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Toward a shared glossary for territorial risk management due to climate change

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ABSTRACT

The dynamics of demographic, industrial and economic growth that have occurred on a global scale since the industrial revolution have over time resulted in an increase in the frequency and intensity of hazards and in the levels of vulnerability of the exposed resources at local level. The need to counteract these phenomena has led to substantial international development of territorial risk management techniques with contributions from experts in different disciplines and which, to facilitate communication and exchange of information between professionals, has led to the construction of very similar methodological approaches and specialised glossaries.
This article was produced to contribute to meeting the need, which emerged during an ERASMUS+ European research project called CARE - Empowering Climate Resilience, in which numerous European and Latin American universities took part, to overcome the existing terminological differences between the different schools of thought in managing risk due to climate change, a European one, mainly oriented to spatial planning, and a Latin-American one, mainly based on social science. This contribution consists of proposing a set of clear and consistent definitions of the main words used for the territorial risk management due to climate change. As this glossary refers to the management of risks due to climate change, it has mainly been developed on the basis of the definitions indicated by the Intergovernmental Panel on Climate Change (IPCC).

1. WHY A SHARED GLOSSARY FOR TERRITORIAL RISK MANAGEMENT DUE TO CLIMATE CHANGE

The management of territorial risks is a global issue that has amplified its importance due to various phenomena that have increasingly affected human settlements since the industrial revolution and especially since the end of the Second World War. These phenomena consist mainly of demographic, industrial and economic developments which have caused a marked expansion of settlements and territorial infrastructures, with consequent increase in exposure to territorial risks of population, assets and activities (Bobrowsky, 2013; GFDRR, 2016). For about 30 years, the effects of climate change have been added to those processes, which are causing an increase in the type, frequency and intensity of the hazards and vulnerability of the exposed resources. The management of territorial risks due to climate change constitutes the main reference of this glossary, even if it can be used for the management of any type of territorial risk (IPCC, 2018a, 2019).

Territorial risk management requires the contribution of experts from different disciplines who must find a common methodological approach and language, to favour an effective integration of the relative knowledge, skills and practices and to achieve efficient communication in the development and implementation of policies, strategies and actions (GFDRR, 2014; UNDRR, 2019). Among the experts who deal with territorial risks there are also the urban and territorial planners, since risk prevention policies and the results of emergency interventions have a significant impact on the transformations of increasingly large parts of the territory. Furthermore, these issues are central factors in the construction of sustainable and resilient cities and territories, so they must be considered in ordinary planning practice. In fact, with climate change and pandemic phenomena, the issue of territorial risks is no longer a niche topic as it relates to some circumscribed phenomena and processes and affects ordinary urban and territorial planning.

Territorial risk analysis, which is the tool that underlies the techniques of risk management, has built up a rigorous and internationally agreed approach to the problem and language over time, even if for some terms there are slight differences (UNISDR, 2009; Menoni et al., 2012). Although it is a secondary aspect of territorial risk management compared to the development and implementation of contrast and adaptation strategies, actions and interventions, the possibility of sharing a broad and detailed terminology favours a more effective use of information and analysis and evaluation results of the cases dealt with.

This article has been prepared to contribute to meeting the need, which emerged during the development of a European project financed by ERASMUS+ funds and called CARE - Empowering Climate Resilience (https://www.erasmus-care.eu), in which numerous European and Latin American universities took part, to promote the interdisciplinary skills of HEI staff and students by developing innovative educational approaches to planning and to shape climate change resilient policies. Right from the design phase of the training modules the work group tried to overcome the problem of different terminology and, more widely, different approaches in risk management due to climate change among the different university disciplinary sectors: urban and territorial planning (Politecnico di Milano - Italy, Universiteit Twente - Netherlands, UC and UDEC - Chile), social sciences and territorial studies (UFPA and UFABC – Brazil, UDELAR - Uruguay), geography (UPO – Spain), environmental sciences and forestal/agronomic engineering (UNIBAGUE and UT – Colombia, UTE and UTEQ – Ecuador), Decision Support System and urban governance (POLIEDRA Politecnico di Milano - Italy and UNAL - Colombia) and community empowerment (UIM Unión Iberoamericana de Municipalistas – Spain and CRIC Centro Regionale d'Intervento per la Cooperazione Onlus – Italy).

Two main schools of thought have emerged, one mainly oriented to spatial planning, predominant among European universities, which aimed at the reduction of risk impacts starting from the prediction and prevention of its components of hazard, exposure and vulnerability and from the enhancement of adaptive capacities (Schmidt-Thomé, 2007; Menoni, 2011; Bobrowsky, 2013) and the second one based on the Social Theory of Risk (Giddens, 1990; Barrenechea et al., 2003), prominent in the Latin American academic context, which mainly focuses on the social component of vulnerability and considers risk as an outcome of the social perception and responsibility for decisions.

A great effort was made to integrate these cultural approaches, selecting a basic and restricted set of concepts and terms related to risk management and agreeing on a first shared definition, while for other terms it was not possible.

Starting from this preliminary exploration, it is intended to contribute to the improvement of a glossary for territorial risk management due to climate change by proposing definitions of those terms that are still discordant or that have not yet been explored, trying to take a step forward from the glossaries relating to climate change. We have proceeded on the basis of the most widely shared definitions on fighting climate change, such as those indicated by the Intergovernmental Panel on Climate Change (IPCC, 2014a, 2018b), integrating them with the indications of the glossaries prepared by the UNDRR (UNDRR, 2016, 2019), the Armonia EU funded project (Schmidt-Thomé, 2007), the ENSURE EU funded project (Menoni, 2011) and the Encyclopedia of natural hazards (Bobrowsky, 2013).

For the development of this glossary a "risk-thinking" approach was adopted, which focused attention on the analysis, assessment, action for territorial risk management, reassessment, and response, acknowledging uncertainty and achieving management objectives through a structured feedback process that includes stakeholder participation (IPCC, 2014b, 2019), and the two terms that characterise it, that is, those of risk and territory were defined first.

Risk: The term ***risk*** is meant as "the potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Risk results from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence" (IPCC, 2018b). Therefore, the term risk refers to adverse consequences of both shock events, such as natural disasters and other sudden and extreme events, and stress pressures, such as continuous and incremental changes to temperature and rainfall (Chambers and Conway, 1991; Jones et al., 2010).

Territory: The term ***territory*** means a complex system consisting of the totality of the elements and their relationships located on a defined portion of terrestrial space, which can be of an urban, rural and / or natural type. In particular, it consists of the set of resources, material and intangible, of a social, economic, cultural, environmental, organisational nature, the set of relationships and interactions that take place between the subjects (public and private, individual and collective, local and supra-local) present in it, the set of cognitive and material interactions undertaken by the subjects with the resources, the set of relationships between local and supra-local subjects and organisations (Dematteis, 1985; Magnaghi, 2010; Bonesio, 2011; Caroli, 2006).

The glossary has been compiled in four sections according to the main logical elements of the analysis and management of territorial risks, which are the components of risk, the phases of the risk cycle, the capabilities to reduce the risk, the responses for risk management. To make the definitions given more understandable, illustrative purposes related to two of the phenomena that most characterise climate change have been given, heat waves and floods.

2. THE COMPONENTS OF RISK

There are three main components of territorial risk and they are *hazard*, *exposure*, and *vulnerability*. These in turn are divided into further components that describe their characteristics more in detail.

The term ***hazard*** is defined as "the potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources" (IPCC, 2018b). The *hazards* could be

referred to climate-related physical events or trends (shocks and stresses) or their physical impacts (IPCC, 2014a). The *hazards* due to climate change are socionatural because they are associated with a combination of natural and anthropogenic factors.
The term *hazard* indicates an event or phenomenon that can occur individually or in conjunction with others, therefore combined or sequential in their origin and effects, the severity of which depends on the probability with which it can occur, its intensity, its frequency and the extent of the affected area. Its occurrence can generate negative *impacts* on the territory, depending on the severity of the *hazard* itself and the degree of *exposure* and *vulnerability* of the affected area.
The term ***exposure*** is defined as “the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected” (IPCC, 2018b). *Exposure* therefore constitutes the total value of people, livelihoods, infrastructures, animal and plant species, ecosystems and environmental, economic, social, and cultural services-goods-resources potentially affected by a *hazard*, because of their location in or connected to *hazard*-prone areas. It depends on the quantity and value of the exposed elements that could be negatively impacted at the same time by one or more *hazards* on their structures, functions, and responsiveness.
The term ***vulnerability*** is defined as “the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including *sensitivity* or *susceptibility* to harm and lack of capacity to cope and adapt” (IPCC, 2018b). *Vulnerability* constitutes the propensity or predisposition of a territory to be negatively impacted by a *hazard* and therefore to suffer *losses* and *damage* when it is exposed to a *hazard*. The *vulnerability* of a territory depends on socio-economic, environmental and institutional factors and on the characteristics of the built environment, the uses of resources and the activities that take place there and can be divided into two types of interconnected factors, namely *sensitivity* and *systemic vulnerability*, which both express the *resistance capability* of a territory to *hazard*, and the *capability for protection*, *recovery*, *reconstruction* and *preparation*, which constitute the capabilities that are most recognised in the concept of resilience (IPCC, 2012; Menoni et al., 2011).
Sensitivity is the predisposition of a territory to suffer direct negative *impacts* due to a *hazard* according to its intrinsic characteristics of human beings, infrastructure, environmental elements and their content. This word is mainly used in studies on climate change, while in studies on natural hazards the words ‘susceptibility’ or ‘fragility’ or ‘physical vulnerability’ are mainly used. An example of a person's *sensitivity* factor to heat waves is his or her physical condition which influences the physiological thermoregulation capacity as the environmental temperature varies,

while a *sensitivity* factor of a settlement to floods is given by the levels of material and structural stability of embankments and buildings.

Systemic vulnerability expresses the difficulty of a territory in guaranteeing its functionality when it is affected by the consequences of the *direct impacts* of a *hazard*, that are defined as *indirect impacts*, such as the worsening of the functioning of *critical infrastructures* or a significant increase in the demand for resources and services (Menoni et al., 2011). It depends on the balance between the resources available in the *emergency phase* following the occurrence of a *hazard* and the need for these resources by the community involved in the hazardous event.

Systemic vulnerability also considers the negative effects of a functional type that physical *losses* and *damage*, occurring on a local scale, cause at the higher scales and therefore it increases its importance as time passes after the *hazardous event*. It depends on the level of resources and services useful in the event of an emergency and on the degree of dependence of the territory on damaged *critical infrastructures*. For example, *systemic vulnerability* to heat waves depends on the relationship between the provision of services and resources needed by vulnerable subjects - such as usable health (hospitals, first aid, ...) and social (institutions, associations, solidarity networks, ...) services, the delivery services of water, food and home equipment, the activation of cooling systems, ... - and the number of people who are in critical conditions during these events. *Systemic vulnerability* to floods is instead given by the interruption of the road connections essential to reach the rescue facilities (hospitals, firefighters, civil protection, ...). The systemic vulnerability to floods, on the other hand, depends on the possibility that the road connections essential to reach the rescue facilities (hospitals, firefighters, civil protection, ...) can be interrupted.

Critical infrastructure means a system or parts of it which are essential to maintain the health, safety and economic and social well-being of citizens and the vital functions of society and whose damage or destruction, even partial or temporary, can have a weakening impact, also due to possible domino effects, of the whole territory (Directive 2008/114/EC). *Critical infrastructures* are the networks for the extraction, production, transmission and distribution of energy, telecommunications and telematic networks, networks for the water supply and wastewater management, health facilities (clinics, hospitals, service networks, ...), air, sea, rail and road transport and the distribution of basic necessities, the production of foodstuffs, banks and financial services, organisations and structures for security and civil protection (law enforcement, armed forces, urban surveillance and civil protection, ...) and the central and local government structures.

The ***impact*** is a “consequence of realised risks on natural and human systems, where risks result from the interactions of (…) *hazards* (…), *exposure*, and *vulnerability*” (IPCC, 2018b). In fact, *impacts* are caused by *hazards* and their magnitude and extend depend on both the severity of *hazard* and the degree of *exposure* and *vulnerability* of impacted natural and human systems. “*Impacts* generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social, and cultural assets, services (including ecosystem services) and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial” (IPCC, 2018b).

The *impact* can be a qualitative-quantitative modification of available and potential assets, activities and natural and anthropogenic resources, material and intangible, and the health conditions of the people involved.

An *impact* can be direct or indirect.The modification, mostly of a physical and material nature, caused by a *hazard* which occurs in close spatial-temporal concomitance with it, such as the collapse of a building or a pylon of the electricity grid due to an earthquake is a ***direct impact***. An ***indirect impact*** is the modification that occurs subsequently, even over a long period of time, due to a *direct impact*, such as the interruption of the electricity supply due to the *damage* to a pylon following an earthquake.

Impacts, when negative, can be expressed in terms of *losses* and / or *damage*. As some authors specify, *losses* and *damage* have been taken to refer both to *impacts* and *risk*, considering in the first case observed harm from *impacts* and, in the second case, projected harm from *risks* (Mechler et al., 2018).

The ***damage*** is the result of a negative (observed) *impact* or a (projected) *risk* due to the elimination or quantitative and functional reduction of a non-unique asset or of any other element that has an economic, emotional and moral value, see for example the destruction or putting out of use of an infrastructure, the loss of functionality of services, the increase in diseases, the degradation of ecosystems. The ***loss*** is the result of a negative (observed) *impact* or a (projected) *risk* that cannot be assessed in monetary terms because it affects people, such as their death or the loss of basic physical or mental faculties, or goods of a unique nature, such as animal and plant species and monuments of inestimable value.

3. THE PHASES OF THE TERRITORIAL RISK CYCLE

The territorial risk cycle is a process that does not end with the complete recovery of the conditions prior to a *hazardous event* but continues when, if such condition should occur, there are no more known or predictable *hazards* that constitute problems, or when unpredictable shocks and stresses because of unavoidable uncertainty conditions should occur. The phases that characterise the risk cycle are of two types, the first type concerns the phases that envisage actions of contrast, adaptation and reconstruction and are the *pre-event*, *impact*, *emergency*, and *post-emergency* phases while the second type concerns the period of ordinary management of a territory, when a new *hazardous* *event* is not expected or not predictable and at the same time the reconstruction of what has been suffered from previous *hazardous events* has been completed. In this regard, different parts and areas of a territory that has suffered a *hazard* may be in different phases over time, so that, for example, in some areas it may still be in a situation of reconstruction while in other areas this situation has been finished.

The ***pre-event phase*** is the one that precedes a potential *impact*, in which precursor or premonitory events of a *hazard* occur, for which a community is alerted and prepared to face it to reduce its consequences. The effectiveness of this phase depends on the *preparation capability* of the *vulnerable exposed* area. For example, in the pre-event phase of a heat wave, the temporary transfer of the most sensitive individuals to their own or third party homes located in cooler places, where available, is promoted, while in that of a flood, the flood wave upstream of the considered area is monitored and the population alert tools are activated.

The ***impact phase*** is the one in which one or more *hazards* occur that can generate *direct impacts* on people and assets according to their *exposure*, *sensitivity* and *self-protection capability*. *Direct impacts* on *critical infrastructures* can trigger *indirect impacts* on the territory depending on the *systemic vulnerability* of the territory itself. *Sensitivity* and *systemic vulnerability* influence the *resistance capability* of the system (Menoni et al., 2011, 2012; IPCC, 2012). For example, in the *impact phase*, a heat wave can cause illness (*direct impact*) to elderly people or with thermoregulation problems (high *sensitivity*) and / or whose mobility problems do not allow them to drink or independently change their clothing (low *self-protection capability*), thus causing an increase in the demand for rescue services (high *systemic vulnerability*). In the *impact phase*, a flood can lead to the collapse (*direct impact*) of a road section with low structural stability (high *sensitivity*) where no elements for the construction of water barriers (low *self-protection capability*) are available thus causing the interruption of essential road connections (high *systemic vulnerability*).

The ***emergency phase*** follows the *impact phase* when, as a result of the *direct* and *indirect impacts* suffered, problems arise in the performance of the activities of a territory, in particular for *critical infrastructures*, and there is a strong increase in the demand for resources and services. This phase is characterised by the implementation of interventions to restore or upgrade *critical infrastructures* and those of rescue, shelter and safety of people and assets damaged due to poor *resistance* and *self-protection*. The effectiveness during the *emergency phase* depends on the *recovery* and *protection capabilities* of the territory itself. For example, in the *emergency phase* of a heat wave, elderly people with mobility difficulties can be given social and health care at home (high *protective capability*) to hydrate and cool their homes. In the event of floods, any damage to the electricity network can be subject to immediate repairs while residents who have unusable homes can find accommodation in temporary homes (high *recovery capability*).

The ***post-emergency phase***, or *reconstruction phase*, begins when the *critical infrastructures* have been repaired and the emergency requests are permanently met, while the restoration, recovery and reconstruction of the remaining damage must be completed, and the resumption of economic, productive and service activities supported. The effectiveness in the *post-emergency phase* depends on the *reconstruction capability* of the territory itself. For example, after a heat wave, when sick people have been rescued, damaged trees must be recovered or replaced, while after a flood it is often necessary to provide definitive housing solutions for the displaced (high *reconstruction capability*).

The ***ordinary phase***, so called with respect to a territorial planning approach, since the term *peace phase* is more widespread in the field of Natural Hazards, occurs when the *impact* on the territory of a *hazardous event* has been completely absorbed and there is no prediction of imminent occurrence of a new one or when unpredictable shocks and stresses because of unavoidable uncertainty conditions could happen. In this phase, the territory is in a normal state and can therefore implement effective *risk* reduction, prevention and adaptation strategies and actions by acting on *hazard*, *exposure* and *vulnerability*, with appropriate attention to temporal and spatial dynamics that characterise the three *risk* components, and, where shocks and stresses are unpredictable because of unavoidable uncertainty conditions, by focusing on system *vulnerability*. More than in the other phases, in this phase a co-evolutionary resilient vision of the interventions can be adopted and the system can seek not only to manage the risk conditions but think about the evolution of the territorial system in the long term.

4. RISK REDUCTION CAPABILITIES

Risks reduction capabilities are a set of complementary capabilities that need to be integrated as much as possible to increase their systemic effectiveness and whose overall effects lead to a reduction in intensity and / or modification of the characteristics of the *impacts* due to a *hazard. Those capabilities are obtained through interventions on hazard, exposure and vulnerability factors related to both known and unpredictable risks*. They are the *capabilities of resistance, protection, recovery, reconstruction and preparation* (Wisner et al., 2004, Schmidt-Thomé, 2007).

Resistance capability is the ability of a territory to counteract the generation of *direct and indirect negative impacts* and therefore to preserve its structural and functional integrity after the occurrence of a *hazardous* event. It depends on *sensitivity* to *direct impacts* and *systemic vulnerability* to *indirect* ones. For example, the ability to withstand the illnesses of a heat wave is greater in healthy and young people than in the elderly or sick with thermoregulation problems (*sensitivity*), while in the event of a flood the *resistance capability* to ensure a good supply water (*systemic vulnerability*) is lower where the related *critical infrastructures* have problems of structural and / or functional stability (*sensitivity*).

Protection capability is the ability of a territory to use defence devices and / or behaviours to cushion the *direct impacts* of a *hazardous event*, both with autonomous actions (self-protection), and with external help (care, rescue, safety, ...). These capabilities are influenced by personal conditions of a psychological / cognitive, mobility, socio-economic, cultural nature, which can facilitate or hinder the implementation of protective behaviours, and by external factors of a technological, localization and organizational nature, which can favour the use of protections for people and assets in critical situations. For example, the *self-protect capability* with respect to illness due to a heat wave is lower in people whose mobility difficulties do not allow them to drink or change their clothing independently. The *protection capability* is greater where there is a social and health care service at home to support the hydration of people and the cooling of the rooms. On the other hand, in the event of a flood, the *self-protection capability* is low where the inhabitants of an area that is about to be reached by a flood wave are not equipped with elements capable of forming water barriers, while it is high where the exposed critical points of an electricity network are promptly secured by the competent entities.

Recovery capability is the ability of a territory *damaged* by a *hazardous event* to promptly recover a satisfactory operating condition and, pending or unable to complete the restoration of *critical infrastructures*, to activate responses, even temporary ones, to ordinary and extraordinary requests for resources and services for the rescue, recovery, shelter and safety of people and assets. It depends on the ability to carry out the necessary interventions in a timely manner to repair the damage and the ability to know, organise and mobilise the resources of the territory to respond to unforeseen situations. For example, the *recovery capability* from a heat wave is greater where it is possible to activate rescue and care services for people who suffer from the heat or have suffered from illness. The *recovery capability* from a flood is greater where dedicated financial resources are available for carrying out repairs to damaged *critical infrastructures*.

Reconstruction capability is the ability of a territory to return to a normal condition after the occurrence of a *calamitous event* through the completion of the restoration and development interventions of what has been damaged or interrupted, including economic and productive activities and services. It depends on the ability to repair all the *damage* suffered and the ability to know, organise and mobilise the resources of the territory to effectively support reconstruction. For example, the *reconstruction capability* of agricultural activities affected by droughts is greater where farms are covered by insurance policies against natural disasters, while the *reconstruction* *capability* after a flood is greater where there are sufficient financial and economic resources to repair or rebuild damaged buildings.

Preparation capability is the ability of a community to foresee and prepare the actions to be activated during and after the occurrence of a *hazardous event*, in order to cushion its negative *impacts* as much as possible. It depends on the knowledge of the characteristics of the potential *risk* and the organisation of behaviours and actions that can directly and indirectly influence *risk* components (*hazard*, but most of all *exposure* and *vulnerability*). For example, the *preparation capability* for a heat wave is greater where exposed subjects are sensitised on good hydration rules to follow in the hottest periods of the year, while the *preparation capability* for a flood is greater where the communication methods of the organisational aspects to the subjects involved in the management of the emergency are well defined.

5. THE RESPONSES FOR RISK MANAGEMENT

The term ***responses*** indicates the policies, regulations, strategies, actions and interventions with which a community and the delegated institutions face territorial *risks* to reduce and, if possible, eliminate them and, when *risks* are unpredictable, to reduce the system *vulnerability* enhancing *risks reduction capabilities*. Therefore, this purpose can be achieved by acting in an integrated way on the causes and effects of *risks* through the reduction and elimination of situations and factors of *hazard*, *exposure* and *vulnerability* and also through the improvement of the *capabilities* of *resistance*, *protection*, *recovery*, *reconstruction* and *preparedness* of the involved territories.

Hazard reduction involves decreasing its frequency, duration and / or intensity. For example, the *hazard* of heat waves can be reduced by acting on the shape (height, roughness, density) of the buildings, in order not to hinder air flows, on the optical and chromatic characteristics of their surfaces, to increase reflecting power, on the vegetation cover and the permeability of the soils, to favour the evapotranspiration processes. The flood *hazard* can be reduced instead through the construction of river accommodation works, much better if based on nature-based solutions, for the reduction of the flow rate (rolling tanks), for the control of the solid transport (restraining bridles), for the defence against erosion (banks of support).

Exposure reduction involves the reduction or elimination of the presence (permanent, prolonged or short) of goods, people and activities in the areas affected by a *hazard*, starting from the subjects who remain there for longer to reside or work. For example, *exposure* to heat waves can be reduced through the transfer of elderly and children to cool places for their vacations during the hot period of the summer season or through their temporary movement during emergency phases in air-conditioned spaces (commercial centres, cooled public areas, ...). Flood *exposure* can be reduced through the evacuation of exposed people to safe collection areas, the temporary transfer of people and goods to safe temporary homes and spaces, the permanent relocation of people, goods and activities to non-exposed areas to hazard.

Vulnerability reduction involves the reduction or elimination of the vulnerabilities and factors of vulnerability of potentially *exposed* assets and people, aiming to reduce *damage* and *losses*.

A first form of *vulnerability reduction* concerns the actions to increase the *resistance capability* of a territory to a *hazard*, decreasing its *sensitivity* with respect to the relative *direct impacts* and its *systemic vulnerability* to the indirect consequences of the *damage* suffered. The decrease in *sensitivity* can be obtained by improving the intrinsic characteristics of a territory. The decrease in *systemic vulnerability* can be achieved by increasing the supply of resources and services useful in the event of an emergency and reducing the degree of dependence of a territory on *critical infrastructures* that can potentially be *damaged* after a *hazardous* event. Possible responses to increase the *resistance capabilities* to heat waves are the improvement, through medical treatment, of the thermoregulatory capacity of heart patients (*sensitivity*), the increase in the availability of food to meet the dietary needs in case of subsistence crop loss (*systemic vulnerability*) and improvement of the efficiency of irrigation systems to be able to irrigate agricultural crops even in dry periods (*systemic vulnerability*). Responses that increase the *resistance capabilities* to floods are those that improve the structural stability of bridges, homes and other territorial infrastructures (*sensitivity*) and increase the availability of secure infrastructure connections to reach the rescue points (*systemic vulnerability*).

A second way of *reducing vulnerability* is obtained with actions that increase, where a territory is not resistant enough, the *capability for protection, recovery, reconstruction and preparation*.

The increase of the *protective capability* can be obtained by improving the psycho / cognitive, mobility, socio-economic and cultural conditions in the population that facilitate the execution of self-protective behaviours and by strengthening the technical, localisation and organisational conditions necessary to activate the protections in case of hazardous. For example, some possible responses to increase the *protective capability* of a territory against heat waves are the technical solutions that facilitate the elderly with mobility difficulties to quench their thirst and activate the cooling in their homes rather than the strengthening of irrigation systems for being able to supply water even in dry periods. Responses that increase the *protective capability* to floods are instead those that provide the inhabitants located in *sensitive* areas with devices for the construction of temporary barriers or those that activate a defence for the maintenance of *critical infrastructures exposed* to a *hazard*.

The enhancement of the *recovery capability* can be achieved by improving the technical, urban, environmental, economic-financial factors, which affect the feasibility of repairs and construction interventions of *damaged* essential services, especially relating to *critical infrastructures*, and by enriching knowledge, skills, organisation, and management of existing or potential resources of a territory for rescue and safety operations. In this regard, it is necessary to consider the higher decision-making levels since the resources necessary to restore local conditions come from the different levels of government and also depend on the type and strength of the relationships between the affected places and the wider concerned region (Menoni et al., 2011). For example, a response that increases the *recovery capability* in the event of heat waves is the strengthening of the interconnection of electricity dispatching networks to ensure its availability in case of a shortage of water flows. A response that increases the *recovery capability* in the event of floods is the sharing of knowledge and skills of institutional and non-institutional subjects who carry out rescue operations in the emergency phase (Civil Protection, associations of health volunteers, ...).

The increase in *reconstruction capability* can be obtained by improving the technical, urban, environmental, economic-financial factors that affect the feasibility of repairs and reconstruction of *damaged* infrastructures and by enhancing knowledge, skills, organisation and management of existing and potential resources in the area to support the resumption of interrupted economic-productive activities and services. *Reconstruction capability* can be improved by considering the weaknesses that a territory has revealed during a past event and by seizing, in reconstruction, the opportunities to build a better and safer place to live (Rose, 2004). For example, a response that increases the *reconstruction capability* in the event of heat waves is the spread of insurance protections by farms to compensate for *damage* suffered due to droughts, while a response that increases the *reconstruction capability* in the event of floods is the improvement of design and technical solutions for the consolidation and reconstruction of *damaged* buildings.

The increase in *preparedness capability* is achieved by improving the knowledge of *risk* conditions, through more precise forecasting systems, with appropriate attention to temporal and spatial dynamics that characterise risk, and, especially when shocks and stresses are unpredictable because of unavoidable uncertainty conditions, by focusing on system *vulnerability* and enhancing the awareness of the involved subjects, the promotion of appropriate behaviours to mitigate the *impacts* and the planning of emergency procedures. For example, an increase in the *preparedness capability* for heat waves is obtained through an arising awareness of the hydration rules of vulnerable subjects, while the increase of the *preparedness capability* in case of floods is obtained through the development of emergency plans to organise communication and emergency operations during the weather alert.

6. FINAL REMARKS

Sharing a glossary constitutes, in various scientific and disciplinary fields, one of the first problems that experts who have different scientific-cultural approaches must face when they must carry out a common task. Over the last 3 decades, this type of problem has taken on different connotations with the ever-increasing internationalisation of research and professional works and editorial products. In fact, on the one hand more and more international research groups and scientific associations have shared their approaches and terminologies, thus converging towards the drafting of common glossaries; on the other hand, more and more new networks have been created which connect different realities and which therefore require a comparison of existing glossaries to develop new ones.

In research activities it is often not possible to share a common glossary and, when this happens, most of the time it is shared at the end of the work. This is because sharing a glossary is not a simple terminological issue but also requires sharing the approach and foundations of the research or professional activity to be carried out.

This article was written to respond to a need that the authors strongly felt during the research CARE - Empowering Climate Resilience, a need that began to arise about 15 years earlier during the research INTERREG–MEDOCC QUATER - Qualité dans le territoire and in some subsequent research of national interest on these issues. Thus, during the CARE project, what was a shared approach between European partners, due to a reference framework that was built up over years of scientific activity at European level and which has been enriched with numerous neologisms to take into account the increasingly articulated, in-depth and innovative policies and strategies that have been developed and implemented over time, was compared with a different approach proposed by some of the Latin American partners.

In drafting this glossary, the main aspects that should characterise the plans, strategies and actions aimed at managing the territorial risks associated with climate change have been considered. First of all, a co-evolutionary resilient vision of the interventions to be implemented was taken as a reference, which requires thinking about them within an ever-evolving process that seeks to transform crises into development opportunities (Davoudi et al., 2013; Holling, 1973). This type of vision does not only involve the achievement of a high resilience from natural and / or anthropic disasters and shocks, but also considers the evolution of the territorial system in the long term. This characteristic of resilience requires citizens to share not only the objectives of the change but also the usefulness of the change itself and therefore the predisposition to act on potential shocks and stresses by anticipating changes. Secondly, the search for a profitable and efficient relationship of actions related to risk prevention and post-disaster recovery both in the emergency phase and in the subsequent phases was considered as an indispensable strategic objective. In particular, the ability to intervene in the reconstruction phase with actions that reduce risk levels is a factor of considerable efficiency in the use of resources.

Finally, the involvement of the population in decision-making and implementation aspects in all phases of the risk cycle was considered as a very important factor in achieving a strong capacity for intervention. In this regard, the construction of a high capacity to intervene on potential risks makes it possible to acquire a greater ability to deal with uncertainty and therefore to recover from the possible occurrence of unexpected phenomena.

The terminological differences that were addressed mainly concerned the implementation of territorial risk management actions, which are strongly connected with the planning processes. This glossary proposal is therefore a particularly useful tool for urban and territorial planning experts.

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