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The Territorial Project as a Condition for Post-Earthquake Reconstruction of L'Aquila

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Preamble

The numbers that can be sharply drawn from the L'Aquila Earthquake (2009, M_w=6.3)[1] are certainly less extensive than those that have characterized other similar disasters: The Great East Japan Earthquake (2011, M_w=9), The Haiti Earthquake (2010, M_w=7), The Kashmir Earthquake (2005, M_w=7.6), The Gujarat Earthquake (2001, M_w=7.7), but also with respect to other seismic catastrophes that the same area has undergone in the past. An example is The Marsica Earthquake (1915, M_w=7): 30,000 people lost their lives out of a total of 120,000 residents, old town centers were destroyed including Avezzano as well as a vast number of individual buildings, palaces, churches, fortifications. This catastrophic event happened a few years after what is considered the most devastating event of the XX century in Italy: The Messina Earthquake (1908 M_w=7.2), followed by Tsunami that destroyed 90% of the city and caused the deaths of over 100,000 residents.

But damages caused by The L'Aquila Earthquake takes on much more weight when you consider that a cultural and historical heritage of great importance was hit. 6,000 buildings (Casarotti *et al.*, 2009), 199 churches and 50 palaces (Calderini, 2011) were seriously damaged.

L'Aquila is a city encompassing a vast territory dotted with numerous small nuclei - as well as some recent suburbs formed along the main roads - gravitating around the inner city based on a clear and strong Roman Castrum. The District[2] of L'Aquila represents a significant monumental complex comprising 989 assets worthy of protection by virtue of their architectural features.

Table 1. Distribution of the category "Architectural Heritage" belonging to each Mountain Community of L'Aquila District. Legend: A Archeological areas - C Churches - E rural Buildings - F Castles - N Borough - P Palaces - I Other monuments. Source: CRESA 2008

[1] L'Aquila (population 72.696) is the capital of the province of the same name and of Abruzzo, one of Italy's 20 regions. The seismic event occurred at 03:32 local time on Monday 6 April 2009 and had an epicenter 3.4 km southwest of the city of L'Aquila.

[2] The District of L'Aquila coincides with the Territorial Framework of Reference (LR 70/95). It comprises the town of L'Aquila and municipalities that belong to the Mountain Communities: Amiternina, Campo Imperatore – Navelli Plain, Sirentina

District of L'Aquila	A	C	E	F	N	P	I	Total
Amiternina	2	170	7	13		39	11	242
Campo Imperatore – Navelli Plain	5	131	4	31	14	67	10	262
Sirentina	4	111		25	5	34	16	195
L'Aquila Municipality	2	151	6	19	1	85	26	290
Total	13	563	17	88	20	225	63	989

Almost one third of this architectural heritage is located in the city of L'Aquila which, by extension, represents less than 25% of the district (CRESA, 2008). These complexes that date back to XI century, have developed and integrated harmoniously until the first half of the XX century. The heyday belongs to the period between the XIII and the XVI century.

Figure 1. *The Duomo Cathedral of San Massimo is seen damaged in the town center of L'Aquila, central Italy, on Tuesday, April 7, 2009. (AP Photo/Alessandra Tarantino)*

General Data of the L'Acquila Eartquake

The city of L'Aquila was not the only one to be hit. The 2009 earthquake caused devastating effects on an even larger area: the so-called "Crater". According to official estimates 57 Municipalities have been hit, 308 inhabitants were killed, 1,500 injured, 202 of them seriously (Volpini, 2009) and 67,500 people were left homeless. Almost all economic activities have been interrupted: 1800 commercial and craft companies were forced out of business out of a total of 2000 (STM, 2011); the production capacity of industrial plants in operation has fallen for several weeks after the earthquake, to 60-70% of their potential (CRESA, 2011); social services stopped: health, safety, public administration, school; University lost most of its teaching and research

venues as well as services for students (19,000 enrolled of which around 10,000 were residents). It is as if all the old clusters were hit by a series of explosions, with more or less severe effects on building structures, blocking the collective life and functional organization of Municipalities.

As well known internationally, emergency operations worked well, helping people from the first moment and then - within the first six months - building hundreds of good quality accommodation, able to bring people housed in temporary accommodation[3] close to the affected urban areas. At the beginning of 2010, built accommodation in the town of L'Aquila were 7,000, organized in small neighborhoods and built with innovative earthquake-proof solutions. At the same time, all the 249 damaged monuments and most of the buildings were made secure, with the adoption of techniques and materials mostly tested after the Umbria Earthquake (1997, M_w=6.1). It is not purpose of this paper to report the details of these challenging and expensive operations that, however, have been extensively discussed in the "34th International Symposium on the Conservation and Restoration of Cultural Property - Reconstruction Process and Cultural Heritage" (Tokyo, January 2011). What we wish to emphasize is that:

a) this disaster hit a great cultural heritage as well as the lives and economies of the population;
b) the risk posed by the effects of The L'Aquila Earthquake cover almost the entire territory of historical and cultural heritage of Italy (see Figure [3]);
c) the characteristics of these assets are such that a complex treatment, able to correctly interpret the strong integration between monumental buildings, urban historical context, quality of the natural environment and landscape, identity and culture of the local communities, is needed.

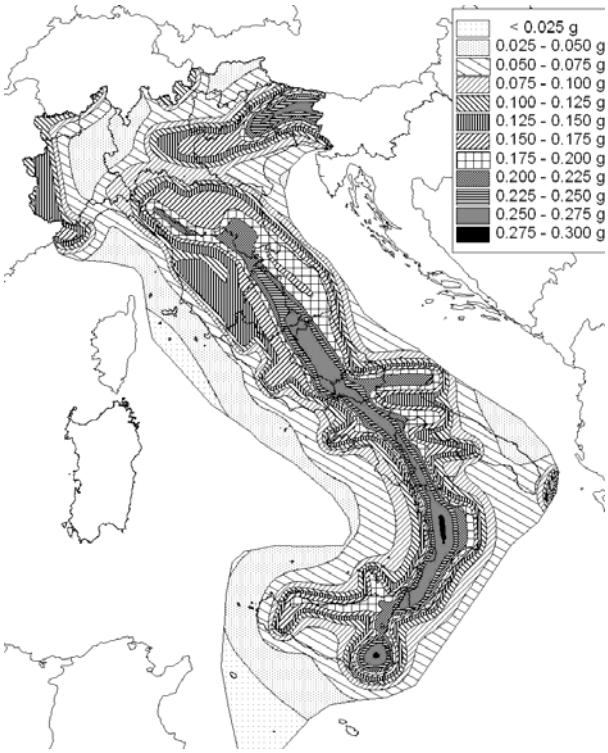

Figure 2. *Seismic Risk Map of Italy (b/w version - G.U. n.108, 11/05/2006 - Istituto Nazionale di Geofisica e Vulcanologia (INGV)*

[3] According to Alexander (2010) roughly a third were temporarily re-housed in hotels on the Adriatic Sea coast of Abruzzo and about a third were accommodated in 171 tent camps. Most of the others found alternative accommodation on their own initiative.

Issues related to the affected heritage

Emergency response operations have worked well both in protecting people's basic needs and avoiding further possible loss of architectural heritage. Although many Reconstruction Plans have had a positive reception by the Struttura Tecnica di Missione (STM) are on track to final approval, the next phase, the organization and the start of reconstruction, has not yet been concluded for several reasons. On the one hand the complexity of political, decision-making and administrative-operational processes that chronically afflict this country; the other, the objective difficulty to deal with reconstruction work where you need to recover the entire not only individual buildings but the entire urban fabric, and the need to exercise constant vigilance on the effective heritage protection. It is known, for example, the operational difficulties which have affected the management of the estimated 1.5–3 million cubic meters of debris (Di Coma C., 2010) which had to be removed along with a accurate cataloging and were deposited at regional sorting and disposal sites (Brown *et al.*, 2010). After, debris were reused in careful interventions of reconstruction, rehabilitation able to restore the individual buildings and monuments to a condition that allows the understanding of the constructive qualities, historical events and the relationship with the environment. The issue of correct heritage recovery is central, especially in this context because it is the greatest resource not only for what it represents itself but also for the relationship with the local culture, for the integration with the environment and the territory.

The complexity of the heritage affected by The L'Aquila Earthquake is represented by the tight integration between the individual parts of buildings, the urban fabric, the richness of the geography and the natural environment (Abruzzo is the Green Region of Europe, with its 3 National Parks, 14 State Reserves, 25 Regional Reserves, 10 Special Protected Areas). This heritage comprises not only single building or architectural complexes, but should be interpreted as a whole including the territory with all its resources.

The reconstruction costs, referred only to works of restoration, were estimated at approximately euro 12 billion (OCSE, 2010), a surprising amount that must be summed up to the costs of many other natural disasters that every year, affect the entire country. The causes are different, in part related to the particular nature of geographical contexts, in part due to the lack of prevention and maintenance, often due to the abandonment by residents, especially in inner areas. Abandonment (of agricultural land, houses, entire neighborhoods and ancient villages, including churches, convents and monasteries) is the main cause of the structural weakening and degradation of the heritage, of its tragic fragility in the face of disastrous events such as the earthquake. The action against this phenomenon[4] is not easy, it requires policies and programs that cannot be based on the commitment of public money in an unproductive way but should stimulate private interest to stay in place, to invest in new activities and maintenance of assets. It is thus clear that any process of reconstruction can be addressed with a restricted vision, nor strictly localist, but should be put within a structural view able to indicate the prospects for rehabilitation of the territories through the revival of economies. The territory of L'Aquila has environmental resources that if properly exploited can play a decisive role in this regard. The mountains surrounding the city of L'Aquila are not only rich in natural areas of great interest but also comprise two major basins for winter sports: Gran Sasso and Altopiano delle Rocche.

[4] In Abruzzo, 76.6% of the total area is classified as mountainous. 37% of the total population lives in mountainous areas. The aging index in the mountain areas is equal to 172.8%, a value much higher than the national average (131.4%). The net migration rate is positive (3.9 per thousand), but not high enough to compensate for a negative natural growth (-4.3 per thousand), so the population in these areas is declining, in contrast to the increase in rest of the region (EIM, 2010)

Figure 3. *Shattered roofs of collapsed houses are seen against the backdrop of snow-covered mountains after an earthquake in the Italian village of Onna April 6, 2009. (REUTERS/Chris Helgren)*

The role of architects and the commitment of university

The commitment of architects is crucial in the treatment of many categories of the reconstruction project, but a special role should be played by planners in two types of project:
a) The preparation of Reconstruction Plans for the establishment of new municipal structures in which the protection of historical and environmental heritage, the highest standards of collective security, space and technical models targeted to a general improvement of living and production quality are integrated;
b) The preparation of strategic plans that offer visions for the political reorganization of infrastructures and key local services, highlighting the possibility of developing new economies (as well as the recovery of pre-existing ones. See STM (2010) for a detailed overview).

The University "G. D'Annunzio" of Chieti-Pescara was immediately made available to authorities and people after the earthquake, forming groups that have technical personnel drawn mainly from the Faculty of Architecture and Geology. Professors & architects have been involved in this commitment that, in June 2009, led to the signing of an initial agreement with the Region of Abruzzo for more structured assistance to some of the municipalities affected by the earthquake. We have coordinated a group of teachers, researchers and students who worked for the Municipalities of Altopiano delle Rocche.

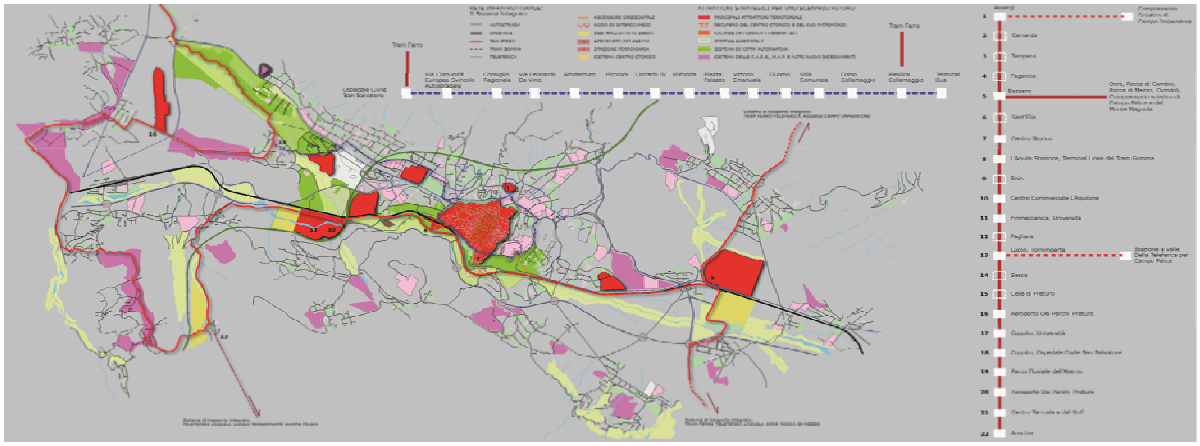

Figure 4. *Masterplan for L'Aquila Metropolitan Area (Interlab Group: Rocca di Mezzo)*

After an initial phase of assistance to the Council for surveys and administrative procedures for cataloging the damage, efforts were aimed at studies and proposals for regional Reconstruction Plans. The study of population movements and changes of urban structures formulated proposals for future scenarios for the urban renewal area of Altopiano delle Rocche and the entire metropolitan system of L'Aquila. One of the first conclusions reached is that action taken during the first emergency phase to give the people a chance to stay in their places of residence, while being constructive and valuable episodes that will last over time, have substantially changed urban structure and spatial relations. If before the earthquake, the city of L'Aquila was the reference nucleus in a complex composed of small urban units substantially closed and almost totally dependent on the central city, today it is one of the several nuclei that integrate into a completely different territorial system. From a hierarchical model and based on a network of autonomous settlements we have moved to a nebulous system, in which old suburbs located on the main roadways, play a major role. The implementation of the C.A.S.E.[5] plan in L'Aquila, and localization of MAP[6] nuclei have contributed to this process of morphological change through criteria of pure seismic proofness and soil characteristics. The only element of aggregation between pre-existing and new locations is almost always the road, possibly endowed with underlying utilities.

The new territorial scenery: from the compact city to the sprawl city

Various administrative measures have changed the rules:

- to facilitate the planning of new residential complexes or locations and the individual operations of private citizens willing to build their new homes;
- to identify reference nodes around the old city and the centers of affected towns.

More specifically, Deliberation of City Council n° 58, May 25, 2009 intended *to meet the temporary housing needs of citizens and those relating to the development of activities related to the residence by establishing criteria and procedures for locating, building and then removing temporary buildings, given their provisional characteristic* (trans. by Author).
The result has been the production of an uncontrollable phenomenon of consolidation of peripheral settlement through many public and private interventions connected to major roads (SS 16).

[5] The Project C.A.S.E. is a plan that provides for the construction of "Seismic-Proof Sustainable Eco-friendly Complexes" in the town of L'Aquila.
The government authorizes the Commissioner appointed to design and build in record time:
- New houses;
- Not only houses, but durable and technologically advanced areas (this includes all services).

[6] The temporary housing units, also called MAP, are the houses built in the municipalities affected by the earthquake, apart from L'Aquila, and intended for all those who have unsafe houses.

Although Deliberation n° 58 was revoked by Deliberation of City Council n° 145 of 16 November 2010, it is estimated that in the entire crater there are about 4 000 abusive buildings, compared with the 1046[7] wooden buildings authorized and constructed[8].
The results of this radical change are still largely unknown but it is very likely that the future scenario (3-5 years) will show us a territory organized in a manner substantially different from the original, an urban area where a cloud of settlements of various types will be aggregated along a linear structure east-west oriented tangent to the ancient city. Because of the lengthy reconstruction process, the old town of L'Aquila has now become an impenetrable island around which not only thousands of new homes were built but most of the numerous functions that were within its perimeter have been relocated. The old town today has no aggregation and identification areas capable of evoking a sense of the centrality. It is clear that this system cannot be replaced by new buildings or the aggregation scheme of seismic proof complexes. Each part of this new periphery is a closed fence around which unvaried interventions of all kinds and for every need are located.

The problem of mobility - already evident in the pre-earthquake condition, mainly because of the lack of a complete east-west corridor capable of directing the cross traffic away from the center- has reached such levels that it could considered a new emergency. The difficulty of movement around the city today has become unbearable and certainly a strong contrast to the smooth recovery of productive activities, but also contrary to the simple residential function, because of long travel times and dispersion of the service centers. In the new structure, peripheral towns and consolidated urban nuclei, which have not undergone an excessive damage, quickly assumed a relatively central role in the district of L'Aquila. The Masterplan of L'Aquila will deal with an entirely new and essentially unplanned organization of the territory. A situation in which: new centers will be considered; an urban system will be organized taking into account that the Old Town will have a marginal role for several years (8-12). In addition to urban areas, individual buildings and monuments, many of the original functions will be recovered, but surely the resident population will be much smaller than before the earthquake and this raises important questions about the future.

Local themes of recovery

The issue of how to intervene in the historical center of L'Aquila is so dominant in the set of issues tragically emerged after the earthquake that damages in the other 56 municipalities of the Crater seem to be of little significance. But if the pre-eminent position and the significant role at the regional level of L'Aquila is not questioned, the same is not true for the other municipalities.

The earthquake has reported dramatic evidence of the problems that small towns and inner city centers are facing. They relate on the one hand the absolute necessity to make the complex secure, the other the chronic difficulty in finding the necessary resources for this and for the protection of the enormous historical and architectural heritage. What emerges from the positions expressed by the Mayors with the first acts of the reconstruction is the constant need to find opportunities for raising funds not only for its buildings but also for urbanization. The widespread fear is that the available resources may generate a sporadic reconstruction mainly entrusted to the will and initiative of individuals. For many Municipalities it will be difficult to go beyond limited processes of reconstruction and recovery, but for those that have retained some vitality, thanks to their position in areas served by the most important infrastructures or simply because influenced by the proximity to the most dynamic areas, it will be possible to activate more complex and more pervasive mechanisms.

That said, the whole Planning & Public Works System is clearly inadequate, while shares for strategic planning and design of neuralgic works aimed at raising funds and realization are growing in importance. The risk of losing the image of a cohesive area, in which every part plays an important but not decisive role in the allocation of a particular character and identity, is very serious. Losing sight of the importance of a unified perception of these places can be fatal not only to smallest and weakest towns but also to the capital and its suburbs. The aim

[7] 437 in San Giacomo-Pile; 158 in Pianola-Monticchio-Bagno; 47 in Roio Poggio; 35 in Preturo Colle; 70 in Sassa-Brecciasecca; 45 Assergi-Camarda; 243 in Paganica ed Onna; 11 in Arischia.

[8] http://www.consiglio.regione.abruzzo.it/rassegna-notizie/guerra-alle-casette-abusive-controlli-dal-cielo

of the architects who are now engaged in the reconstruction of new buildings and especially in the preparation of new planning instruments, is to demonstrate the ability to combine restoration with better protection of heritage and the life of the population for the future. To achieve this goal, improvement of the technical tools is needed, but also collaborate with other experts (geologists, engineers, environmental experts, geographers, sociologists, restoration experts, economists) and cultivate a special relationship with the people, to be sure "to rebuild and improve".

A scenario for the future: security, innovation, sustainability

Compared to the background perspective outlined above, several initiatives have been promoted: some aimed to rapidly mature the competitive capacity of the system, by promoting convergence among groups of municipalities, regional governments, universities and businesses. In particular, the following actions were initiated:

a) the definition of a first program for the dissemination of knowledge and building consensus around plans and projects;
b) the formalization of an agreement Municipalities-Region-Struttura Tecnica di Missione of the Commissioner for the Reconstruction-University, for the promotion of a unified planning program, based on research, experimentation and training, for innovation in the field of environmental sustainability and recovery processes of city centers;
c) the opening of negotiation tables among Municipalities-Region-Companies to establish a Thematic Agenda for Companies, aimed at creating a specialized chain in the sustainable construction and conversion of existing historic town in a safe and sustainable city;
d) the provision of an integrated communications program, designed to raise awareness of the commitment of municipalities and other actors both to local populations and outside the territory of L'Aquila;
e) the development of Reconstruction Plans, able to effectively promote the approach to sustainability in collaboration among government, universities and businesses.

It is important to note that technology and science continue to bear the weight of a subordinate role to history and philosophy in the division of the two cultures, the scientific and the humanistic one (Snow, 1963). A help through a desirable unitary reunion of cultures seems to come by the emergence of well-known concept of sustainability, often abused and mainly recall in relation to climate change problems.

In an era of globalization, sustainability can act as an antidote to this difficulty in combining protection, enhancement and development of cultures, economies and lifestyles. For anyone who has a responsibility to the Cultural Heritage, sustainability means firstly to respect the cultural identity of places and consider the compatibility of its operations with the particular social and intellectual structures, the philosophical conceptions, religious and aesthetic sentiments of the place where he intervenes. Sustainability should characterize the reconstruction process. Furthermore, technological innovation (with new investigative techniques and new materials) together with the innovation of planning process (with new models of protection, prevention and conservation) should help reduce the degradation or at least delay the cost of reconstruction, in line with a philosophy of sustainable territorial development.

Beyond the technology, planning rules also need to become sustainable, balanced between tradition and innovation, without sacrificing the valuable contribution of methods, materials and tools already available from research, that improve the quality of the processes of conservation and make more sustainable costs in the long run, contributing to the low environmental impact of operations and construction.

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