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Planning seismic Inner Areas in Central Italy. Experimental application for the infrastructural project, lifeline and resilient public space in the shrinking territory

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Abstract

Natural calamities that repeatedly hit the Country, ranging from earthquake to climate change induced events – like landslides and floods – resulted in huge damages, worsened by the infrastructural degrade and by the abandonment of some territories, especially in the inner areas of the Country. There is therefore a pressing need to improve the infrastructural resiliency, focusing on extraordinary manutention, on the technological development of the monitoring activities and of the supporting infrastructure, on the prevention, the civil protection and the public aid. Resilience nonetheless, is a much wider concept, as it was made dramatically evident by the current pandemic crisis. This includes, for example, the capability of the urban system to respond to unexpected seismic events or health issues; the solidity of the public space fabric, of services and strategic program supporting communities needed to promptly and efficiently respond to sudden crisis. This paradigm, limited to municipal administrative boundaries, results in an increased fragmentation of the territorial safety project, where the connection between infrastructural networks at the regional scale is not always achieved. Peripheral urban contexts of the Inner Areas are exposed to “isolation Risks” in case of catastrophic events, as witnessed after the 2016 seismic events, where secondary infrastructure network was heavily affected, bringing great problems for those living in the areas. The paper explores experimental methodologies to bring substantial modifications to the villages and minor urban areas structure (for the damaged buildings as for the infrastructural network) that the reconstruction makes possible, making of it a unique occasion to renew and reorganise the territory.

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Keywords: Type your keywords here, separated by semicolons ;

1. Risk prevention and territorial security in the re-population project

The themes of environmental risk prevention and management have been neglected for years, returning to the center of public attention only after calamities occur (Oliva, 2014). The awareness that the urban systems of our country are interested by a high level of vulnerability should, and must, trigger a growing demand for security, focused not only at preventing or limiting the damage deriving from calamities, but also at considering the topic of “risk” as a mean/tool to invest in the competitiveness and quality of life of our country (Struttura di missione Casa Italia, 2017).

The Italian regulatory system gives the regions the task of issuing laws on territorial governance, a hierarchy which, despite having shown its effectiveness in the past, has revealed its shortcomings regarding prevention and management of environmental risk, as emerged after the 2016 Central Italy seismic event (seismic crater between 4 regions: Abruzzo, Lazio, Marche and Umbria) (fig.1).

Despite some legislative innovations matured in the regional contexts (Umbria LR n. 11/05, Marche LR n. 61/08, Emilia-Romagna LR n. 20/2000 LR n. 6/2009, Calabria LR n.19 / 2002), it remains a strong separation between urban planning and risk planning (Struttura di missione Casa Italia, 2017).

The current regional laws only partially integrate the topic of prevention through ordinary planning tools for the management of the territory, with the exception of the Umbria Region which started in 2005, with L.R. n. 11/05, a path to integrate the topic of risk prevention into ordinary planning, introducing the identification of the Minimum Urban Structure (Struttura Urbana Minima - SUM) to reduce seismic vulnerability on an urban scale, and implement objectives and risk mitigation interventions, a path that in the general scheme led to the definition and approval of the programmatic lines of the "Multi-risk prevention coordinated regional plan" (DGR n.859 / 2018).

The tendency to implement a notion of risk still linked to an emergency and sectoral action, linked to the time frame of the calamitous event, has caused a delay in recognizing the "risk" category as a new value and paradigm of the contemporary plan and project (Clementi, Di Venosa , 2012).

The general seismic and environmental damage of the urbanities cannot be evaluated as a mere sum of isolated physical damage to buildings and infrastructures, since it also implies functional damage and loss of efficiency in the social system. The approach linked to temporariness, intrinsic to the emergency phase, must necessarily be overcome in favor of systematic preparation (Sargolini, 2017) and prevention strategies, focused at accepting risk as a permanent element to deal with, and include this "strategic component" in the urban-territorial and socio-economic project of the rebirth of territories, orienting future regarding spatial, hierarchical and functional choices for the planning of cities and territories (Domenella, 2019). This study analyses the seismic crater of the Marche Region, focusing on the current state of drafting / implementation of the tools to support safety.

To achieve the goal of raising the level of security of the territories it is necessary to overcome the current municipal fragmentation regarding the safety project and to use the tools (CLE, PEC, MS) as guiding framework for the construction of a new and complex urban-territorial balance.

2. Post-earthquake criticalities in the Marche’s infrastructural framework: First assessments and opportunities

The 2016 earthquake highlighted not only the shortcomings of the existing infrastructural network, but above all its weakness: landslides of roadsides and detachments of road surfaces have worsened the capability to act during the emergency and made it more difficult (in some cases prevented) the operation of rescuers.

Moreover, the presence of collapsed or unsafe buildings at the fringe of some of the access roads to the main cities and villages, compromised even more the accessibility, especially where the road affected was the only way of access. The most recent primary road infrastructure, based on the “Quadrilatero Umbria-Marche” (SS. 76 Vallesina and SS.77 Val di Chienti), fig. 2, has not suffered substantial damage, with the only exception of the SS.4 Salaria, interrupted due to landslides (Farabollini, et al, 2018). Many municipal and provincial roads have suffered a worsening of accessibility, also caused by very little maintenance in recent years due to the scarce financial resources of the

managing institutions (fig.3). Also due to these criticalities, the Provinces of Marche have returned the management responsibility of the former state-road network to the Regional authorities, which in turn has established a partnership with Anas for the maintenance of the aforementioned road network. This transfer of powers has caused a fragmentation of potential projects (divided between Anas, Provinces and Municipalities, with the Region only responsible as the owner for the ex-Anas viability), with the result that in the “Piano Operativo del Fondo Sviluppo e Coesione Infrastrutture 2014-2020”, approved with Resolution CIPE 25/2016, in the Marche’s territory no road project has been funded.

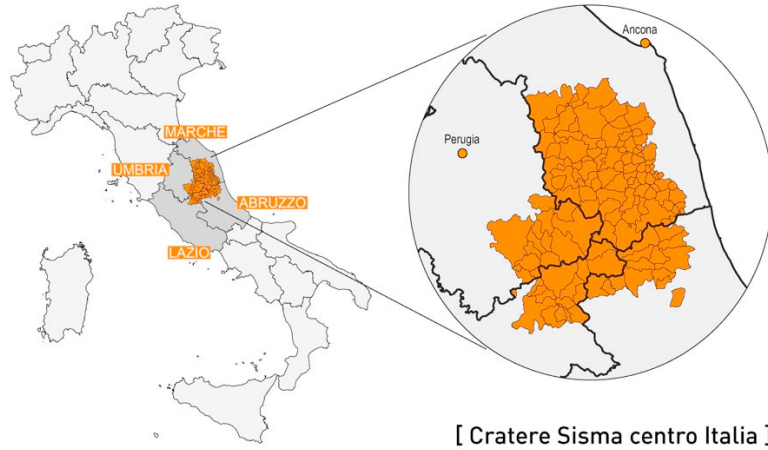


Fig. 1. Central Italy territory affected by earthquake, regions: Abruzzo, Lazio, Marche, Umbria.

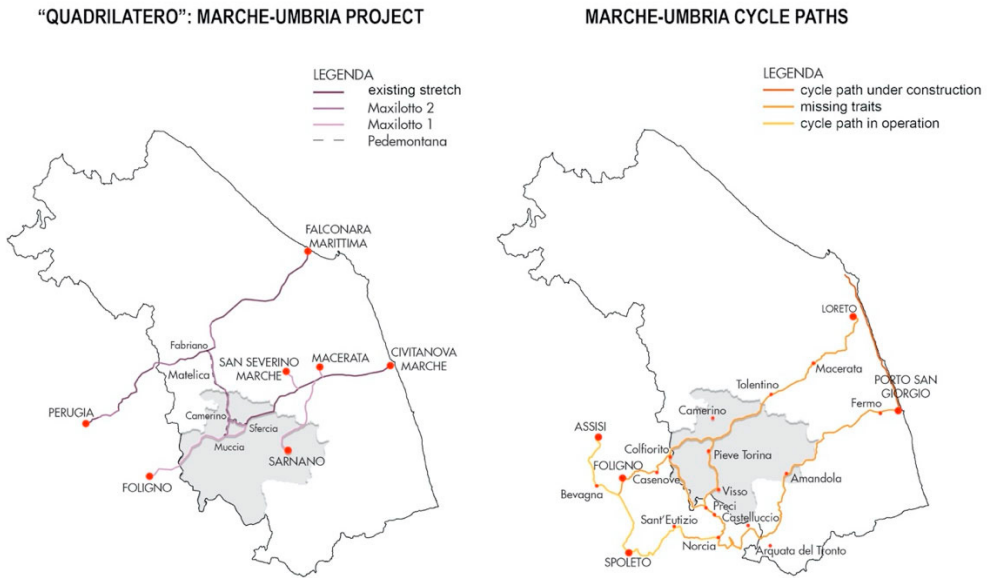


Fig. 2. Marche region Inner area Alto Maceratese. Primary infrastructure network.

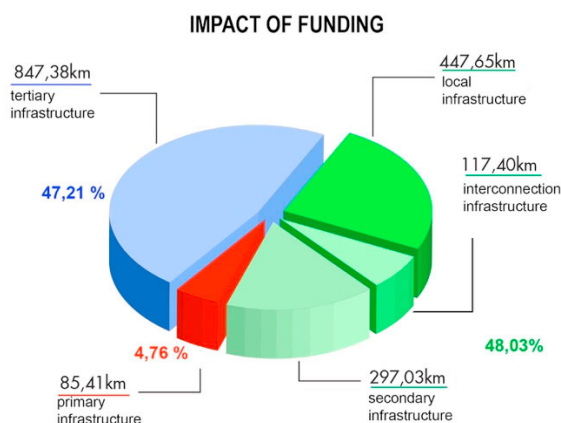


Fig. 3. Marche region Inner area Alto Maceratese. Funds distribution for post-earthquake infrastructure reconstruction.

Despite the infrastructural network of the Marche crater has shown all its vulnerability, on the other hand it has shown undoubted positive aspects, especially regarding hillside and mountain tourism: the deficiency of the road network is balanced by the substantial environmental integrity of the landscape, with very few exceptions.

Up to now, the mountain has also been protected regarding the settlement of ski resorts and the maintenance of unobstructed views of the cultivated hills and promontories, which in themselves represent a natural resource to be preserved and enhanced.

For these reasons, the need for intervention on the infrastructural network of the Marche territory mitigating local and territorial vulnerability, cannot ignore the protection of the delicate balance between infrastructures and landscape composed by various landscape matrices (Sargolini, 2017), in line with the development of local economic activities (especially artisanal and agricultural), and of services related to tourism, which do not require new large and fast infrastructures, but rather a complete and safe network with constant maintenance.

2.1. Development goals for the secondary road network

It is evident that the reconstruction cannot ignore the reorganization of the infrastructural system and the sustainable development of the territory, through a renewed accessibility to the cities at the foothills and “Inner Areas”, which allows to live in an effective condition of resilience to cope with future seismic events.

The reconstruction offers the opportunity to make substantial changes to the layout of villages and minor urban areas affected by the earthquake (regarding both the damaged buildings and the infrastructural network), giving a unique and unrepeatable opportunity for innovation and organic rearrangement of the territory (Marinelli, 2020). Pursuing this goal means first and foremost ensuring that:

- The Minimum Urban Structures (SUM) provided for by the O.C. 39 (ordinance governing the Reconstruction Implementation Plans), should have access infrastructures from with a low degree of vulnerability, achieved by a suitable road and building project (junctions, roundabouts, setbacks and localised voids, etc.);
- Road layouts (regional, provincial and municipal) are made safe from landslides, through containment works, tunnels, reduction of tortuosity and what is necessary to ensure full accessibility even in emergency conditions.

A complex but lasting intervention, which must not consist on new roads, but on the substantial improvement of the existing network and its accessibility, with the goal to make all the cities of the crater that are going to be rebuilt easily accessible, in any weather condition and in any circumstance (Farabollini, 2018). An intervention with strong of environmental sustainability qualities, which will require:

- the access to a subsidized and multi-year financial source;
- a singular implementing authority throughout the crater, or at least for each territorial area, through a design and consequent implementation in strict contact with local authorities, with the urban planning decision of each territory;
- the improvement of the transversal valley network (eg Val d’Aso, Val Tenna, etc.) connecting the area of the crater to the coastal road system, with regional and / or state fundings.

2.2. Development goals for the primary road network

The road infrastructure of the crater area, in spite of the resiliency shown in 2016, require a development project (since long scheduled by ANAS) such as the foothill network Fabriano-Muccia (already designed) and Sforzacosta - Sarnano, that even if already part of the Quadrilatero network after 1997 seismic event still demand for a rapid completion. The road network has to be completed, improving the existing system to facilitate the development of the area exploiting tourism and the rich productive landscape (Antonelli, Viganò, 2007). Finally, it is important to consider the problematic north-south regional connection, rethinking the primary road infrastructure, starting from the missing of the third highway lane in the region, source of limitations especially in emergency situations.

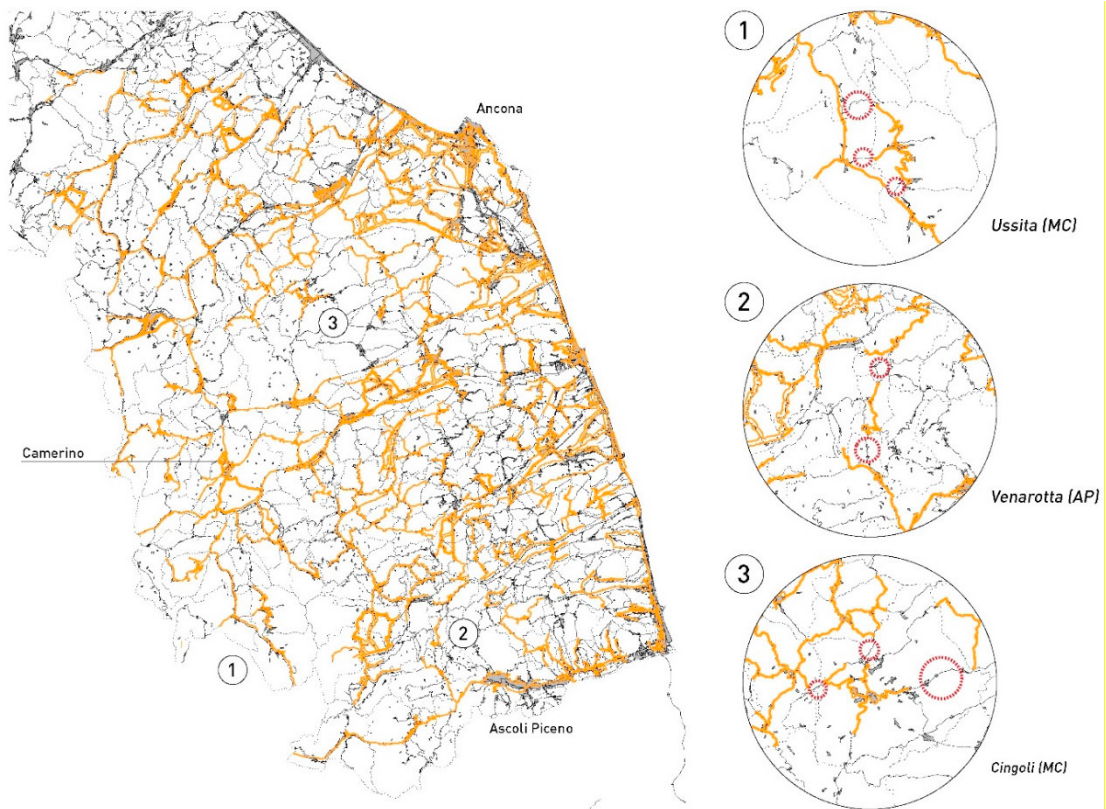


Fig. 4. Regional Mosaic for Emergency Limit Condition (CLE). In orange connective and accessibility infrastructure included in CLE; in red the gaps between CLE regarding neighboring municipalities.

3. Resilience infrastructures and lifelines for a territorial safety project

In the Marche region (the one hit the hardest by the 2016 events) the “safety project” consists almost exclusively of the Emergency Limit Condition (CLE), a tool that by definition represents the "Condition of the urban system under which, following the occurrence of a seismic event, even in conjunction with the occurrence of physical and functional

damages, resulting in the interruption of almost all the urban activities including the housing, the urban area still allows, as a whole, the operation of most of the strategic emergency activities, their accessibility and connection with the urban network "(OPCM n.4007, 2012). Even if the CLE evaluation is configured as a tool for verifying the instruments of the emergency management system on a municipal scale (strategic buildings, safe areas, accessibility infrastructures), small-medium municipalities erroneously attribute to this the role of a "project", neglecting the constituent components of a project: definition of actions / interventions and their implementation (Olivieri, 2013).

The analysis and application action of this tool is limited within the municipal boundary, limiting the seismic vulnerability assessments to individual centers and neglecting the territorial criticalities that may emerge following a calamitous event (fig. 4). This paradigm, limited to the municipal administrative borders, gives rise to a fragmentation in the territorial safety project, in which the connection with the infrastructural systems on a regional scale is not always guaranteed. The peripheral urban systems are exposed to the "risk of isolation" in the event of a calamitous event, a condition found in 2016 following the earthquake, in which the secondary road infrastructures went into crisis, with many inconveniences for those living in the areas.

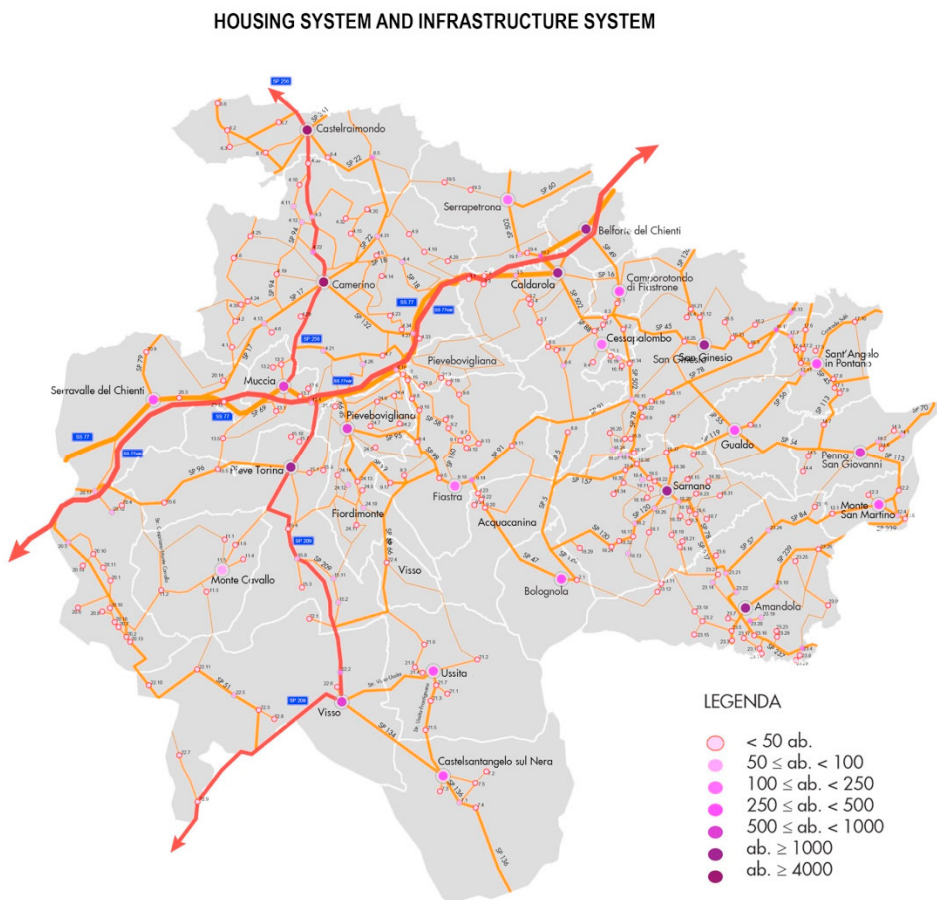


Fig. 5. Marche region Inner area Alto Maceratese, secondary road network and population distribution related to road segments. Analysis of population risk exposure

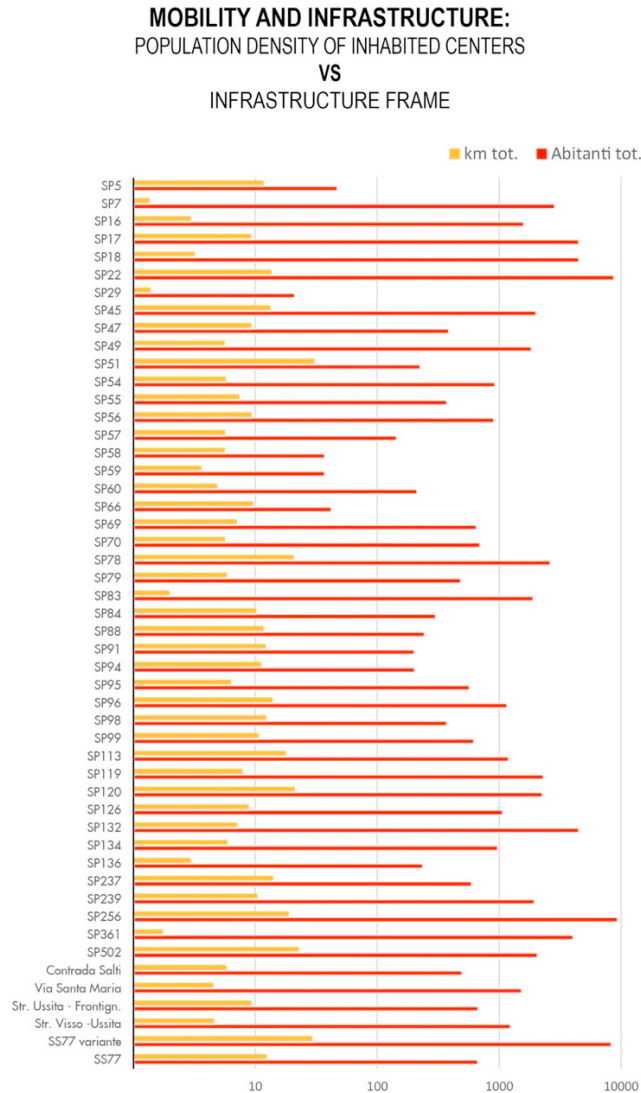


Fig. 6. Marche region Inner area Alto Maceratese, secondary road length related to population resident in proximity to each road sector

4. Conclusions and working trajectories

It is now evident that the Disaster Risk Reduction strategy must find its concrete expression within the regulations and ordinances of the Regions and Municipalities of the crater area. The management and monitoring of all phases of the long reconstruction process requires a unique regulatory instrument capable of integrating the “component” of risk in the urban-territorial regeneration project of the territories hit by the earthquake. This awareness, while finding more and more space in European territorial governance policies, struggles to find its place in the urban planning of our country, which relegate the topic of risk mitigation to local instruments that are too often not integrated with general planning. The United Nations Office for Disaster Risk Reduction highlights the key factors to address:

- prepare individuals, communities and economic and social organizations to face natural disasters and the associated risks;
- Operate after disasters to build better, taking reconstruction as an opportunity to mitigate the consequences of future disasters. Building Back Better (Esposito, et al, 2017).

The integration between prevention tools, territorial development/revitalization strategies and ordinary planning for territorial management can no longer be postponed, there is a need to rethink new urban-territorial balances in the fragile territories of the seismic crater of Central Italy, with the goal of preserving the Italian historical environmental heritage. Overcoming the sterile debate on "where it was as it was", it is possible to outline cross-disciplinary principles and common elements, to define the foundation of the reconstruction actions:

- Operating in areas hit by recent earthquakes means combining the "re-construction" plan with a "re-housing" project based on innovative tools and strategies in which prevention, urban quality and safety take on a complementary role for the regeneration of territories in crisis;
- Accepting the risk and seismogenetics of the territory as a permanent factor to deal with is a necessary prerequisite to undertake the technical-cultural leap at the base of the process of reconstruction in Central Italy;
- Highlight the gap, in temporal and economic terms, between the goals and desires of the citizens, and their possible fulfilment (Bronzini, Bedini, Marinelli, 2017) and define concrete operational responses;
- Develop a systemic risk prevention project, integrated into reconstruction plans and activate general planning for permanent preparedness of the fragile territories of the Central Apennines.

It is clear that the topic of safety should be addressed together with a multi-risk approach, focusing on places and communities, analysing the various components that can affect the level of safety (fig.5,6). It is necessary to overcome the approach linked to homogeneous and undifferentiated policies on the national territory, in favour of targeted policies, defining specific action for each specific risk situation embedded in the site, taking into consideration the living conditions and customs of the communities that live in the area.

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