Territorial Regeneration in the Crater Municipalities After the Earthquake of L'Aquila: Social Challenges and Innovative Approaches

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Abstract. The earthquake that struck L'Aquila and its surrounding area in 2009 caused considerable devastation, leading to the establishment of Special Offices for Reconstruction. In addition to restoring the built heritage, these offices tackle pre-existing challenges such as combating social exclusion, and demographic decline, and preserving cultural heritage. While these challenges are not direct consequences of the earthquake, they have been exacerbated by it. Addressing them while ensuring respect for the sustainability goals outlined in the United Nations' 2030 Agenda is essential. Key strategies include promoting sustainable tourism, involving the community in decision-making processes, and using technological tools such as WebGis platforms for data collection and analysis, as well as social inclusion. Several projects are outlined to illustrate participatory design aimed at urban regeneration, and social revitalization, and how these can contribute to the characterization of the territory. This contribution underscores the importance of inclusive approaches and innovative solutions to contribute, within the post-earthquake reconstruction context, to achieving the Sustainable Development Goals (SDGs).

Keywords: Territorial Regeneration · Social Challenges · Participatory Planning

1 Introduction

On April 6, 2009, L'Aquila and its surroundings were struck by a devastating earthquake (Mw = 6.3), resulting in significant casualties, injuries, displacement of residents, and extensive damage to infrastructure and cultural heritage [1]. This event marked a turning point, dividing time into "before" and "after," exacerbating existing issues such as inner-city marginalization, demographic decline [2], heritage abandonment, and unchecked urban sprawl [3]. The new settlement structure has triggered phenomena of various kinds: extreme fragmentation of construction, especially in the flat areas of the basin of the Aterno River, further decrease in average residential densities, quantitative erosion

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of agricultural surfaces, and degradation of the agricultural landscape and associated local ecosystems, fragmentation of the remaining ecological continuities between the major naturalistic polarities of the Central Apennines, adversely affecting the European-level biodiversity [4]. Following the earthquake, Law No. 134/2012 put an end to the emergency state, and established the Special Office for the Reconstruction of L'Aquila [5] and the Special Office for the Reconstruction of the Crater Municipalities [6] to oversee reconstruction efforts. While the first Office focuses on L'Aquila's reconstruction, the second Office oversees 56 Crater municipalities and over 100 municipalities outside of it (see Fig. 2). This article will mainly focus on the activities carried out and coordinated by the Special Office for the Reconstruction of the Crater Municipalities (see Fig. 1), "Special Office" from now on.

In this severely affected region, there's a pressing need to rebuild social cohesion, enhance territorial attractiveness, and stimulate local economies in line with the Sustainable Development Goals (SDGs) and local socio-economic needs. The local population must be the cornerstone for expressing the potential of sustainable socio-economic development.

This work does not present a case study but aims to showcase a reality that, with multidisciplinary tools, proposes a reconstruction and regeneration of the territory according to sustainability criteria.



Fig. 1. Goal – Action – Tool of the Special Office

Section 2 explains the intervention context of the Special Office, its governance, and the expansion of its mission that characterizes the office. Section 3 outlines the goals of the 2030 Agenda relevant to the main activities of the Special Office related to sustainable development actions in the territory. Section 4 showcases the management and social tools used in pursuing these actions. Finally, comments and related conclusions are contained in Sect. 5.

2 Reconstruction and Territorial Regeneration

The governance level of the Special Office pertains to a supra-municipal area that encompasses 56 municipalities. The Crater area is divided into 8 Homogeneous Areas, each representing an aggregation of municipalities based on geographical proximity and territorial vocation affinity. This allows for inter-municipal coordination of reconstruction actions and the development of local territorial systems.

The Crater is in the Apennine area of Central Italy, in the innermost zone of the Abruzzo Region. In this case, settlement dynamics are diversified compared to those of the municipality of L'Aquila. Except for major attracting poles, the jurisdictional area mostly consists of intermediate, belt, and peripheral areas [7]. Indeed, all the issues of inner areas in terms of essential services (healthcare, mobility, school services) are highlighted, leading to population marginalization and depopulation towards areas richer in services [8].

According to the Habitat and Birds Directives [9, 10] and Italian law [11], the area is characterized by a high degree of naturalness: there are 3 National Parks and 1 Regional Park: the Abruzzo, Lazio and Molise National Park (EUAP0001), the Gran Sasso and Monti della Laga National Park (EUAP0007), the Maiella National Park (EUAP0013), and the Sirente-Velino Regional Park (EUAP0173), along with other reserves and natural areas. They form the most important environmental matrix with a high heterogeneity of flora and fauna [12, 13]. Moreover, they constitute attracting poles for nature tourism, an aspect not to be overlooked as it characterizes the attractiveness potential, and uniqueness of this territory.

Over the years, the Special Office has expanded its scope and restructured its organization. It has become a key player in its governance model, initially focusing on reconstruction processes and later on the implementation of large-scale development projects. Its actions adhering the institution's political and legislative mandate and promote flexibility, adaptability, multi-level action, and a collaborative place-based approach. These characteristics allow the Special Office to create innovative processes aimed at culturally based territorial development. In the process of expanding its activities, the Special Office evolved from support for municipalities to take on responsibilities for public procurement. It shifted from being a Grant Office of the Ministry of Tourism for municipalities to offering technical assistance to local governments in the design, management, and implementation of scouting initiatives. The renewed status as a Public Administration (PA) has led these activities to be part of a broader plan for the cultural enhancement of the territory, accompanied by participatory planning with citizens and local stakeholders in urban regeneration programs.

In this way, the Special Office transcends the boundaries of ordinary governance by intervening transversally among planning levels. It not only facilitates the reconstruction process but also addresses the socioeconomic and quality of life needs of local communities. This approach, which includes urban regeneration, is defined in the literature as Territorial Regeneration. It addresses the systemic and structural conditions of a territory related to settlement systems and related functions, service provision, and ecological components. It is an approach that must be managed at a territorial scale to find the correct dimension of application [14–16], which in this case is supra-municipal.

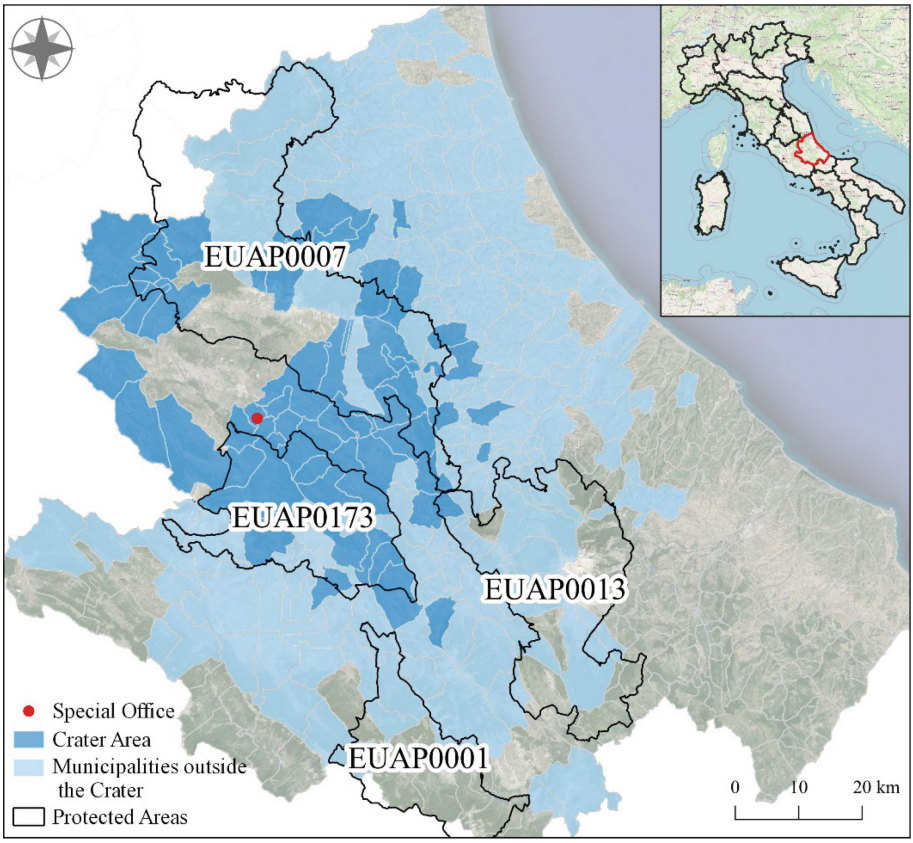


Fig. 2. Identification of the Crater area: the municipalities in dark blue are the areas with major damages and those in light blue are those with minor ones/ damages.

3 Sustainability and Social Challenges

The 2030 Agenda defines objectives and actions to ensure sustainable development globally, aiming to end poverty, combat inequalities, and enhance social and economic development while emphasizing crucial aspects such as climate change and environmental protection. This paper refers to SDGs No. 8 and No. 11.

SDG No. 8 aims to promote sustained, inclusive, and sustainable economic growth by implementing policies to promote sustainable tourism, create jobs, and promote local culture and products. Through access to national funds and programs, the Special Office is implementing Integrated Tourism Projects to revitalize the social and economic fabric of the Crater territory. These projects complement and enhance the reconstruction actions of municipalities, in line with the predominant tourist vocation of the relevant Homogeneous Areas.

The Integrated Tourism Projects aim to enhance:

- Historical, cultural, and religious tourism. The goal is to enhance archaeological sites, castles, fortifications, and cultural heritage.
- Nature-based tourism. Promotion of areas with high environmental value, historical-environmental paths, and mountain tourism.
- Village tourism, traditional, and food and wine traditions. Enhancement of historic villages, traditional festivals, and high-quality local productions.

Promoting sustainable tourism implies a long-term vision that includes tourism experiences with minimal environmental impact and that actively involves local communities in decision-making processes, thus ensuring a fair distribution of economic benefits [17].

Goal 11 emphasizes the need to focus on the dimension of cities and communities to make settlements inclusive, safe, resilient, and sustainable. Sustainability cannot be separated from the social sphere and consequently from the population living in the territory. Especially in this context, involving local realities allows for a bottom-up approach and makes citizens the true protagonists of actions in the territory [18].

In practice, Goal No. 11 includes participatory planning [19] in which the citizens and stakeholders are involved at multiple levels. The OECD Recommendation of the Council on Open Government (2017) distinguishes three levels of participation with increasing degrees: one-way information from planners to citizens, two-way consultation between institutions and citizens, and engagement with citizens and stakeholders. In this latter case, the subjects receive the necessary resources to collaborate during all decision-making phases, and in the design and provision of services. Special attention must be paid to the balance between these three figures because their approach to the problem and solutions, as well as their educational background, may differ [20].

The following paragraph presents some examples of useful tools in territorial administration, including community meetings. Through a process of direct and inclusive involvement, communities can articulate their visions for urban development, identify priorities and critical areas, and contribute to the design and implementation of tailored solutions. This approach not only enhances the quality of decision-making but also fosters a sense of ownership and responsibility towards the urban environment [21]. While detailed results and reports of these events will not be discussed in this paper, they serve as exemplars of projects promoting inclusion and sustainable management of the territory.

4 Technological Approaches

One of the challenges imposed by the goals of the 2030 Agenda is to build increasingly resilient and interconnected cities. There is a need to manage a vast amount of data while simultaneously ensuring interoperability among different sources. Smart city concepts have long been discussed, emphasizing how Information and Communication Technology (ICT) can enhance the quality of cities and the well-being of citizens [22, 23]. Moreover, ICTs can play a fundamental role in the development of cultural tourism [24]. This concept can be applied to a much broader context, such as the Crater of 2009, comprising multiple urban areas undergoing reconstruction. Thus, there is a transition from “smart cities” to “smart land” [25, 26].

In addition to the tools that will be described in the following sections, the Special Office materializes this approach through an integrated system of supra-municipal scale video surveillance. Through the implementation of other technologies, the realization of additional services for the population is envisaged, along with monitoring and analysis aimed at improving social connections within the territory.

4.1 WebGis Platform

To collect data and perform spatial analyses, the Geographical Information System (GIS) can be employed. Its purpose is to manipulate and analyze data, providing a quantitative interpretation to identify territorial dynamics. WebGis platforms have made remote access widely available, enabling anyone with an internet connection and a device to access and process the provided data.

Through a collaboration between the Special Office and the University of L'Aquila, the latter has developed a platform to manage the practices and data of the Special Office. This system facilitates the storage of a large amount of data and ensures interoperability among them. It allows for quick and simultaneous data querying from various remote office locations and facilitates monitoring of reconstruction processes (information by Technical Report). Equally important is the management of an interface for citizens to access various levels of information.

Furthermore, this platform can integrate information and data collected from participatory meetings. To standardize and digitize the data, participatory meetings can be structured through Online Participatory Technologies (OPTs) [27]. Some of these technologies involve the use of GIS software, but attention must be paid to the individuals involved. It is expected that some participants may not be familiar with this software, or they may not like to dedicate their time to learning how to use it [28].

4.2 Participatory Planning with the Municipality of Santo Stefano Di Sessanio

The municipality of Santo Stefano di Sessanio (province of L'Aquila) has an area of about 33 sq km and most of the territory is at an altitude of more than 1300 m a.s.l..

The center town (see Fig. 3) is at 1100 m a.s.l. with 114 inhabitants (at 01-01-2023) [29] and it is among the least populated municipalities in the province. It is also included in the list of the "Most Beautiful Villages in Italy" [30].

This experimental project unfolds through a series of meetings with the local community, administrators, and local authorities to identify urban regeneration action and social, economic, and cultural revitalization of the municipality. The aim is to foster cooperation and cohesion in the community and responsibility towards the urban commons. Figure 4 illustrates the main phases of the participatory planning process.



Fig. 3. Location map of the Municipality of Santo Stefano di Sessanio. The image was reworked by the authors based on the following sources: "Visit San Demetrio" and "iStock".

4.3 The "Cammini Degli Altipiani" Project and the Operative Mapping

This project involves the creation of 4 paths that develop over 42 municipalities inside and outside the Crater. The paths (see Fig. 5), create a route of about 340 km to optimize and enhance the resources of the territory and promote tourism through slow mobility.

From the beginning of the project, a significant amount of georeferenced and digitized data has been collected, ranging from the background of the area to the use of VGI data (OpenStreetMap, OutdoorActive, Koomot, etc.) to identify interferences with the road network and to define heatmaps of area. Due to the vector nature of the data, it will be possible to integrate this level of information into the platform.

In the following stage of territory characterization, there was an Operative Mapping meeting that involved stakeholders, authorities, and associations in the area. The phases of this meeting are detailed in Fig. 6.

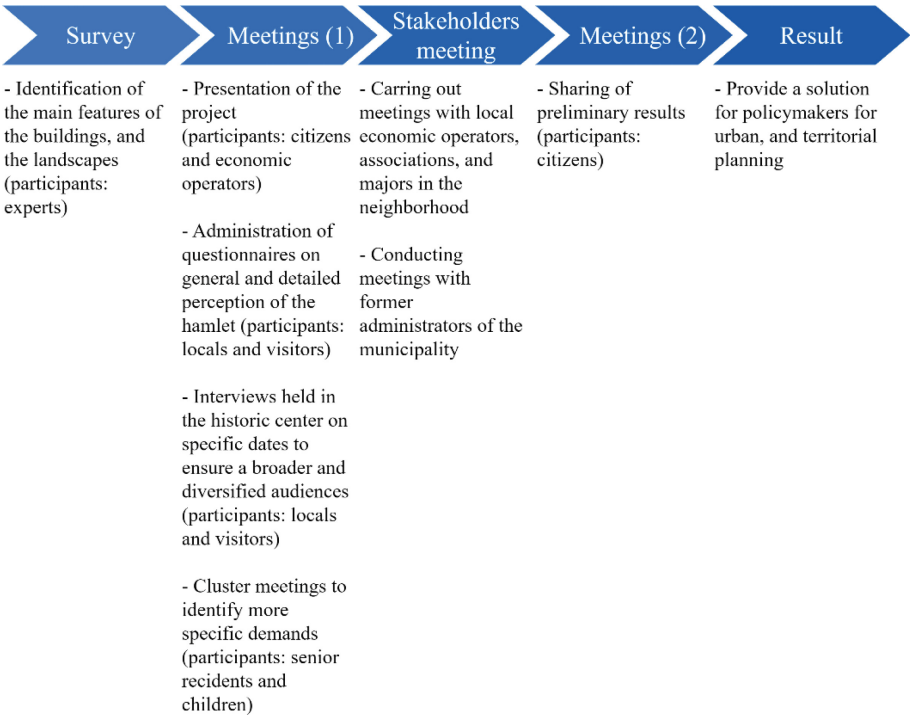


Fig. 4. Steps of the participatory planning of Santo Stefano di Sessanio

The goal of this meeting is to contribute, starting from the needs that visitors may encounter, and the services and activities already available in the area, to the implementation of an integrated service system for the 4 paths.

4.4 Cultural Events Billboard

The Cultural Events Billboard [31] is a tool that, through a user-friendly WebGis platform, collects cultural initiatives and any other event scheduled in the area, facilitating their organization and dissemination.

The website allows municipalities and associations to keep their events updated. Organizations need to make a request to the Special Office and fill out a form with detailed event information, including type, access costs, accessibility for people with disabilities, and the event's location. Users can easily find and interact with events through an interactive map of the municipalities or by filtering based on event type or date. Additionally, events can be shared on social media platforms for wider reach.



Fig. 5. The "Cammini degli altipiani" project by the Special Office (the tracks are still in the approval process)

The use of Cultural Events Billboard has two main implications. In the former case, creating a unified platform for the promotion of the area allows users to view activities beyond the individual municipalities. Secondly, the synergistic work between the Special Office and organizers can facilitate the collaborative scheduling of events and the management of periods with an excess or lack of offerings. The choice of the WebGis platform allows for interoperability between data and sources, their standardization, and an intuitively user-friendly mode of operation.

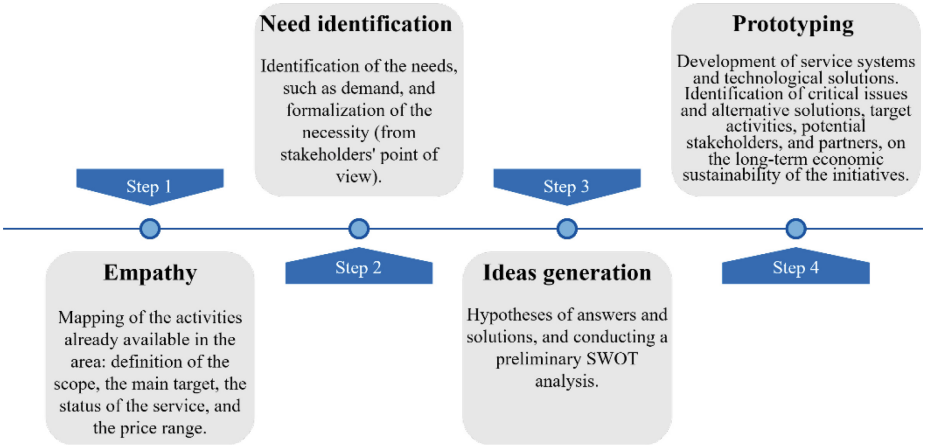


Fig. 6. Steps of the Operative Mapping

5 Conclusion

The post-earthquake experience has highlighted the need for careful and inclusive governance. The Special Office has had to address challenges not only related to physical reconstruction but also to the social and economic recovery of the affected communities through the coordination of activities and territorial development projects. The United Nations' 2030 Agenda has drawn attention to the need to pursue sustainable development that encompasses social, economic, and environmental aspects. In this context, the multidisciplinary approach adopted in addressing post-earthquake challenges has promoted the integration of territorial regeneration policies and socioeconomic development, with a particular emphasis on sustainable tourism as a driver of economic growth and social inclusion.

A key element in the territorial regeneration process is the active participation of local communities and stakeholders. The adoption of participatory approaches allows for the direct involvement of citizens in decisions regarding the development of their territory, ensuring a greater sense of belonging and responsibility. Furthermore, the inclusion of diverse perspectives and expertise fosters innovation and the creation of solutions adaptable to the specific needs of the local context.

As previously mentioned, the area of interest is characterized by demographic decline, with local communities sometimes comprising as few as a hundred inhabitants. Consequently, participatory meetings may encounter limitations, such as low turnout at informational and planning sessions.

To foster participation, it can be helpful to begin with a pre-operational phase focused on raising awareness and understanding of these types of gatherings and the topics they will cover. Associations and organizations involved in social issues can play a crucial role in this phase. They can act as mediators between the population, helping to spread awareness and sensitivity to these topics, and as intermediaries with planners to express the needs of local communities.

The subjective nature of opinions and ideas is inherent in the bottom-up approach. Therefore, a careful post-processing phase is necessary to analyze the collected data and provide an accurate interpretation of the phenomena of the territory.

To improve the efficiency of these processes, the use of technological tools, such as the WebGis platform, facilitates the collection, analysis, and sharing of territorial data, enabling a more efficient and transparent management of reconstruction and development activities. These tools streamline citizen participation in participatory planning processes through remote access to information and also offer the opportunity for active contribution using dedicated Online Participatory Technologies. At the same time, involving GIS system experts alongside participants is essential to prevent discrepancies arising from differences in proficiency levels.

In conclusion, this work demonstrates how the adoption of integrated and inclusive approaches in the management of reconstruction and territorial regeneration processes can contribute to achieving sustainable development goals and improving the quality of life of local communities.

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