	ENSURE PROJECT *Contract n° 212045*

ENSURE E-LERNING TOOL

F07
Vulnerability and Resilience

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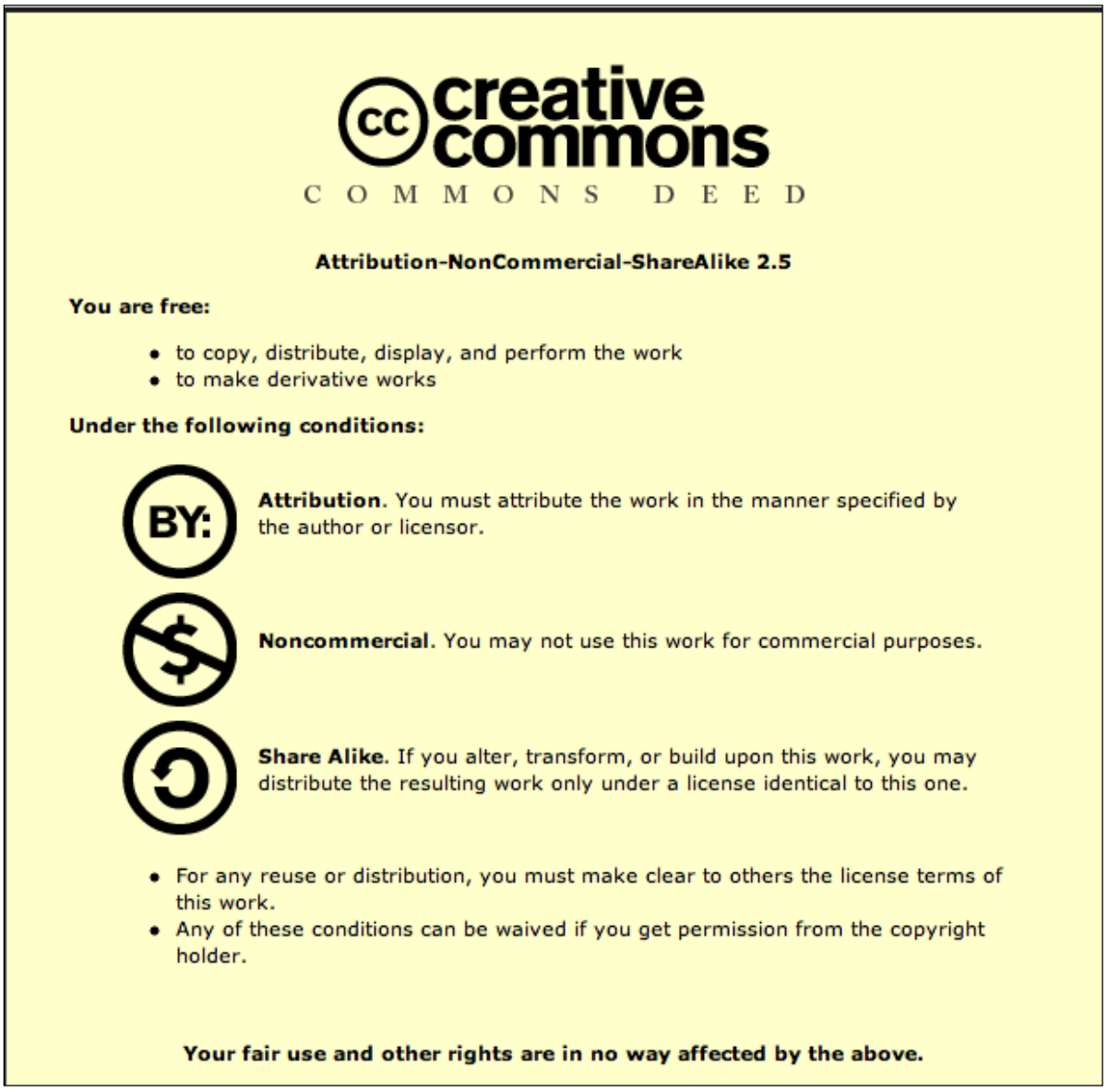
Activity 6.1 "Climate Change, Pollution and Risks"

Reference reports:

Del. 4.1: Methodological framework for an Integrated multi-scale vulnerability and resilience assessment (1.2, 2.1, 2.2)



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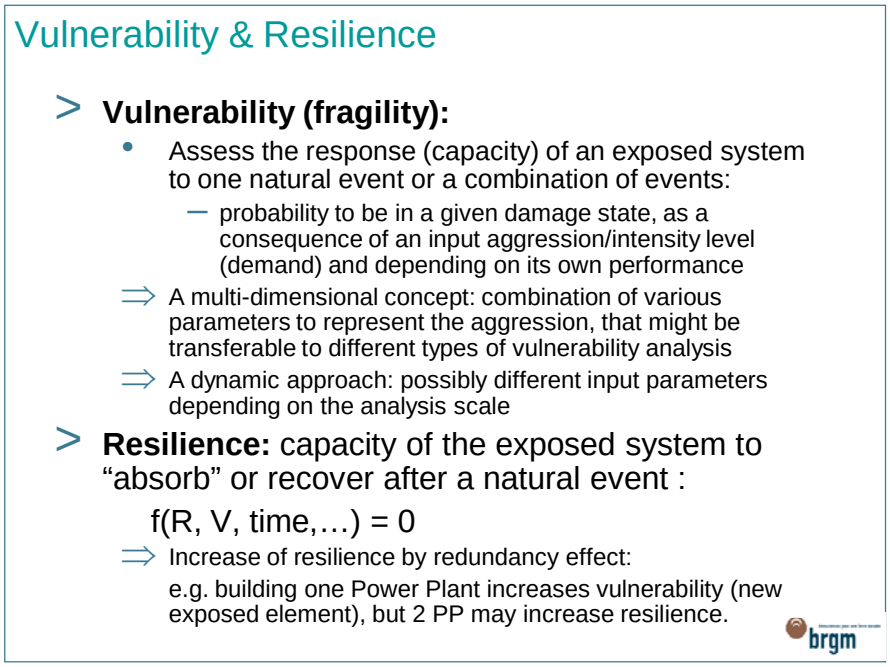
Vulnerability and resilience

In the project proposal, vulnerability was the main topic to be searched, with little consideration of other definitions that were considered in WP1 as part of the state of the art. Nevertheless during the project development, a consensus among partners was achieved regarding the need to make explicit the relevance of resilience. For the detailed discussion regarding the differences and overlapping meanings of vulnerability and resilience, it is worth to refer to the deliverables resulting from WP2; what is important here is to make clear how resilience entered in the Ensure project and how it is considered in the proposed integrated framework that will be described in subsequent sections of this report.



BRGM - ENSURE Kick-off meeting - Paris, June 30-July 1st, 2008

The main output of long discussions, readings and reflection is that resilience cannot be simply considered as the "flip-side" of vulnerability. In other terms, a resilient community is not just a community manifesting low levels of vulnerability. A community may be even vulnerable, particularly as far as physical vulnerability is concerned, and still be resilient in the aftermath of a disaster and manifest a high capacity to react and recover effectively. Also because what seems to emerge in literature is a different focus of vulnerability and resilience studies: the first are more oriented towards the identification of weaknesses, fragilities that make a given territory, a given community, a given country unable to resist the stress provoked by an "external" source. Looking at resilience we appreciate the capacities to react, to overcome the problems created by the same existence of vulnerabilities and to "bounce back" despite damages and disruption to ordinary life. Resilience entails the capacity to recover effectively, transforming the damage and losses into opportunities for a different territorial and environmental setting, in such a way that pre-event vulnerabilities will be reduced and the resulting societal, urban, and regional patterns are healthier and safer than before the event

impact. Authors like Handmer and Dovers, 1997 and Norris et al, 2008 have rejected the idea that a resilient community or a resilient city is simply a community or a city that is able to bounce back to pre-event conditions. Sometimes getting back to the exact pre-event conditions is just the opposite of resilience, particularly when high level of vulnerabilities characterized that condition. Instead, resilience has to do with the capacity to adapt to changes, to manage creatively uncertainty, to find resources, both material and immaterial, to face the consequences of a disaster.

Resilience is perhaps an even more dynamic concept than vulnerability, in that it addresses the capacities to innovate and the ability to strategically orient complex processes like those implied by emergency, recovery and reconstruction.

As just mentioned, literature on resilience is as vast as that on vulnerability. Also in this case the Ensure project needed to choose a direction of work, an interpretation cutting across the various definitions and alternative views available so as to be able to include resilience in the integrated framework.
The diagram in figure 1 represents the interpretation provided by the project.

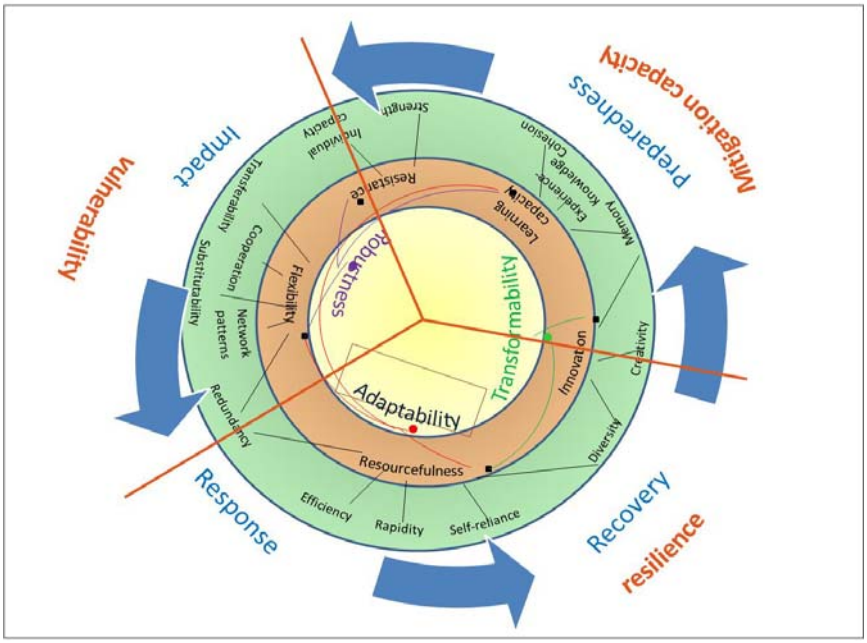


Figure 1: Diagram showing the conceptualization of vulnerability, mitigation capacity and resilience in the Ensure project

The framework for integrate multiscale assessment of vulnerability and resilience to natural hazard responds to the requirement of general theoretical advancement that was one of the two main objectives of the project. Combining the different pieces of the puzzle (or what can be recognised as such) into a methodological framework comprising the various aspects that were deemed important by the working group is by no mean a minor result, even though we are aware of the long way ahead before all parts of it will be actually operationalized in a satisfactory way.

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can be recognised as such) into a methodological framework comprising the various aspects that were deemed important by the working group is by no mean a minor result, even though we are aware of the long way ahead before all parts of it will be actually operationalized in a satisfactory way.

In figure 2 the framework is shown: as it can be clearly seen it is deployed over a plan where both the spatial and the temporal dimensions are evidenced. As for the spatial one, the scales at which both hazards and vulnerabilities should be appraised are represented in two distinct axes.

The reason is that not necessarily the scale at which hazards have to be analysed correspond to the scale at which the different types of vulnerabilities must be considered. For example, physical vulnerabilities are mainly addressed at the local scale, as the intrinsic fragility of structures, infrastructures, and people must be looked at in detail at the local scale. What appears at larger scale is the result of such analysis, in terms of comparison among places. As already mentioned, systemic vulnerability can be appropriately considered only linking the local to the large scale (provincial or county level to the regional an sometimes above regional). When it comes to consider the capabilities to recover effectively in a resilient fashion, all scales must be considered: what will be reconstructed is ultimately what has been locally damaged, but the needed resources cut across all levels of government and depend also on the type and strength of relationships among the affected places and a much wider region.

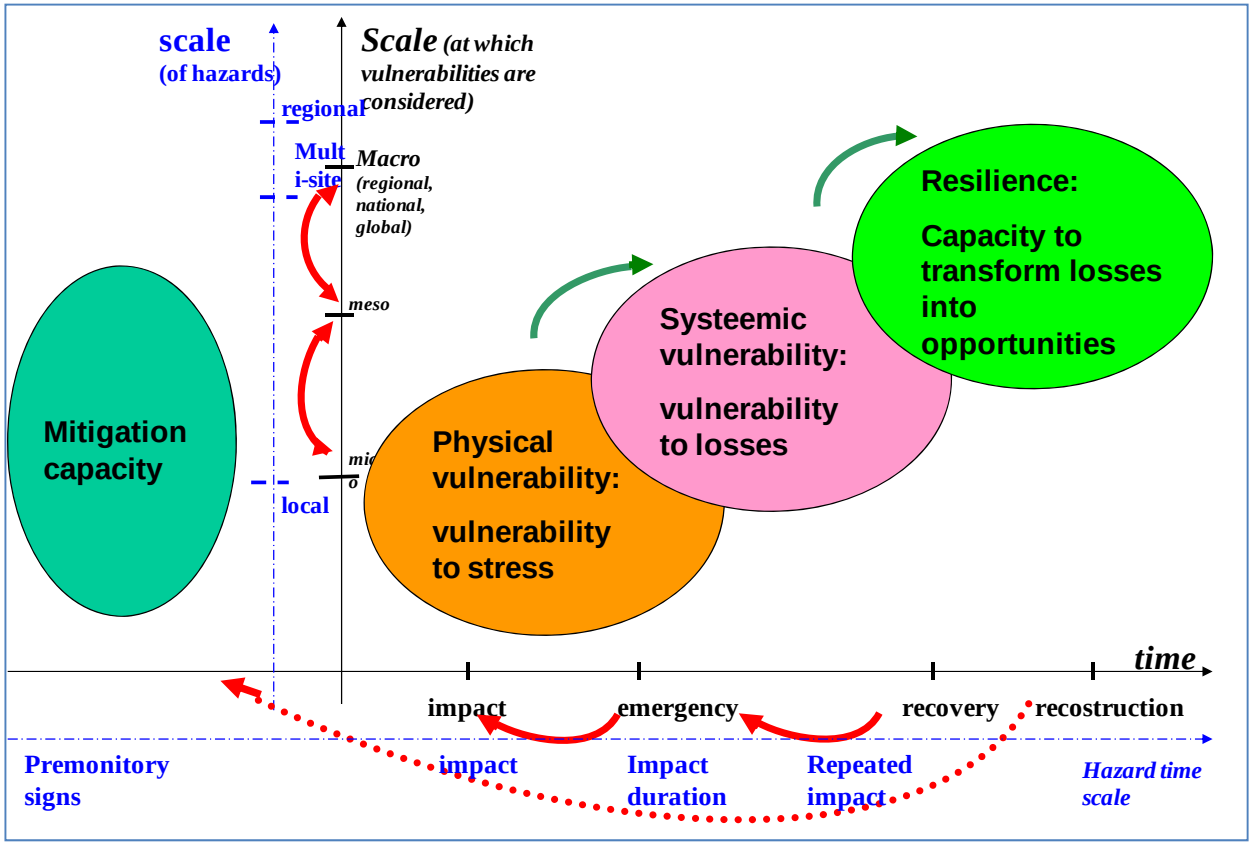

Figure 2: General representation of the integrated framework to assess vulnerability and resilience across time and scales

As for the temporal dimension, again, timing of hazards and vulnerabilities may differ: for example, the possibility of new occurrences of extreme events within a short period, when recovery is still going on, must be accounted for.

In the figure, it is shown how the various vulnerabilities and resilience are considered with respect to the phases of the disaster cycle. Before the impact, that is when a sufficiently long time has passed since the last big event, the mitigation capacities are considered. Rose (2004) suggests that it is more correct to talk about mitigation capacities in the period before the hazard impact, while resilience should define more appropriately capacity to recover from an extreme event. This is nevertheless a matter of deciding the most suitable definition; what is actually relevant here is the attempt to understand whether or not conditions to enhance coping capacity and resistance of a complex system exist or not and how they are manifested. At the impact, instead, the physical vulnerabilities play the major role: the direct physical damage that can be accounted for are strongly correlated on the one hand to the severity of the hazard, on the other to the level of physical fragility of artefacts and constructions. As the time from the impact passes, other forms of vulnerability gain relevance and, in particular during the emergency phase, precisely systemic vulnerabilities. Those express the response capacity (or lack of) not to the direct extreme event impact but rather the consequences of the latter, to the impairment in crucial systems and their components provoked by the physical damage. Finally, considering the time of reconstruction and recovery, resilience gain prominence: here again the response is not to the stress, but to the longer term induced, indirect, secondary effects it has produced. What we want to measure here is not merely a response capacity, but rather whether or not systems is able to recover by reducing pre-event vulnerabilities, to learn from the weaknesses that the event has revealed and to transform reconstruction into an opportunity to build and develop a better, safer and healthier place to live.

The red and green arrows represent the various connections and links that exist among the different types of vulnerability and resilience, in space and time. Those will be tackled in sections ahead.