC scenarios |
|--------------------|--|----------------------------------|----------------------------------|
| Wildfire | ↑ | a lengthening of the fire season | SRES scenarios and RCP scenarios |
| Flash Flood | n/a | n/a | RCP scenarios |
| Avalanche | Possible decrease in low altitudes No variation in mid-high altitudes | No variation | SRES scenarios and RCP scenarios |
| Storm | ↑ | No | SRES A1B scenario (A1B) |
| Landslide&Rockfall | ↑ | earlier in the year | SRES scenarios |

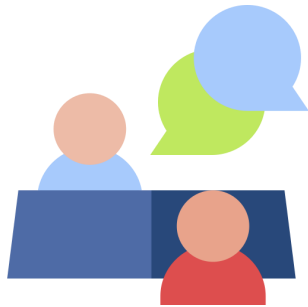


Climate Change impacts on risk management: some challenges

| DISASTER RISK | SOME EXAMPLES OF CHALLENGES FOR COPING CAPACITY | SOME EXAMPLES OF CHALLENGES FOR EXPOSURE AND VULNERABILITY |
|--------------------|---|--|
| Wildfire | Cooperation and coordination and communication Legal framework and chain of responsibility | Fuel management at landscape level Community awareness and preparedness Smart urban planning |
| Flash Flood | CP planning with new risk scenarios | Risk assessment Risk transfer Integrated approach |
| Avalanche | Uncertainty of CC and New extreme scenarios in CP planning | Knowledge, forecasting and assessment Land management |
| Storm | Uncertainty of CC and New extreme scenarios in CP planning Horizontal and vertical communication across institutions | More political will Changing vegetation and land use management |
| Landslide&Rockfall | Chain of responsibility and involvement of private companies More equipment and training | Risk transfer Risk assessment (More available data and early warning system) Integrated approach (Cross-sectoral cooperation) |

Requirements of civil protection and risk manager for facing CC

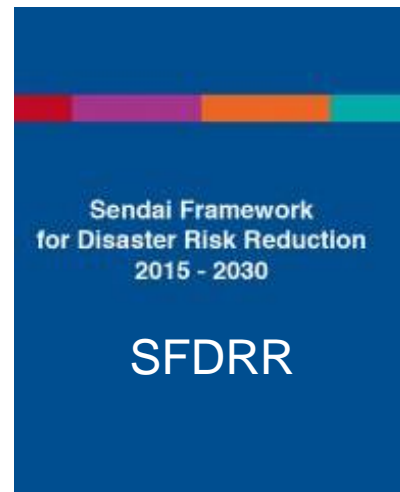
Approach:



Qualitative survey to better understand the main challenges and needs of civil protection and risk managers for facing CC



- PREVENTION
- PREPAREDNESS
- RESPONSE
- RECOVERY.



- 1.Understanding disaster risk;
- 2.Strengthening disaster risk governance to manage disaster risk;
- 3.Investing in disaster risk reduction for resilience;
- 4.Enhancing disaster preparedness for effective response, and to Building Back Better in recovery, rehabilitation and reconstruction.

Requirements of civil protection and risk manager for facing CC



54 Civil Protection (CP) operators interviewed

from different administrative levels and authorities

| | # | ADMINISTRATIVE LEVEL | AUTHORITY / PROFILE |
|---|----|------------------------------|---|
| Germany (FVA): Storms | 4 | Local, regional and national | <ul style="list-style-type: none"> German Committee for Disaster Reduction Federal Office of Civil Protection and Disaster Assistance Regional council Freiburg Technical Advisor forest fires |
| Austria (BWF): Rockfalls & Landslides | 11 | Local, regional and national | <ul style="list-style-type: none"> Political decision-makers representatives of public authorities, support organizations of the federal states fire brigades and CP and disaster management |
| Italy (CIMA): Wildfires | 16 | Local, regional and national | <ul style="list-style-type: none"> Mayor and technicians of the Municipalities of 5 Terre Regional Civil Protection sector (Liguria) Regional Department of agriculture, fire fighting (Liguria) National Civil Protection Department |
| Italy (CIMA): Floods | 15 | Local, regional and national | <ul style="list-style-type: none"> Mayor and technicians of the Municipalities of 5 Terre CP sector of Liguria Region National Civil Protection Department |
| Spain (PCF, DGPC CAT, ICGC, CTFC): Wildfires & Avalanches | 8 | Regional | <ul style="list-style-type: none"> Catalan Fire and Rescue Service Catalan Civil Protection body |
| Portugal (ISA): Wildfires | 5 | Local, regional | <ul style="list-style-type: none"> Municipal and inter-municipal civil protection offices |

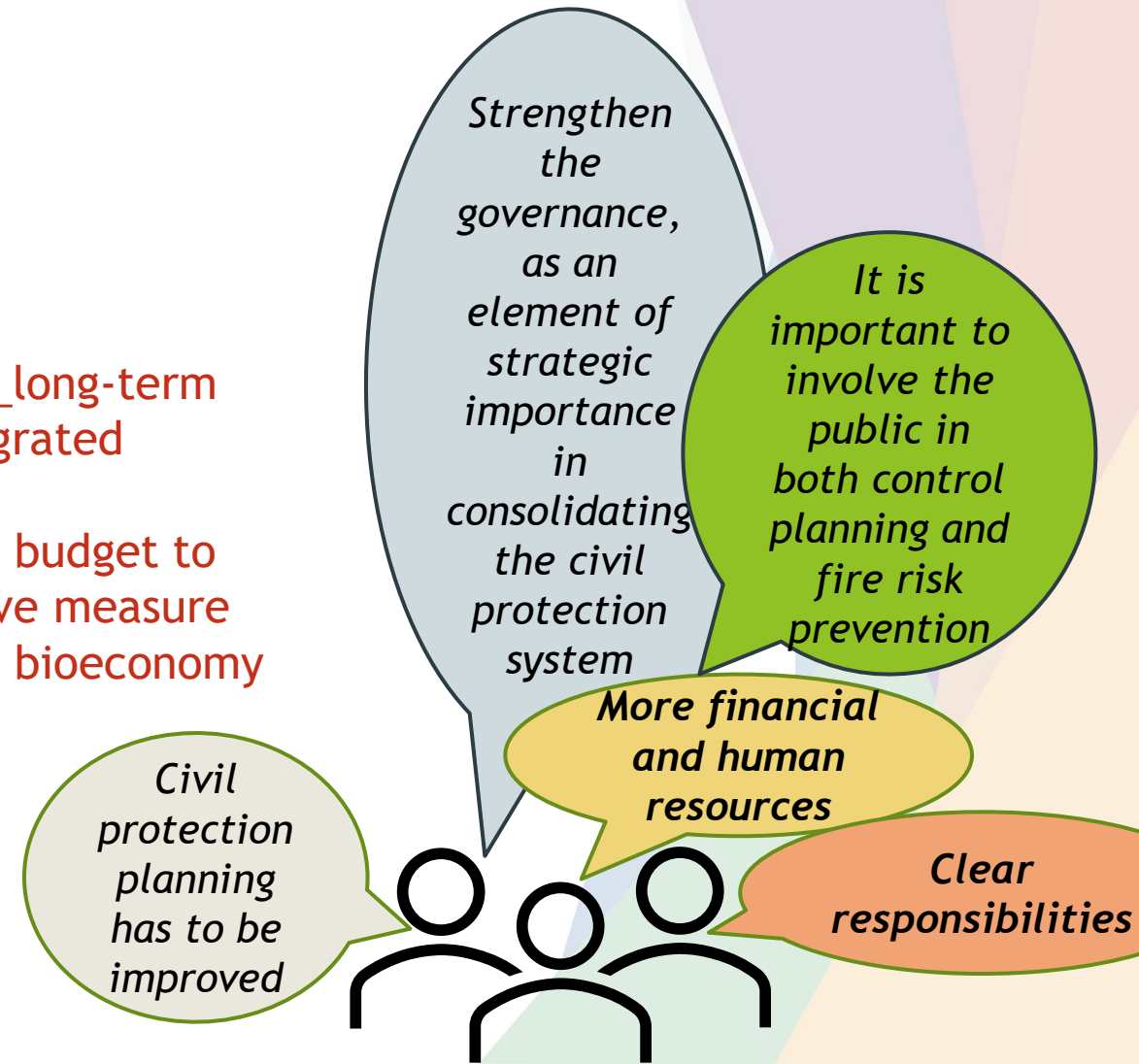
Requirements of civil protection and risk manager for facing CC

Needs/Priorities of civil protection operators

- To strengthen the collaboration between institutions at different levels and offices of the same agency
- To improve forecasting and monitoring
- To get new real-time tools to manage an emergency and support decision
- To gain knowledge of CC scenarios and uncertainties
- To rise risk awareness and involvement of the population in the CP planning process

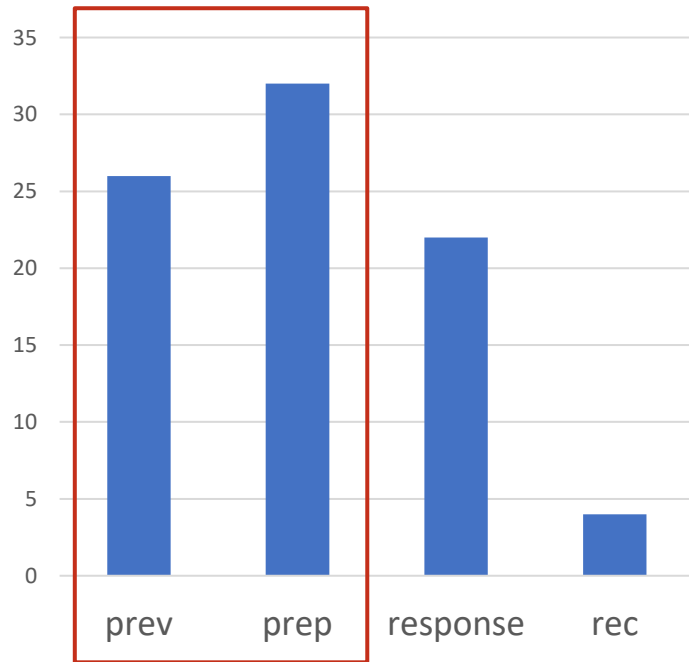
BUT ALSO..

- To foster long-term and integrated planning
- To invest budget to preventive measure linked to bioeconomy

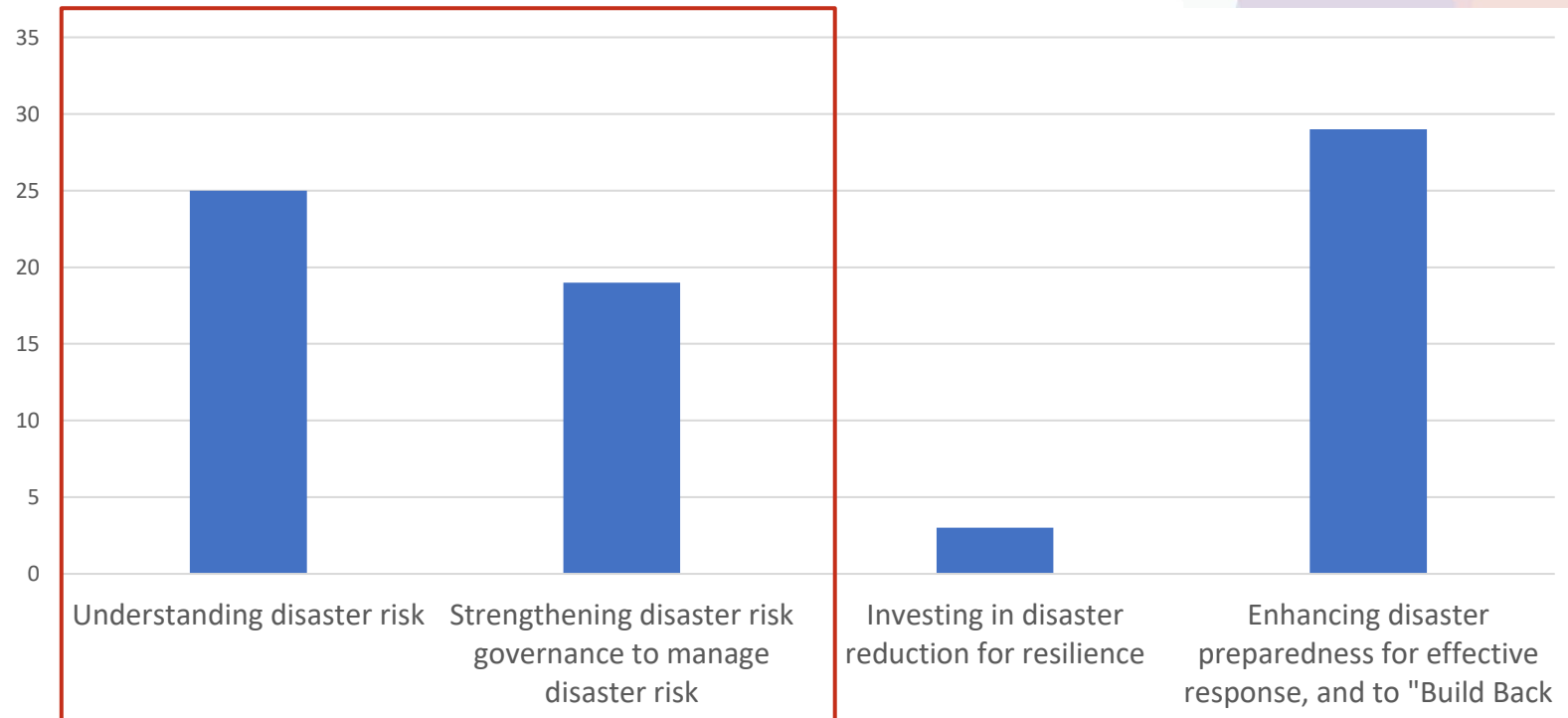


Requirements of civil protection and risk manager for facing CC

Needs/Priorities of civil protection operators



Needs Vs Phases of the risk management cycle



Needs Vs SFDRR priorities

Requirements of civil protection and risk manager for facing CC



27 risk managers interviewed

from different administrative levels and authorities

| | # | ADMINISTRATIVE LEVEL | AUTHORITY / PROFILE |
|--|----|------------------------------|---|
| Austria (BWF): Rockfalls & Landslides | 11 | Local, regional and national | <ul style="list-style-type: none"> Political decision-makers representatives of public authorities, support organizations of the federal states fire brigades and CP and disaster management |
| Italy (CIMA): Wildfires | 1 | Regional | Regional department of agriculture, tourism, training and work policies in the internal areas, forest fire fighting, foresting, parks and biodiversity |
| Italy (CIMA): Floods | 1 | Sub-national | River Basin District authority |
| Spain (PCF, DGPC CAT, ICGC, CTFC): Wildfires & Avalanches | 10 | Regional | Cartographic and Geological Institute of Catalonia (ICGC), Catalan Water Agency (ACA, in Catalan), Urban agenda and Territory Secretariat, General Directorate of Rural Agents, Forest fire prevention section of the Agriculture Department, Catalan Meteorological Service. |
| Portugal (ISA): Wildfires | 4 | Local | Technicians working in municipalities from North to South of Portugal, in the littoral and mountainous areas |

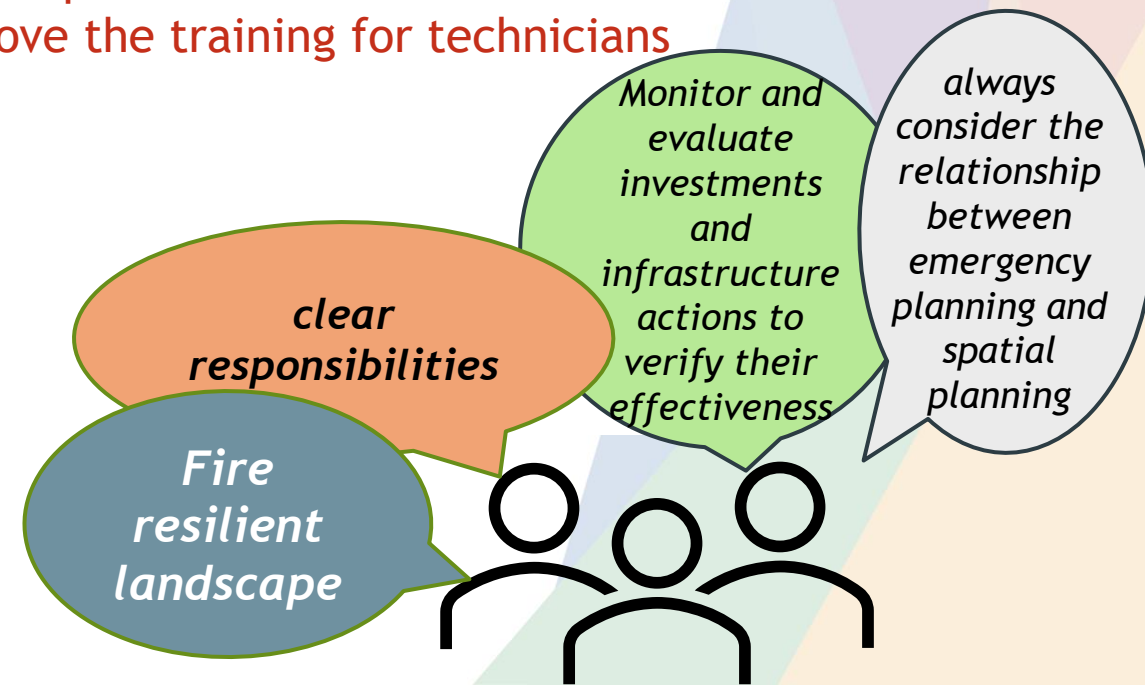
Requirements of civil protection and risk manager for facing CC

Needs/Priorities of risk managers

- To integrate territorial & agricultural policies in the DRR Framework and to develop legislative measure to facilitate land management
- To better understand new risk scenarios and to integrate CC impact in risk analysis and mapping
- To reinforce the collaboration and cooperation between institutions and to innovate the approach of risk management from “protect all” to “live with”
- To know and manage actual exposure and vulnerabilities and improve CP plans
- To reinforce risk awareness and risk perception and to involve the population

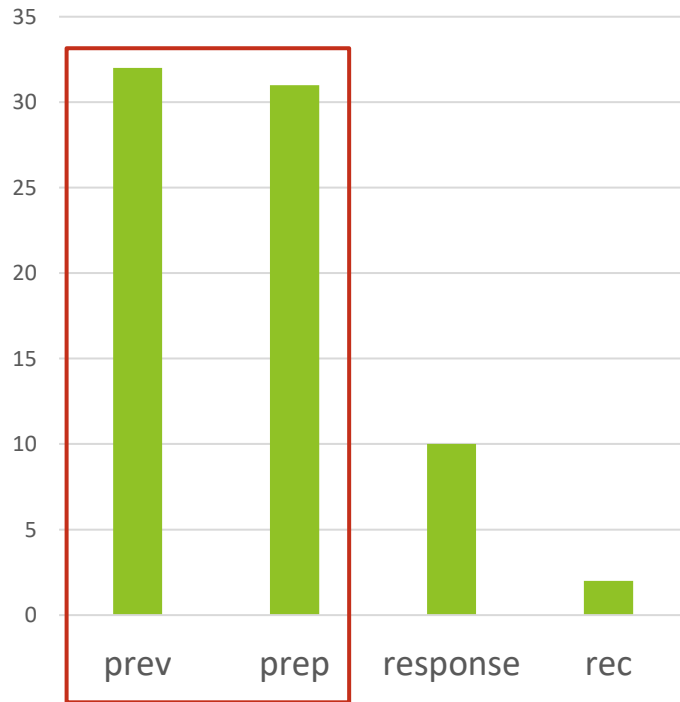
BUT ALSO..

- To improve Early Warning System
- To collect data after events supported by civil protection actors
- Improve the training for technicians

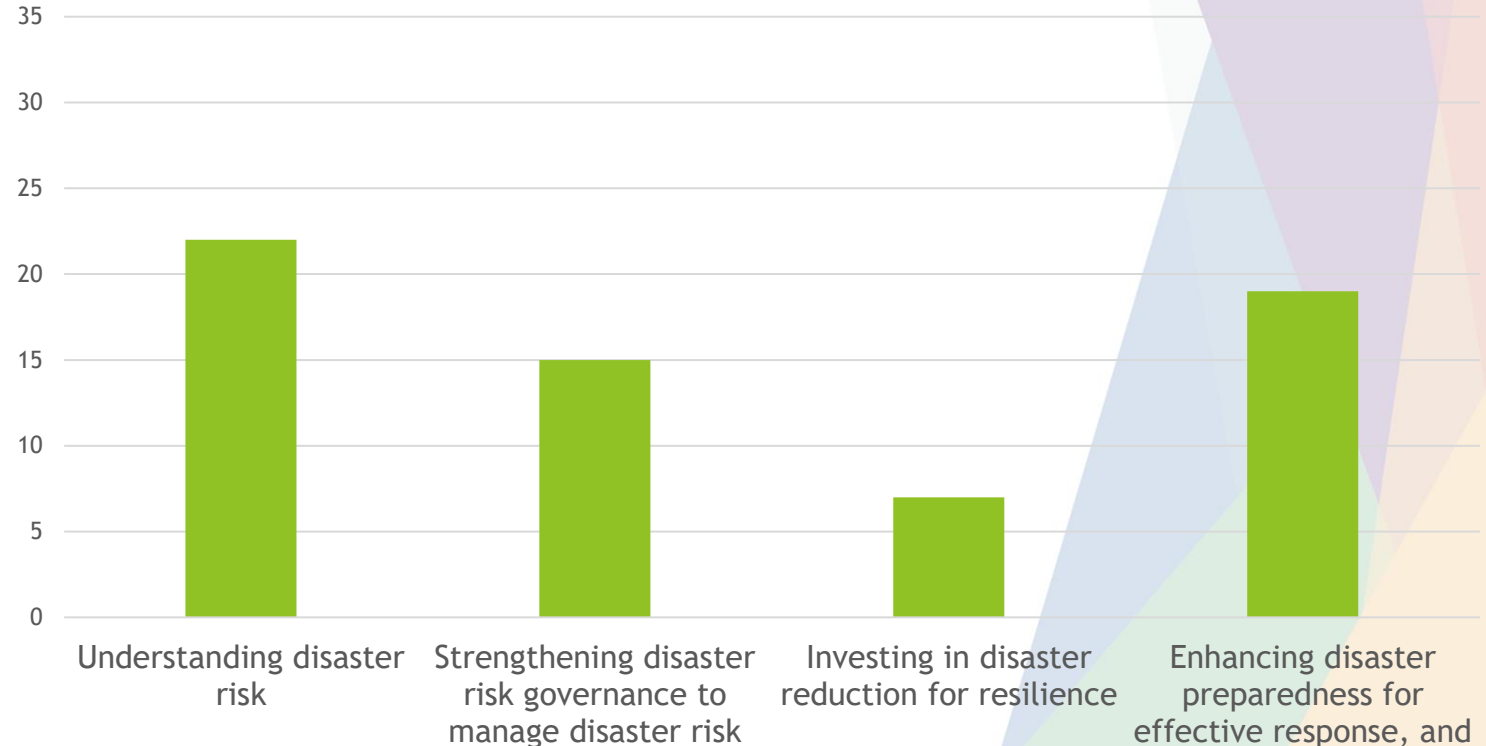


Requirements of civil protection and risk manager for facing CC

Needs/Priorities of risk managers



Needs Vs Phases of the risk management cycle



Needs Vs SFDRR priorities



Preliminary results

Need to reinforce the coping capacity and to reduce vulnerability and exposure, also by improving risk assessment

- Strengthen the collaboration
- Reinforce the risk knowledge and risk awareness
- Integrate planning



RECIPE

Thanks for your attention



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