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The Emergency Plan for the use and management of the territory

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Land Use, Mobility and Environment

Special Issue 1.2021

THE EMERGENCY PLAN FOR THE USE AND MANAGEMENT OF THE TERRITORY

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Editorial correspondence
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

The cover image is a photo of the landslide that hit the municipality of Amalfi (Italy) in February 2021.

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TeMA Journal of
Land Use, Mobility and Environment

Special Issue 1.2021

THE EMERGENCY PLAN FOR THE USE AND MANAGEMENT OF THE TERRITORY

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Spatial knowledge for risks prevention and mitigation

The civil protection planning of the Abruzzo Region

Donato Di Ludovico [a]*, Luana Di Lodovico [b], Maria Basi [c]

[a] Department of Civil, Construction-Architectural and Environmental Engineering
University of L'Aquila, L'Aquila, Italy
e-mail: donato.diludovico@univaq.it
ORCID: https://orcid.org/0000-0002-4650-4808
* Corresponding author

[b] Department of Civil, Construction-Architectural and Environmental Engineering
University of L'Aquila, L'Aquila, Italy
e-mail: luanadilodovico@hotmail.it

[c] Abruzzo Region
Risk Prevention of Civil Protection, L'Aquila, Italy
e-mail: maria.basi@regione.abruzzo.it

Abstract
The scientific research described in this paper concerns the theme of Civil Protection Planning at Regional level and Disaster Risk Management. In particular, it concerns the definition and experimentation of a particular model of basic Knowledge System.
This model, which has been tested within the definition and predisposition of the 'Knowledge elements of the Abruzzo Region territory and civil protection organization of the Abruzzo Region (It)', is the result of a continuous and dynamic technical-scientific action, whose structure must necessarily be flexible in order to collect and analyse data and information concerning themes, the risks, which are constantly changing. In the research, an original analytical methodology of the Knowledge System has become the basis for the experimentation of a Regional Management Risk Plan (case study Abruzzo Region), a part of the Regional Civil Protection Plan, which allows to identify the Hotspots, i.e. areas characterized by very high and probably simultaneous risks, in which it is strictly necessary to identify prevention and mitigation interventions, the 'Territorial Prevention and Recovery Projects' that concern the structural activities of civil protection. The next steps will concern the definition of the methodology for the construction of a Digital Knowledge Platform for the establishment of a Spatial Information Modeling.

Keywords
Civil protection pan; Disaster risk management; Knowledge system.

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1. Introduction

A research of the University of L'Aquila (ICEAA Department) carried out in collaboration with the Abruzzo Region (It) is addressing the issue of the role of knowledge in the context of Civil Protection Planning, oriented in particular to the study of a Regional Management Risk Plan (RMRP), a very specific plan that can be considered an element of Civil Protection Planning. The RMRP, which is based on an important Knowledge System focused on Multi-Risk (Gallina et al., 2016; Kappes et al., 2012), relates to the general theme of Disaster Risk Management (DRM), i.e., a control task with many actors, factors, and scales, which is becoming increasingly central in the context of Civil Protection Planning due to both climate change and catastrophic events that have repeatedly affected areas such as central Italy, particularly the Abruzzo Region (Di Ludovico & Di Lodovico, 2020; Poljanšek et al., 2017; Norton et al., 2015; Rasmussen, 1997).

Over time, Civil Protecion Planning has taken the form of a collection of different activities used to protect populations from both man-made and natural disasters (Alexander, 2002). Modern civil protection and related planning, which emerged from 'civil defense' practices, has focused on managing populations, primarily through a top-down authoritarian approach. It has moved beyond command and control practices, drawing rather from practices of information sharing, collaboration, and distributed efforts among responsible organizations. This is also seen in the European Union, which focuses on processes, civil protection mechanisms rather than planning (Prior et al., 2016). Thus, planning is devolved to the member states, with no real cross-border coordination.

In Italy, in 2018 came into force the new Italian Civil Protection Code, the Legislative Decree n. 1 of 2018 - DLgs 1/2018 (CPC, 2018), which aims both to simplify and coordinate all civil protection activities, and to ensure an operation, in the emergency phase, linear, effective and timely.

In particular, art. 2 describes all the structural and non-structural Civil Protection activities. The structural activities are those related to the definition of guidelines for prevention policies, programming and execution of interventions aimed at the mitigation of natural risks or arising from human activity. Among the non-structural activities there are alerting, training, communication and information and there is also the planning of civil protection, that is the set of non-structural prevention activities, based on forecasting activities and, in particular, on the identification of scenarios, with the aim of:

- to the definition of operational strategies and model of intervention in relation to the optimal areas;
- to ensure the necessary information link with the structures in charge of alerting the National Service;
- to the definition of communication flows between the components and operational structures of the National Service concerned;
- the definition of mechanisms and procedures for the revision and updating of planning, for the organization of exercises and for the information to the population, to be ensured also during the event. (art. 18; CPC, 2018).

The Civil Protection planning process, as defined by DLgs 1/2018 (art. 18), also includes:

- the participation of citizens, individual or associated, in the process of drawing up the plan;
- the coordination of civil protection plans with the plans and programs of management and protection and rehabilitation of the territory and the other sphere of strategic territorial planning;
- the integration between the various civil protection systems of the different territories.

The coordination of the Civil Protection Plan with the plans of management and protection and rehabilitation of the territory, as well as with the territorial strategic ones, underlines the importance of the Knowledge System (Di Ludovico & Fabietti, 2017) that is the basis of planning, in particular the knowledge of risks (multi-risks). In fact, the Knowledge System can be seen as the result of a continuous and dynamic technical-scientific action, whose structure must necessarily be flexible in order to collect and analyse data and information concerning issues, risks, that are constantly changing. A Risk Knowledge System can only be thought of as a

dynamic system. This aspect requires that the civil protection planning, but also the coordinated territorial, environmental and landscape planning, acquire the character of flexibility (Di Ludovico, 2017).
Therefore, also for the Regional Management Risk Plan, as part of a broader Civil Protection Plan, the Knowledge System assumes a primary role, from which it is possible to deduce the Risk Scenarios and define prevention actions and mitigation projects, thus allowing the RMRP to acquire a function that straddles the structural (risk mitigation) and non-structural (risk prevention) functions of civil protection.
Section 2 describes the experience conducted in scientific research on the construction of a Knowledge System for civil protection planning and in particular for a Regional Management Risk Plan in which the theme of risk in its various components (Hazard, Vulnerability, Exposure) is central. Section 3 briefly defines the contents of the Regional Management Risk Plan. The article closes with a section on conclusions.

2. Knowledge for civil protection planning

As seen in the introduction, the Civil Protection planning process defined by the DLgs 1/2018 (art. 18), provides that the same is coordinated with the planning and programming of management and protection and rehabilitation of the territory and the other sphere of territorial strategic planning. This coordination emphasizes the importance of a fundamental component common to all planning processes, namely the Knowledge System, which can be considered the first tool for integration between the same processes. It has also been emphasized that the Knowledge System can be seen as the result of a continuous and dynamic technical-scientific action, whose structure must necessarily be flexible in order to collect and analyse data and information concerning issues, risks, that are constantly changing (Di Ludovico, 2017). This is the model of Knowledge System to which the research refers, that is an open, dynamic, modifiable, socially shared system, integrated in the different planning processes that affect the territory (multi-sectoral and multi-level), first of all that of civil protection and specifically of multi-risk management. To such a Knowledge System must correspond a planning model that is also dynamic and updatable, therefore flexible, directly connected to the Knowledge System.
Such a Knowledge System has already had a first experimentation in the 'Carta dei Luoghi e dei Paesaggi' (Map of Places and Landscapes) (Properzi et al., 2014), published in the WebGis of the Abruzzo Region under the name of 'Sistema delle Conoscenze Condivise' (Shared Knowledge System) to support the new Landscape Plan. It is a complex GIS that describes the territorial, environmental and landscape components through the categories of Values, Risks, Degradation and Abandonment, Urban and Territorial Framework, and Constraints. These derive from (1) institutional knowledge, produced at different scales by entities such as Regions, Provinces, Municipalities and many others; (2) local or identity knowledge outcomes of the knowledge sharing phase by organized groups of citizens, associations and other organizations; (3) intentional or project knowledge, inferred from the specialized analyses produced within the planning/design phase (Di Ludovico, 2017). Such a system, unveiling all the knowledge of a territory (this aspect is related to the concept of 'veil of ignorance' theorized by John Ralws and to the justificationist attitude of planning), can be considered the basis of planning processes of any level and sector, but it is also oriented to assume the role of a tool for the preliminary environmental compatibility evaluation of the choices made on urban and spatial plans and projects (Di Lodovico & Di Ludovico, 2014). Of these components, our research specifically explores the Risks.
In a parallel research to the one presented in this paper, a Digital Platform (Antofie, Doherty & Marin Ferrer, 2018; Weinberger, 2012) based on the new concept of Spatial Information Modeling (SIM), evolution of City Information Modeling (CIM), is being studied in relation to the specific theme of risks, which the present research program is developing (Di Lodovico & Di Ludovico, 2017; Xu et al., 2014). The platform aims to integrate institutional/scientific Knowledge, with intentional/project and local/identity Knowledge (Di Ludovico, 2017), thus overcoming self-referential meanings of the same Knowledge, promoting a new way of doing governance, but above all ensuring the coherence, i.e. the alignment and adjustment, of plans and decision-

making system of local, regional and central administrations in terms of civil protection and risk mitigation (Properzi et al., 2014). In fact, its main feature is to connect, in a circular logic, Knowledge, Governance and Plan/Project.

2.1 The Knowledge System of the Civil Protection Plan of the Abruzzo Region

The topic of knowledge has always played a central function in the disciplinary debate, particularly with respect to the role it plays in the urban and territorial planning process, a role that is often secondary or justificationist (Di Ludovico, 2017). Instead, the knowledge factors of risk, which are typically multidisciplinary and multi-scale, should take a main role in the planning process and the latter should refer to a model that puts in the foreground the effects and mitigation of the same risks (Properzi et al., 2014). As already described in the previous paragraphs, the Government of the Territory is a complex (territorial, environmental, economic, social and landscape) and wide area of interest, where are also included patterns of use, perspectives and visual relationships, social and cultural practices, economic processes, relevant historical-cultural, natural-environmental and landscape values, exposed to hazard. It is essential, in this perspective, to systematize and update the regional and national knowledge frameworks, paying particular attention to the issue of risk, mitigation of effects and increasing territorial security (Di Lodovico & Di Ludovico, 2017).
Starting from these reflections, and taking into account the most relevant risks for civil protection purposes (Art. 16 and 18; CPC, 2018), in the research a model of the Knowledge System of the Abruzzo Region Civil Protection Plan was developed and tested. A knowledge system that addresses in particular the issue of multi-risks, in addition to the knowledge analysis of the municipal territory, namely the knowledge and consequently the in-depth analysis of seismic, hydraulic, hydrogeological risk, from adverse weather phenomena or for dam risk, snow and avalanches, forest fires, water deficit and seaquake. The volcanic risk has not been examined because it is absent at territorial level. However, it must be remembered that the Abruzzo Region is involved in the emergency procedures in case of eruption of Vesuvius or the Campi Flegrei area (Naples city area). The other types of risk to be considered, i.e. chemical, industrial, transport, environmental and hygienic-sanitary, have been treated compatibly with the competences of the subjects institutionally in charge.

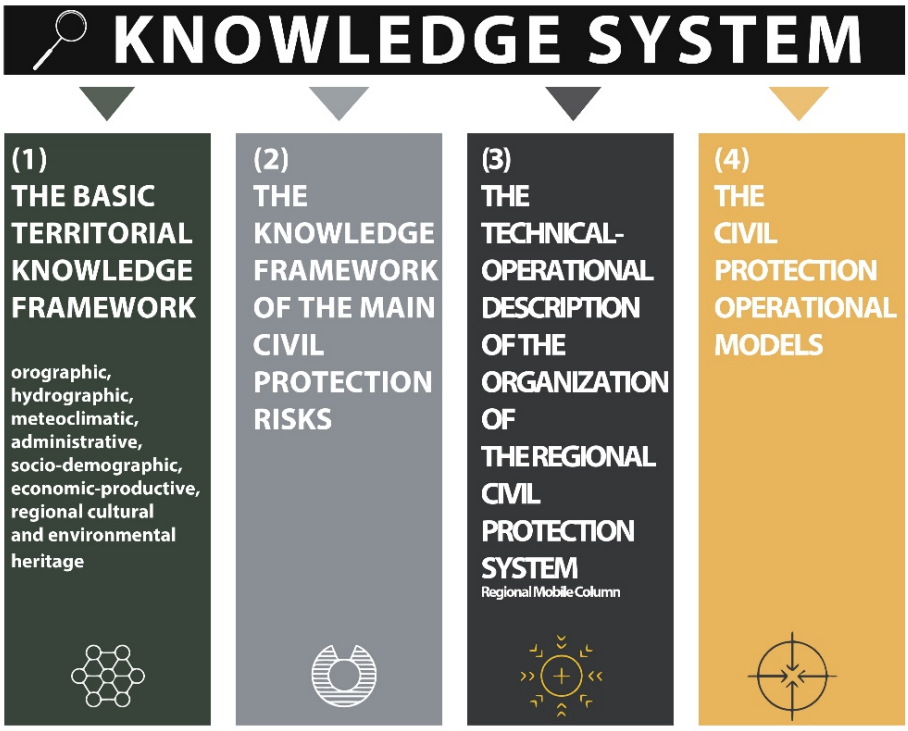


Fig.1 Outline of the Knowledge System of the Regional Civil Protection Plan

The above mentioned Knowledge System (KS) has been prepared in a specific research product (University of L'Aquila / Abruzzo Region) called 'Elementi conoscitivi del territorio della Regione Abruzzo e organizzazione di protezione civile' (Knowledge elements of the Abruzzo Region territory and civil protection organization of the Abruzzo Region (It); RegAbr, 2019). This specific report describes a dynamic and updatable structure of the KS (Fig. 1), and it has been drafted starting from the assumption that the knowledge of the territory is the essential requirement for a correct Civil Protection planning (Di Ludovico & Di Lodovico, 2019; Di Ludovico, 2017; Properzi et al., 2014).

The KS consists of four elements. (1) the basic territorial knowledge framework (orographic, hydrographic, meteoclimatic, administrative, socio-demographic, economic-productive, regional cultural and environmental heritage); (2) the knowledge framework of the main civil protection risks; (3) the technical-operational description of the organization of the regional Civil Protection system, the composition and the intervention model of the Regional Mobile Column; (4) the Civil Protection operational models.

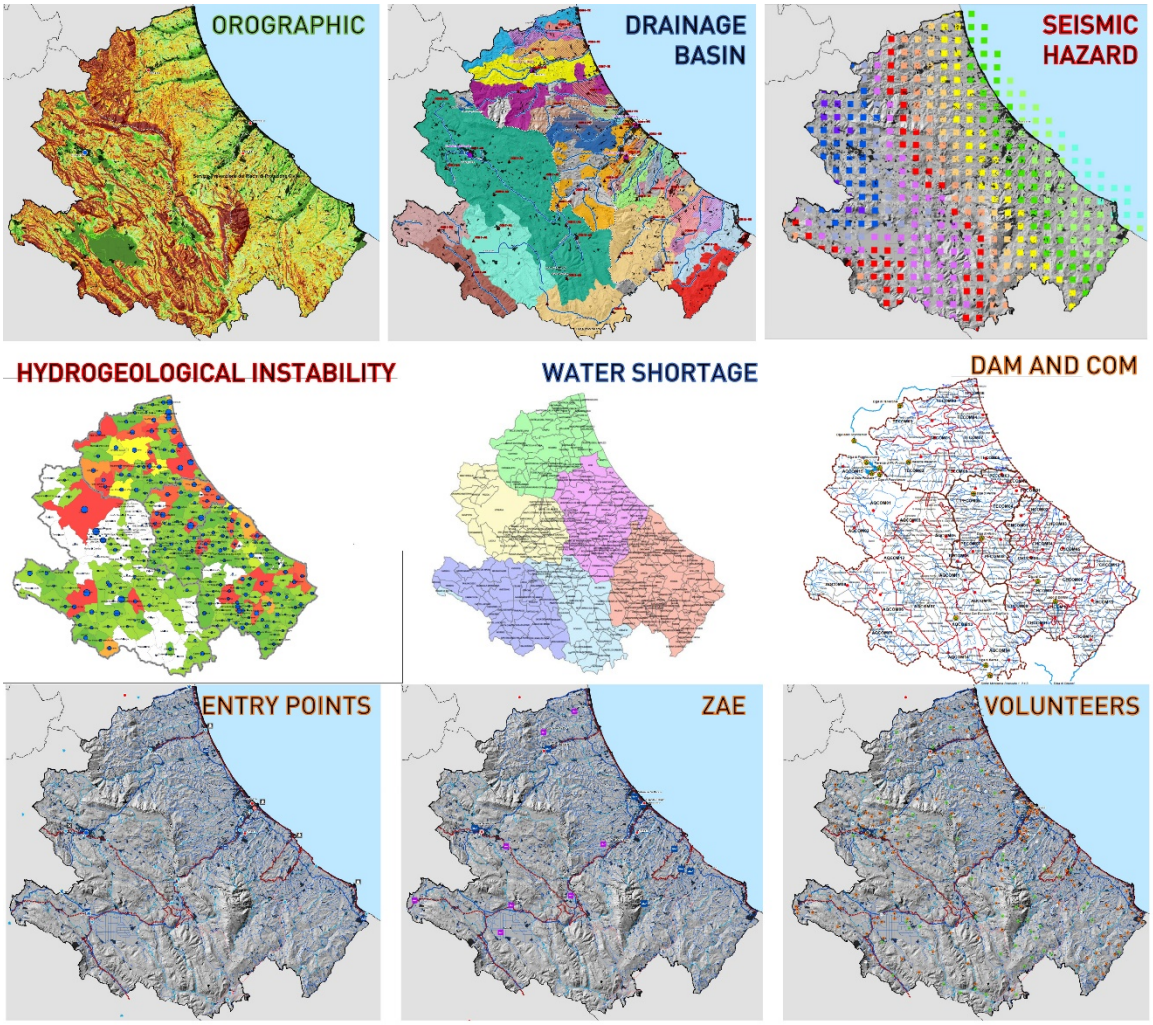


Fig.2 Some examples of GIS maps of the Knowledge System of the Regional Civil Protection Plan, as the basis of a digital platform for Spatial Information Modeling

Among the information collected for the KS, the data collected during the reconstruction phase of the post Abruzzo 2009 earthquake have been fundamental, allowing the production of completely new knowledge bases that represent innovative elements to support the analysis of risk components. For example, these are the following georeferenced databases (Fig. 2):

- schools (cover the whole Region), which includes data related to their geometric characteristics, Peak Ground Acceleration (PGA) data and related damages, when present. This is an update of the database

available on the website of the Abruzzo Region[1] in the section 'School Buildings Information System' (SIES). The updating of the database was carried out in collaboration with the 'Network of University Laboratories of Earthquake Engineering' (ReLUIS) and the Special Office for the Reconstruction of the Crater (USRC)[2];

- the complete census of all strategic structures for civil protection can also be consulted online on the website of the Regional Civil Protection[3], in the section 'Sistema Informativo Edifici Strategici' (Strategic Buildings Information System - SIGEOIS);
- the mosaic of Seismic Microzonation Studies (MzS) and the Emergency Limit Condition (CLE), still in preparation for the entire regional territory, which represents a thorough reading of local seismic conditions and therefore a fundamental tool to identify more accurately the vulnerabilities (Di Lodovico & Di Ludovico, 2018);
- the complete census, updated to 2019, of 18,000 phenomena of hydrogeological instability present on the Regional territory (65 slopes conspicuously affected by deep gravitational deformations; 186 bodies of landslides of collapse and overturning; 727 bodies of landslides of translational sliding; 3,512 rotational sliding landslide bodies; 1,953 subsidence landslide bodies; 412 landslide bodies of complex genesis; 6,510 slopes affected by slow surface deformation and surfaces with diffuse and/or concentrated forms of runoff; 1,446 gully surfaces and similar forms);
- the regional map of the location and characterization of dams, weirs and crosspieces in the region with subdivision of the reservoirs according to their authorization and supervision;
- the map of the regional hydrographic basins with indication of the Territorial Presidiums and COMs (Mixed Operational Center);
- the map of the regional health system with indication of the Hospitals and Health Centers;
- the map of fire danger with an indication, in percentage, of the forest types classified according to the level of danger;
- the Synthetic Framework of the characteristics of the regional water supply system (divided into 6 sub-areas), built with information taken from the Emergency Management Plans submitted by the Managers of the Integrated Water Service;
- the Synthetic Framework and the database of all the State Operational Structures to be involved in an emergency and for rescue and/or relief operations (VV.FF., Red Cross, Carabinieri, Port Authority, etc).

These are often autonomous GIS or Databases, which have been integrated into the KS, addressing issues of thematic, temporal and scale coherence. The objective, that the research dedicates to the construction of this first KS is to devise a digital platform of knowledge for the establishment of a planning tool called Spatial Information Modeling (SIM), aimed at the analysis and governance of risks, support of Prevention Projects and Territorial Recovery (Section 3), and place of integration of civil protection planning with the urban and spatial, pursuing an approach that at the international level is referred to as comprehensive (cite).

Such a Platform is composed of three components: information (of various types, bases for analytical application to support innovative planning tools), communication/participation (with various tools and techniques) and governance of the plan/project (the innovative tools verified through the basic information). Its main objective is on the one hand to constitute the autonomous Knowledge System from information, and on the other hand to generate and evaluate models and frameworks of territories and cities, to understand and represent their processes, to support their debate and address their conflicts. The Knowledge System and

1 http://protezionecivile.regione.abruzzo.it/index.php/rischio-sismico

2 DPC-ReLUIS 2019-21 Project, WP4-MARS (Task 4.7 – "Modelli e curve di fragilità per le scuole e altri edifici strategici o rilevanti").

3 http://protezionecivile.regione.abruzzo.it/index.php/rischio-sismico

these frameworks can show events in progress, those that took place in the past that will take place in the future, through two-dimensional techniques, scenarios, diagrams, ideograms, etc. (Hanzl 2007, p. 290).

3. From the Knowledge System of the Regional Civil Protection Plan to the Regional Management Risk Plan

The constitution of the Knowledge System of the Abruzzo Region Civil Protection Plan was the starting point for the construction of a part of the Civil Protection Plan dedicated to multi-hazard analysis, prevention and mitigation/reduction of risks, the so-called 'Regional Management Risk Plan' (RMRP) that responds to the demand for prevention and mitigation typical of 'structural' civil protection activities (Di Ludovico & Di Lodovico, 2020).

The topic of Disaster Risk Management (DRM) is becoming more and more central in the context of Spatial Planning (Poljanšek, Marin Ferrer, De Groeve & Clark, 2017). In this context, the experimentation of the RMRP of the Abruzzo Region (within the Civil Protection) addresses the issue of Multi-Risk (Gallina et al., 2016) by structuring a methodology oriented to prevention planning, with a focus on spatial aspects, rather than to emergency interventions implemented after the disaster.

Fig.3 Methodology of the Risk Management Plan of the Abruzzo Region

The proposed RMRP is based on an 'all hazards at a place' approach (Hewitt & Burton, 1971), and has as its ultimate goal the identification of 'Prevention and Spatial Recovery Projects' (PSRP). These projects represent the tools for implementing prevention/mitigation and recovery actions, and the tools for coordination (Rivera, Tehler & Wamsler, 2015) between these actions and those provided by other levels of Planning unrelated to Civil Protection but impacting the territory, environment and regional landscape.

The RMRP of the Abruzzo Region is based on a detailed Knowledge System, described in Section 2 above, which undergoes a Multi-Risk Assessment process (Risk Mapping → Assessment → Planning (FEMA, 2018)), which crosses the components of Multi-Hazards (M-H), Multi-Vulnerability (M-V), and Multi-Exposure (M-E) (Fig.3).

These three knowledge components have been selectively crossed according to an innovative methodology in order to obtain the Risk Scenarios, which have been differentiated into two large groups, those involving the Environmental/Landscape system and those involving the Anthropic/Settlement system. The identification of Risk Scenarios allows for the selection of risk treatment options, a subject explored in both the defense and financial fields, for example with the ACAT - Avoid / Control / Accept / Transfer model (DoD, 2017), or the TARA - Transfer / Avoid / Reduce / Accept model (Kaplan, 2012).

The Risk Scenarios correspond to the planning of two actions, one involving Prevention interventions and another involving Mitigation interventions and therefore Risk Control. In our methodology these actions have been differentiated also according to the main classes of land use, namely natural / semi-natural use, urban use and agricultural use.

The subsequent selective overlay of the Risk Scenarios has allowed the identification of the so-called 'Hotspots' (Fig. 4), big multi-risk 'hot' areas, with high priority in which there are more high risks, and in which it is foreseen to intervene with specific planning instruments, the already mentioned 'Territorial Prevention and Recovery Projects' (Fig. 5.1 & 5.2) that foresee spatial interventions of prevention/mitigation and recovery with low impact and coherent with the objectives and strategies of the other levels and types of Plans present in the same areas.

This process allows to improve the balance of development requests with the need to protect the environment and the landscape, that is, risk mitigation, and coordination of the spatial impacts of prevention and mitigation interventions with territorial policies.

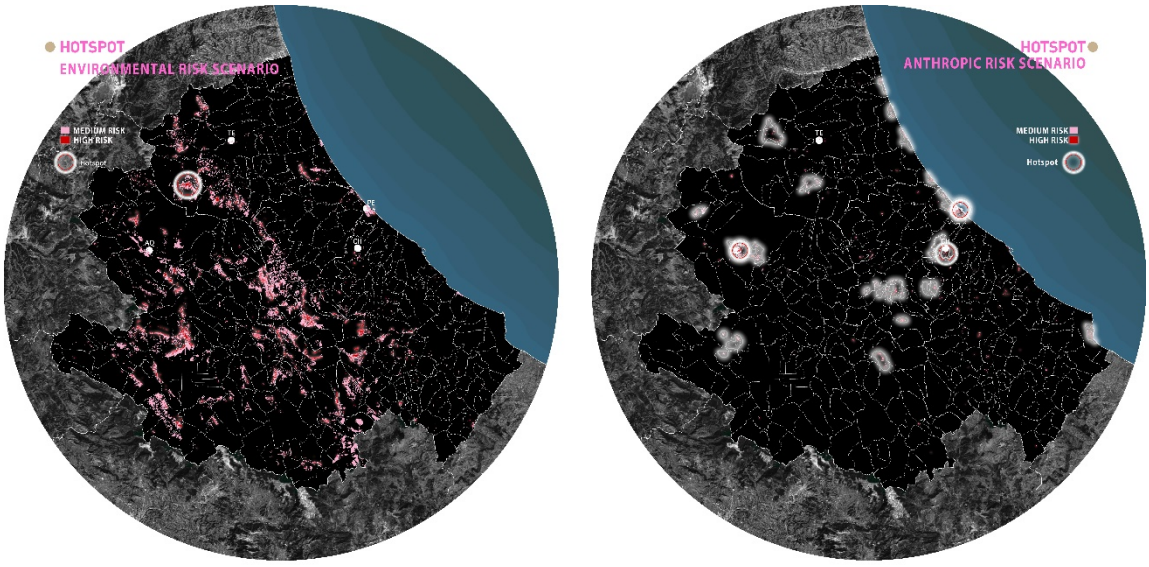
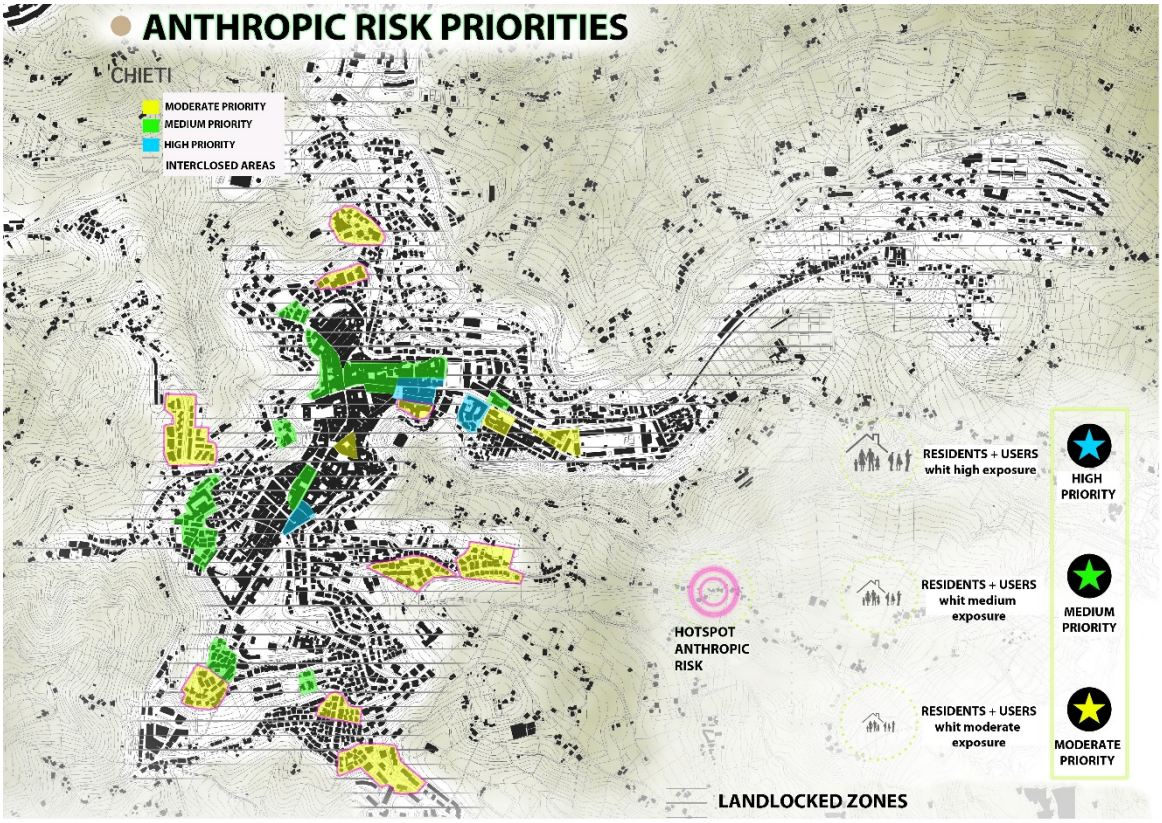


Fig.4 The Multi-Risk Hotspots in the Regional Management Risk Plan (Source: Elena Scarpone). The white circles identify the Hotspots in which the PSRPs have been tested



CHIETI

RISK MANAGEMENT POLICIES - ANTHROPOGENIC RISK

Mitigation and preventive measures of risk

The following interventions are proposed, divided according to the persistent risks. These interventions are associated with the priority, determined through the analyses proposed above, and the effects they produce, i.e:

landscape (impact on the landscape) environmental (impact on the environment and nature) territorial (impact on the spatiality of the territory and its socio-economic components)

Moderate priorit

WILDFIRE RISK

- Carry out routine maintenance, first of all cleaning (deforestation, removal of unplanned shrubs), removing dry parts and vegetation under trees that could carry flames to higher areas.
- Creating protective spaces around wooded areas to avoid the potential spread of flames to settlements
- Construct and maintain buildings with fire-resistant and flame-retardant materials
- Adopt stricter standards at the designing stage
- Ensure that water supplies are available in case of fire
- Draw up fire prevention plans

HYDROGEOLOGICAL RISK

- Stabilising slopes and altering natural slopes as little as possible
- Reduce the loads of structures on slopes by building lightweight structures
- Remove as little vegetation as possible in risk areas
- Adopt a land use plan that avoids construction in areas most at risk from hydrogeological hazards.
- Adopt stricter implementation rules when building in risk areas cannot be prohibited
- Carry out ordinary and extraordinary maintenance on all works on land at risk, in particular on risk containment works

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance in the settlements
- Carry out seismic microzoning
- Carry out construction interventions (new or maintenance) that guarantee adequate resistance to earthquakes

LANDLOCKED ZONES

are within the urban perimeter but are not prioritised due to reduced exposure. They should however be subject to the ordinary and general interventions associated with SEISMIC RISK and (when present) HYDROGEOLOGICAL RISK and/or PYROLOGICAL RISK i.e:

- prepare emergency strategies as landlocked areas;
- carry out routine maintenance of buildings and green areas;
- setting up emergency information and education channels.

High Priority

HYDROGEOLOGICAL RISK

- Stabilising slopes and altering natural slopes as little as possible
- Reduce the loads of structures on slopes by building lightweight structures
- Remove as little vegetation as possible in risk areas
- Adopt a land use plan that avoids construction in areas most at risk from hydrogeological hazards.
- Adopt stricter implementation rules when building in risk areas cannot be prohibited
- Carry out ordinary and extraordinary maintenance on all works on land at risk, in particular on risk containment works

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance in the settlements
- Carry out seismic microzoning
- Carry out construction interventions (new or maintenance) that guarantee adequate resistance to earthquakes

Medium priority

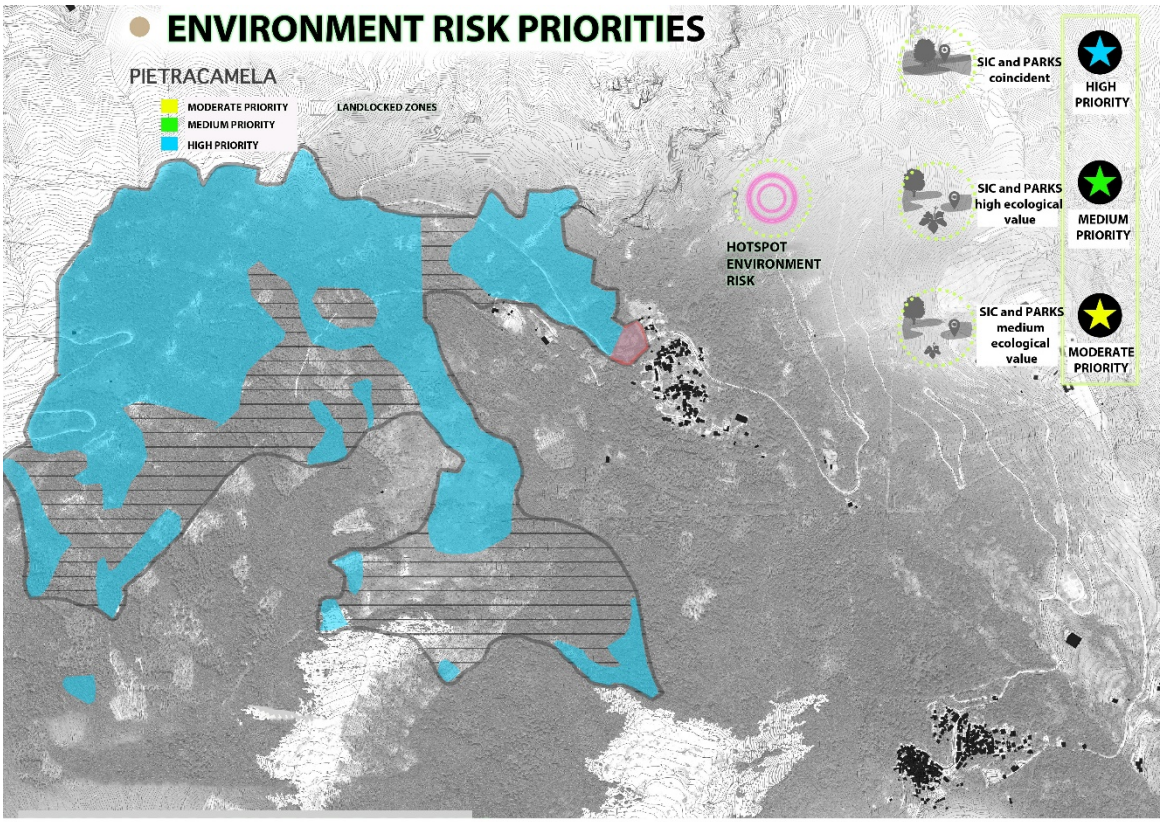
HYDROGEOLOGICAL RISK

- Stabilising slopes and altering natural slopes as little as possible
- Reduce the loads of structures on slopes by building lightweight structures
- Remove as little vegetation as possible in risk areas
- Adopt a land use plan that avoids construction in areas most at risk from hydrogeological hazards.
- Adopt stricter implementation rules when building in risk areas cannot be prohibited
- Carry out ordinary and extraordinary maintenance on all works on land at risk, in particular on risk containment works

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance in the settlements
- Carry out seismic microzoning
- Carry out construction interventions (new or maintenance) that guarantee adequate resistance to earthquakes

Fig.5.1 Example of Prevention and Territorial Recovery Projects in a settlement Multi-Risk Hotspot (Source: Elena Scarpone)



PIETRACAMELA (TE)

RISK MANAGEMENT POLICIES - ENVIRONMENTAL RISK

Mitigation and preventive measures of risk

The following interventions are proposed, divided according to the persistent risks. These interventions are associated with the priority, determined through the analyses proposed above, and the effects they produce, i.e:

landscape (impact on the landscape) environmental (impact on the environment and nature) territorial (impact on the spatiality of the territory and its socio-economic components)

High Priority

WILDFIRE RISK

- Carry out routine maintenance, first of all cleaning (deforestation, removal of unplanned shrubs) by removing dry parts and vegetation under trees that could carry flames to higher parts.
- Maintain existing buildings with fire-resistant and flame retardant materials.
- Prevent construction
- Prepare water supplies to be used in case of fire
- Prepare detailed and up-to-date wildfire plans
- Raise awareness among the resident and non-resident population about wildfire risks
- Developing warning systems that are easily accessible to tourists
- Identify "free zones" to be used as emergency camps for the population
- Define firebreaks
- Define an operational road system to be kept usable in case of emergency
- Set up active, continuous and permanent surveillance systems
- Ensure immediate evacuation of users

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance on existing buildings (if any)
- Carry out seismic microzoning
- Prevent constructive interventions

Medium priority

WILDFIRE RISK

- Carry out routine maintenance, first of all cleaning (deforestation, removal of unplanned shrubs) by removing dry parts and vegetation under trees that could carry flames to higher parts.
- Maintain existing buildings with fire-resistant and flame retardant materials.
- Prevent construction
- Prepare water supplies to be used in case of fire
- Prepare detailed and up-to-date wildfire plans
- Raise awareness among the resident and non-resident population about wildfire risks
- Developing warning systems that are easily accessible to tourists
- Identify "free zones" to be used as emergency camps for the population
- Define firebreaks
- Define an operational road system to be kept usable in case of emergency
- Set up active, continuous and permanent surveillance systems
- Ensure immediate evacuation of users

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance on existing buildings (if any)
- Carry out seismic microzoning
- Prevent constructive interventions

Overlapping Priorities Anthropogenic Risk and Urban Settlement

WILDFIRE RISK

- Carry out routine maintenance, first of all cleaning (deforestation, removal of unplanned shrubs) by removing dry parts and vegetation under trees that could carry flames to higher parts.
- Creating protective spaces around forested areas to avoid potential spread of flames to settlements
- Maintain existing buildings with fire-resistant and flame retardant materials.
- If building is allowed, carry out works with the least possible environmental impact
- Prepare water supplies to be used in case of fire
- Prepare detailed and up-to-date wildfire plans
- Raise awareness among the resident and non-resident population about wildfire risks
- Define widespread information channels
- Developing warning systems that are easily accessible to tourists
- Identify "free zones" to be used as emergency camps for the population
- Define firebreaks
- Define an operational road system to be kept usable in case of emergency
- Set up active, continuous and permanent surveillance systems
- Ensure immediate evacuation of users
- Allocating these areas to functional services for SICs and parks, curbing private use

SEISMIC RISK

- Carry out ordinary and extraordinary maintenance on existing buildings (if any)
- Carry out seismic microzoning
- Prevent constructive interventions

LANDLOCKED ZONES

are within the urban perimeter but are not prioritised due to reduced exposure. They should however be subject to the ordinary and general interventions associated with SEISMIC RISK and (when present) HYDROGEOLOGICAL RISK and/or PYROLOGICAL RISK i.e:

- prepare emergency strategies as landlocked areas;
- carry out routine maintenance of buildings and green areas;
- setting up emergency information and education channels.

Fig.5.2 Example of Prevention and Territorial Recovery Projects in a Multi-Risk Hotspots located in vulnerable area of environmental value (Source: Elena Scarpone)

The result is a complex work, still in progress, that will be integrated in the new research of the project 'Territori Aperti'[4] (Open Territories) of the University of L'Aquila. This project, now in its early stages, aims to bring together data, knowledge and work for the progress of areas affected by natural disasters. It provides for the creation of an 'Interdisciplinary Center for Documentation, Training and Research' oriented to the prevention and management of natural disasters and to the reconstruction and development of the affected areas. In particular, the project foresees the constitution of an Integrated Information System open to social sharing, the realization of training and communication activities, and the realization of research activities oriented to the creation of an international network of competences on the sustainable development of the territories affected by natural disasters.

4. Conclusions

The scientific research described in this paper concerns the theme of Civil Protection Planning at Regional level, and in particular the role that its Knowledge System can assume when dealing with Disaster Risk Management at Regional level whose planning can be considered a part of Civil Protection Planning.

The model of the Knowledge System to which the research refers, which has been experimented in the definition and predisposition of the 'Knowledge elements of the Abruzzo Region territory and civil protection organization of the Abruzzo Region (It)', is the result of a continuous and dynamic technical-scientific action, whose structure must necessarily be flexible in order to collect and analyse data and information concerning themes, the risks, which are constantly changing. Such a model of Knowledge System, which can be managed through a digital platform in the form of Spatial Information Modeling (SIM), requires that the civil protection planning but also the coordinated territorial, environmental and landscape planning acquire the character of flexibility, and this feature is one of the main limitations of the proposal as it presupposes a radical change in the current Italian planning systems and models that are extremely rigid and stable, rather than flexible and dynamic.

In the research, the Knowledge System has become the basis for the experimentation of a methodology for a Regional Management Risk Plan (case study Abruzzo Region), faced with an original hybrid approach, simultaneously evaluative and spatial/structural. The methodology uses the concept of Multi-Risk, analyzed with a semi-quantitative approach, to identify Hotspots, i.e. areas characterized by very high and probably simultaneous risks, in which it is strictly necessary to identify prevention and mitigation interventions, the 'Territorial Prevention and Recovery Projects' (PSRPs) that concern the structural activities of civil protection. The PSRPs also represent the interface with the planning of management and protection and rehabilitation of the territory and the other areas of strategic territorial planning, defined as non-structural activities of civil protection. The research has shown that the Knowledge System can facilitate the integration between different levels and sectors of planning, but that this operation is strongly hindered by the conformative and regulatory nature of Italian planning.

The next steps of this research foresee the construction of the Digital Platform of Knowledge for the constitution of the Spatial Information Modeling (SIM) aimed at the analysis and governance of Risks, support of Prevention and Territorial Recovery Projects (PSRPs), and place of integration of Civil Protection planning with the urban and spatial, pursuing an approach that is internationally referred to as comprehensive.

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Image Sources

Fig.1: Luana Di Lodovico, Donato Di Ludovico;

Fig.2: RegAbr, 2019;

Fig.3: Luana Di Lodovico, Donato Di Ludovico;

Fig.4: Elena Scarpone;

Fig.5.1: Elena Scarpone;

Fig.5.2: Elena Scarpone.

Author's profiles

Donato Di Ludovico

PhD, Assistant Professor of Urban and Regional Planning, Adjunt Professor of 'Urban Design' at the University of L'Aquila (Department of Civil, Construction-Architecture and Environmental Engineering). He carries out research activities within the new forms of Spatial and Strategic planning, Urban planning and design (urban and territorial safety, protection and regeneration), Civil Protection Planning, knowledge and assessment systems (SEA). With regard to the Spatial planning, his research is focused on new models and new policies. He was secretary of INU Abruzzo-Molise section (National Institute of Urban Planning). He is currently Director of the Urban Laboratory for the Reconstruction of L'Aquila (LAURAq-INU/ANCSA), Scientific responsible of AnTeA Laboratory (Territorial and Environmental Analysis) at the University of Aquila, Member of the University Spin Off "DRIMS, Diagnostic Retrofitting and Innovation in Material Srl" and Coordinator of the 1st level Specializing-Master courses "Post-Disaster Technical-Administrative Management of Local Authorities".

Luana Di Lodovico

PhD, collaborates in the scientific research of the DICEAA-University of L'Aquila on the topics of Urban planning and design security oriented, risk mitigating, emergency-planning, preparedness and response, civil protection and rehabilitation measures and reduction of the vulnerability about urban system. She is currently member of INU (National Institute of Urban Planning); responsible of INU's community "Policies and interventions for the conservation of soils and urban vulnerability"; collaborates with the Urban Laboratory for the Reconstruction of L'Aquila (LAURAq- INU/ANCSA); collaborates with the AnTeA Laboratory (Territorial and Environmental Analysis) and the "Open Territories - interdisciplinary center for documentation, training and research" at the University of Aquila.

Maria Basi

Graduated in Construction Engineering and in 'Emergency Prevention Engineering' Specializing-Master course at the University of L'Aquila. She has been adjunct professor for the course of 'Architecture and Architectural Composition III' of Construction Engineering-Architecture, lecturer at the 'Seismic Micro-zonation' Specializing-Master course and at the 'Post-disaster Technical Administrative Management in Local Authorities' Specializing-Master course. She is currently responsible of the 'Seismic Risk' office of the Abruzzo Region and coordinator of the eighth sub-commission 'Seismic legislation implementation' at interregional level. She is the coordinator of the regional monitoring table for seismic micro-zoning studies and Emergency Limit Conditions (CLE), of the Technical Coordination Table of the regional Civil Engineering Works Dep. and vice-coordinator of the Technical Scientific Table of the Abruzzo Region. Finally, she is a member of the commissions for the implementation of the National Plan for Seismic Risk Mitigation. He has published numerous scientific papers on civil protection planning, seismic micro-zoning and site effects, seismic recovery techniques and seismic vulnerability.