TeMA

Journal of Land Use, Mobility and Environment

Cities need to modify and/or adapt their urban form, the distribution and location of services and learn how to handle the increasing complexity to face the most pressing challenges of this century. The scientific community is working in order to minimise negative effects on the environment, social and economic issues and people's health. The three issues of the 14th volume will collect articles concerning the topics addressed in 2020 and also the effects on the urban areas related to the spread Covid-19 pandemic.

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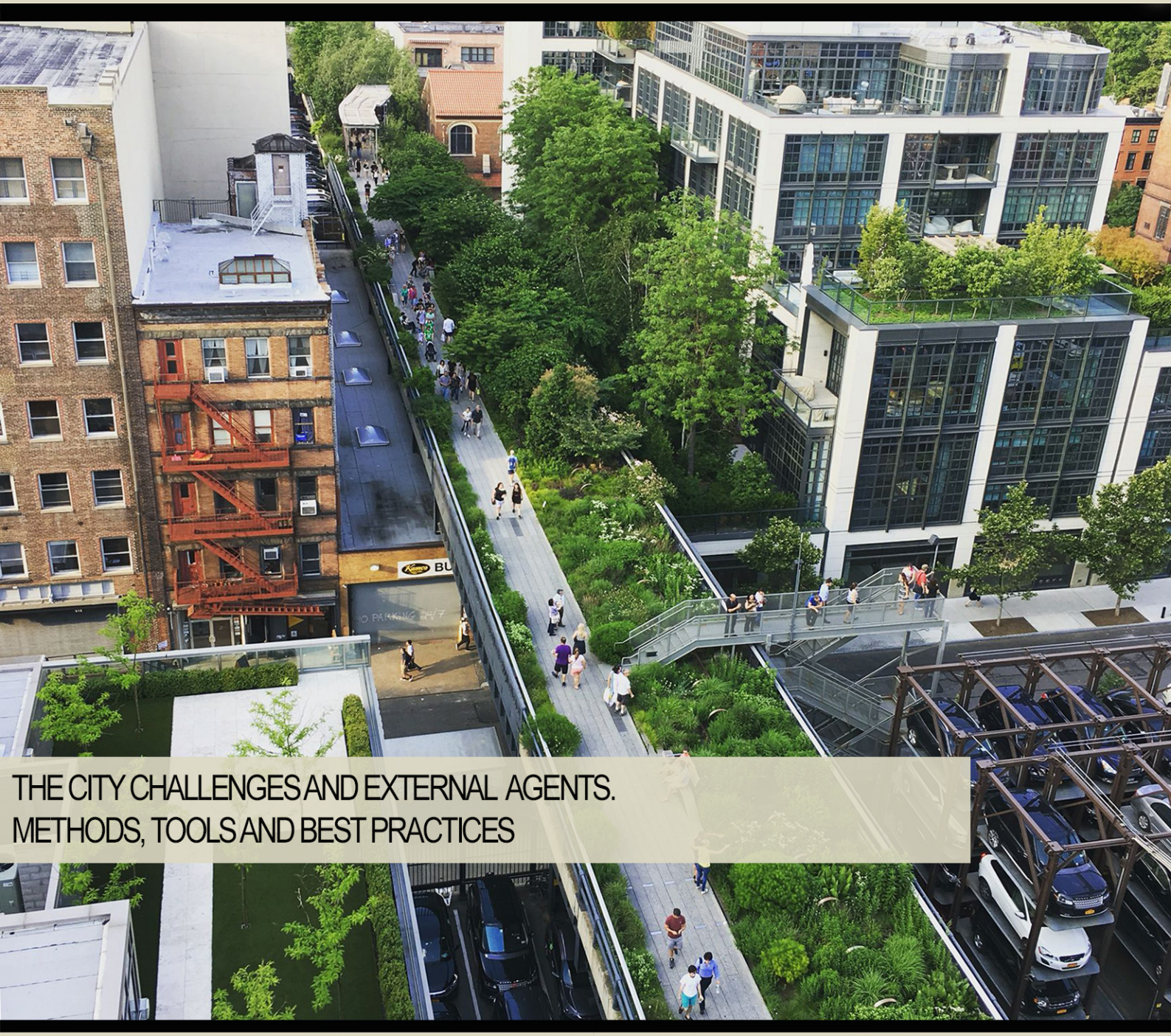

THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES

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TeMA Journal of Land Use, Mobility and Environment

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The city challenges and external agents. Methods, tools and best practices

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Cities need to modify and/or adapt their urban form, the distribution and location of services and learn how to handle the increasing complexity to face the most pressing challenges of this century. On these topics and the ones born during the last year, the scientific community is working in order to minimize adverse effects on the environment, social and economic issues and people's health.
The three issues of the 14th volume will collect articles concerning with the effects of climate change, the ageing of the population, the reduction of energy consumptions from fossil fuels, immigration flows from disadvantaged regions, innovation technology, the optimization of land use and the impacts, in the short and long period, with innovative methods, tools, techniques and practices.
For this Issue, the section "Focus" contains two contributes. The first article of the section is titled "Fostering the climate-energy transition with an integrated approach" by Anna Codemo, Sara Favargiotti, Rossano Albatici (University of Trento, Italy). The paper deals with the well-known topic of climate change and investigates the relationship between adaptation and mitigation strategies in order to evaluate the possibility of combining them in planning policies and design practices. The proposed case study is the Hammerby Siostadt district in Stockholm that could be a significant example also by considering the policies that the City of Stockholm has implemented since 1976, with the adoption of the first environmental program and the development of the policy of adaptation and mitigation.
The second article, titled "Project suggestions for post-earthquake interventions in Italy" by Maria Angela Bedini, Giovanni Marinelli (Polytechnic University of Marche, Italy), focuses on the objective resettlement in the areas of origin of the displaced population. The study aims at providing a set of practical suggestions to make it possible for the population to lead an acceptable "coexistence" with the seismic risk in the high hilly and mountainous areas. This paper also highlights some contents of the current implementation of urban plans (SUM Minimum Urban Structures), which are meant to serve as a dynamic tool for reviving fragile areas.
Two papers address the section "LUME" (Land Use, Mobility and Environment). The first, titled "Congestion toll pricing and commercial land-use: clients' and vendors' perspective", by Mahmoud Saffarzadeh, Hamid Mirzahossein, Ebrahim Amir (Tarbiat Modares University, Iran). The paper investigates the effects of the Tehran congestion toll pricing (CTP) on commercial land uses (CLUs) by examining the clients' behaviour in these business applications concerning the price increase. In the case study of Tehran metropolis, Iran's capital, which has experienced congestion pricing for more than four decades, both clients and vendors' viewpoints were modelled using discrete choice models.
The second article, titled "Recycled aggregates in constructions. A case of Circular Economy in Sardinia (Italy)" by Ginevra Balletto, Giuseppe Borruso, Giovanni Mei, Alessandra Milesi (University of Cagliari, Italy). The paper highlights a theoretical framework for the circular economy, adapting a model of the industrial location to the construction of the Cagliari stadium. Authors build a georeferenced database of activities related to the extraction, processing, and disposal of materials related to construction due to the MEISAR Project. Findings show that the demolition and reconstruction of the Cagliari stadium for the way it was

designed will activate a circular economy process, which will develop between five sub-circular clusters of the city of Cagliari based on the use of recycled aggregates.

The section "Covid-19 vs City-19" collects one publication.

The article titled "Bicycle and urban design. A lesson from Covid-19" by Nicolò Fenu (University of Cagliari, Italy), questions: what is the role of mobility for society and the design of our cities? What is the role of sustainable mobility, of using bicycles addressing the Covid-19 emergency? During and after this emergency, the use of the bicycle can give answers addressing urban quality, liveability for spaces in our cities. The research studies the urban policies of 5 cities: Barcelona, Bogota, Brussels, Milan and Paris and analyses the measures implemented during the first lockdown, from February 2020 to May 2020.

The new Review Notes section propose four insights on the themes of the TeMA Journal.

The first research "Ecological transition: which transactions?" is by Carmen Guida and Federica Natale. This contribution aims at defining the definition and intervention domain of ecological transition. The outbreak of a novel coronavirus and consequent health, economic and social crisis leads to a new era: significant financial resources, plenty room for economic maneuvers may turn the ongoing pandemic into an opportunity, for the following years, to build more sustainable societies and environments. Within this scenario, urban areas play an essential role, as proved in the second paragraph with the support of interesting scientific publications reviewed in the Urban Planning Literature review section of Review Notes.

The second research "Strategies and guidelines for urban sustainability: The impacts of the Covid-19 on energy systems" is by Federica Gaglione. The contribution highlights how the Covid-19 pandemic has a substantial impact on energy systems around the world and on all components of the urban system, for instance on the mobility system and built environment. Furthermore, the review underlines that in this pandemic scenario, the issue of energy has become the focus of discussions by the scientific community and the European Commission. In this direction, the latest documents issued by the European Commission on energy before and after the Covid-19 crisis are analysed with the aim of identifying the priorities and strategies aimed at both reducing energy consumption and improving it in the various territorial contexts.

The third research "Toward greener and pandemic-proof cities? Italian cities policy responses to Covid-19 pandemic" by Gennaro Angiello. The section provides an overview of the policies and initiatives undertaken by three major North American cities in response to the Covid-19 outbreak: New York City (US), Mexico City (MX) and Montreal (CA). Based on this overview, a cross-city analysis is employed to derive a taxonomy of urban policy measures. The article concludes with a discussion on the effectiveness of such measures in providing answers to epidemic threats in urban areas while, at the same time, improving the sustainability and resilience of urban communities.

The last research "Citizen science and urban development" is by Stefano Franco. The section tackles the issue of citizen science, a new data collection methodology for research project that generates sustainability benefits, and that is recently finding applications in urban context to solve social and environmental issues while providing useful information that can be also used to develop urban plans.

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Project suggestions for post-earthquake interventions in Italy

From building reconstruction to the population resettlement

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Abstract
Over the past 30 years, post-earthquake emergency event management in Italy has far too often focused on the provision of temporary wooden housing modules to accommodate displaced residents transferred from their areas of origin to other places. This has led to losing sight of the central objective of resettlement in the areas of origin of the displaced population. Despite significant financial contributions allocated by the Central Government, unacceptable delays in reconstruction have almost always occurred.
This study is aimed at providing a set of practical suggestions, to make it possible for the population to lead an acceptable "coexistence" with the seismic risk in the high hilly and mountainous areas.
This paper also highlights some contents of the recent implementation urban plans (SUM Minimum Urban Structures), which are meant to serve as a dynamic tool for the revival of fragile areas. A few operational recommendations concern the criteria for the choice of the areas where temporary wooden housing modules are to be established in the transitional phase, near the city centre. Finally, the operational suggestions delivered by the study may provide an opportunity to raise the risk protection level and enhance the most important available resource: human capital.

Keywords
Innovative urban plans; Post-earthquake code of conduct; Risk protection tools; Different lifestyle in fragile areas.

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1. Introduction

The succession of major natural disasters has not resulted into a significant lifestyle "change" in the most fragile areas of the region. Furthermore, the current risk protection system is not yet suitable to modern man requirements. The concept of "coexistence with risks" – whatever their nature might be - is not yet deeply rooted. International studies on the recovery process of pre-existing conditions before the earthquake have not yet led to the definition of international protocols, nor to shared guidelines for a political and administrative post-earthquake management nor to the awareness and enhancement of human values underpinning a balanced regeneration of settlement models and minimum human coexistence requirements.
This is the framework in which this paper has been drafted, by collecting the results of a nation-wide research on the evolution of approaches to subsequent seismic experiences in Italy. A few major operational suggestions are aimed at the reconstruction and resettlement of the population ensuring the most advanced risk protection systems and a better quality of life.

2. Positive and negative aspects of the post-earthquake experiences

This chapter provides an analysis of a few positive and negative results of the studies that have been carried out following the most significant seismic events that have occurred in Italy. These studies concern the earthquakes that occurred in the following regions: Marche, 1930 (magnitude 6.0; 18 earthquake victims); Marche, 1972 (magnitude 5.4 to 5.9; no victims); 1997 (magnitude 6.0; 11 victims); Friuli, 1976 (magnitude 6.4, 990 victims); Irpinia and Basilicata, 1980 (magnitude 6.8, 2,735 victims); Umbria, 1979 (magnitude 5.9; no victims); 1984 (magnitude 5.6; no victims); 1997 (magnitude 6.0; 11 victims); Abruzzo, 2009 (magnitude 5.9; 309 victims); Emilia-Romagna, 2012 (magnitude 5.9; 27 victims); Central Italy, Marche, Umbria, Abruzzo, Lazio, 2016-2017 (magnitude 6.0; 298 victims) (Bedini & Bronzini, 2018).
The early studies on seismic microzonation date from the earthquake of Friuli (1976): the overlapping of areas at different geological and geotechnical soil capacity levels and different statistical probability rates to withstand seismic shocks of varying intensity. This experience has favourably influenced subsequent studies on vulnerability, earthquake standards, classification criteria of the affected areas. A special attention was paid to risk issues and risk mitigation, with contributions from different disciplinary sectors of expertise. The small size of the affected municipalities favoured the reconstruction over an average period of two to three years.
The post-eartquake reconstruction in the *Marche (1972; 1997)* was carried out simultaneously with the definition of a new PRG (General Regulatory Plan). The private reconstruction activities were included in the sector-specific detailed plans, which defined division and re-aggregation of individual public and private housing units, according to a collective interest and urban socialization vision, intended as a land regeneration strategy. The post-earthquake reconstruction, in this case, took a decade, and was carried out on the basis of a "single project". In this sense, the experience of Ancona earthquake of 1972 (Campos Venuti, 2012; Frezzotti, 2011) can be regarded as an example of full restoration of the historical city centre, thanks to the huge amount of funds that were allocated, which led to the transformation of the ancient villages perched on Guasco and Astagno hills into rational neighbourhoods. This intervention has led to a better sanitation of the neighborhoods and a network of paths and private spaces, closed between buildings, transformed into public spaces. The result is an excellent example of the redevelopment of the historic center.
The experience of *Emilia-Romagna* (2012) is a watershed in the earthquake approach. For the first time in Italy, a wide spread area was affected by the earthquake. In this case, a whole highly productive and active industrial and agri-industrial area was concerned, which fostered a multi-stakeholder approach with the involvement of social partners. The rapid reconstruction of public services was made possible by the timely implementation of the Emilia-Romagna Reconstruction Plan (Law no. 16/2012) (Nerozzi & Romani, 2014) entitled to exemptions from the ordinary urban management rules. The so-called 2015 Special Area Programs (PSA / SAP), implemented in 24 municipalities, in accordance with Regional Law no. 30/1996 (Franz, 2016),

and the historic town centre Plans reaffirmed the central role of historic urban fabrics, while the innovative Operational Plan (PO / OP) have enabled the design of a master plan, integrated with the financial programs for social and economic regeneration of the historic town centres (Isola & Zanelli, 2015). The rebuilding process has therefore been supported by a new regional law and a new Urban Plan, with the aforementioned Special Area Program (PSA / SAP). The Regional Law no. 30/1996 made it possible to share a major urban planning experience with the strong involvement of municipal authorities and the private sector.

Not positive results were reached instead during the 2012 experience in the smaller towns of the Ferrara province, featuring buildings and monuments of high historical value (Romanesque, high medieval and Renaissance heritage), but also in other small towns characterized by deteriorated and derelict minor historical town centres, very often occupied by low-income immigrant households, with no means to afford any redevelopment or refurbishment projects.

In *Umbria (1979; 1984; 1997),* the choice of opting for a "soft reconstruction" in 1997 (Nigro & Razzio, 2007) made it possible for its inhabitants to return to their homes in a relatively short time, provided that damages were limited. Thanks to the seismic microzonation, it was possible to distinguish areas with different geological and geo-morphological characteristics, to identify the seismic thrust. The Regional authority issued the Regional Decree no. 64/2010 setting out the guidelines for the definition of the so-called Minimum Urban Structure (SUM) aimed at the seismic risk reduction, pursuant to art. 3.3.d of the Regional Law no. 11/2005. The Regional Law no. 1/2015 has integrated SUM into the regulations as a structural urban planning tool, with the task of selecting functions, infrastructure, spaces, and strategic buildings to maximize earthquake safe conditions, during emergency and post-earthquake recovery of urban, economic, and social activities. SUM was therefore designed to identify the structuring lifelines, the main road infrastructures and their intermodal hubs at different scales, the pedestrian escape routes, the open spaces and strategic and safe buildings, the first aid waiting areas, the reception areas of the population. SUM was also intended to identify the critical elements of the urban system: urban gates of historical value, steep or narrow alleys, areas subject to hydrogeological hazard, buildings built closely along the streets, etc.

In the context of urban and territorial SUM, the Intermunicipal Emergency Plan (I-EP) extends the methodological principles of Limit Condition for the Emergency (LCE) to the territory (Di Lodovico & Di Ludovico, 2018).

In the *Irpinia and Basilicata (1980)* earthquake, planning did not play a significant role. The temporary structures that have been supplied have turned out of deficient usefulness and reconstruction took a long time, partly due to the large number of small urban centres involved.

In the *Abruzzo (2009)* earthquake, Central Government's urban redevelopment choices implemented in the wide historic town centre action of L'Aquila were totally devoid of urban and social cultural background. The Central Government's pseudo-innovative strategy was focused on the design of the so-called New Towns ("19 small neighbourhoods scattered in the middle of the countryside"). The reconstruction experience of the historic town centre of L'Aquila was defined by Campos Venuti as an "outrageous action" (Campos Venuti, 2016; Oliva, Campos Venuti & Gasparrini, 2012). Federico Oliva reinforced this negative assessment stating that the definition of New Towns (15,000 people hosted in 4,500 dwellings) was "a rather ridiculous and disrespectful attitude towards the town planning history, given their poor urban quality and size". The historic town centre of L'Aquila has been turned into a cage of metal scaffolding built around the "restricted area" of the Old Town.

Yet, during the same period, in Abruzzo (57 municipalities involved, within three provinces), an alternative revitalization model was designed as part of a university redevelopment project intended for local small municipalities, away from the limelight of the political and media propaganda, in juxtaposition with the negative reconstruction model applied in the historic town centre of L'Aquila. In the framework of this project, nine distinct homogeneous areas were identified, where a coordinated area-wide management programme pooling together a set of services (Di Ludovico & Di Lodovico, 2020) involving more municipalities, was implemented.

The Building Reconstruction Plan also featured a few Strategic Plan attributes, aimed at implementing a socio-economic and spatial programming activity. One again, the Minimum Urban Structure was applied relating both to the urban and regional level. Safe urban routes were identified, as well as protected areas and buildings where maximum protection was to be ensured. Conversely, the possible SUM hot spots and critical conditions were highlighted.

A special focus was placed on the integration of the Old City and the rest of the city centre, by enhancing the interconnecting spaces where safety and beauty could be reconciled, thus not only limited to the functional SUM elements: places featuring a set of formal, cultural, environmental and social values.

The urban and territorial SUM has therefore played a major role in serving as a reference tool, compared to the past, to inform people about where to stop safely, meeting points and escape routes and places, thus facilitating and accelerating the actions to be undertaken by the Civil Protection authorities. Hence, it has proved to be a useful tool in reassuring residents willing to return to their homes in the areas affected by the earthquake.

In *Central Italy,* the earthquake in 2016-2017 (August 24, 2016: epicentre Accumoli, Lazio, 298 victims; 26 October 2016: epicentre between Castelsantangelo sul Nera and Visso, Marche, no casualties; 30 October 2016: epicentre Norcia, no casualties) involved four regions, 10 provinces and 139 municipalities, for a total of about 8,000 square kilometers, reaching magnitude 6.5 with the shock recorded on October 30th, and razing to the ground valuable historic town centres[1].

3. Operational aspects of the 2016-2017 earthquake emergency

During the 2016-2017 earthquake (Istat, 2018), the affected population was accommodated in temporary housing solutions, according to three different forms of subsidy: the first one was applied in the early months of the emergency, through the accommodation of the displaced population in hotels and houses mainly located in tourist resorts along the coast; the second one consisted in granting cash contributions for the rental of other types of housing facilities (the so-called CAS, Autonomous Accommodation Contribution); the third one, which was completed over a period of about 30 months after the earthquake, consisted of temporary wooden housing modules built in non-built-up areas (referred to as SAE, "Emergency Housing Solutions"), in over 70 parcelling lots with variable surfaces, located in 28 municipalities within the area affected by the earthquake.

EARTHQUAKE IMPACT ON HOUSING SYSTEM: Municipalities with population in emergency housing solutions	N. Municipalities	Territorial surface (km²)	Resident population (on 31/07/2016)	POPULATION IN EMERGENCY HOUSING SOLUTIONS (June 2018)						POPULATION IN EMERGENCY HOUSING SOLUTIONS
				People with contribution for renting accommodation (CAS)		N. people in hotel	N. people in other accommodation facilities	N. people in emergency housing (SAE)	TOTAL population	
				N. people	N. households					
MORE THAN 50 % of the population	**9**	655,5	**13.965**	5.445	3.005	482	341	2.331	**8.599**	27,79%
BETWEEN 30% e 50% of the population	**7**	213,1	**4.874**	1.380	642	78	7	428	**1.893**	6,12%
BETWEEN 10% e 30% of the population	**21**	1.114,9	**62.881**	10.689	4.706	247	22	458	**11.416**	36,89%
LESS THAN 10% of the population	**49**	1.994,7	**266.753**	8.983	3.843	20	15	20	**9.038**	29,21%
TOTAL MARCHE SEISMIC CRATER	**86**	3.978,3	**348.473**	26.497	12.196	827	385	3.237	**30.946**	100,00%

Tab.1 Marche Region, the earthquake impact on the housing system. Summary Picture

[1] The Marche Region was the most damaged area of the four regions located within the "seismic area", with extensive damage in 86 out of a total of 139 municipalities involved (3,978 sq. km. of affected regional surface), with a very heavy toll: more than 104,000 damaged buildings, 54,000 evacuated buildings and 32,000 displaced persons, of whom 28,500 benefited from Autonomous Accommodation Contributions (CAS) since the beginning and about 3,400 people were housed in various accommodation facilities along the Adriatic coast. To avoid the depopulation of the earthquake-stricken areas and to bring people back to their homes, since August 2017, over 4,400 people have been temporarily housed in the so-called Emergency Housing Facilities (SAE), progressively built in 28 municipalities located in the seismic area.

MUNICIPALITY	Territorial surface (km^2)	Resident population (on 31/07/2016)	POPULATION IN EMERGENCY HOUSING SOLUTIONS (June 2018)						POPULATION IN EMERGENCY HOUSING SOLUTIONS	EARTHQUAKE IMPACT ON HOUSING SYSTEM: Municipalities with population in emergency housing solutions
			People with contribution for renting accommodation (CAS)		N. people in hotel	N. people in other accommodation facilities	N. people in emergency housing (SAE)	TOTAL population		
			N. people	N. households						
Arquata del Tronto (AP)	92,2	1.160	468	245	41		418	927	79,91%	
Camerino (MC)	129,9	7.008	2.965	1.791	239	305	18	3.527	50,33%	
Castelsantangelo sul Nera (MC)	70,7	274	69	42	11		108	188	68,61%	
Fiastra (MC)	57,7	552	208	94	7		130	345	62,50%	**MORE THAN 50 %** of the population
Muccia (MC)	25,9	915	331	155	16	10	396	753	82,30%	
Pieve Torina (MC)	74,8	1445	578	274	37	3	516	1134	78,48%	
Ussita (MC)	55,3	447	101	51	11		177	289	64,65%	
Valfornace (MC)	48,6	1058	375	182	46		225	646	61,06%	
Visso (MC)	100,4	1106	350	171	74	23	343	790	71,43%	
total	655,5	13965	5445	3005	482	341	2331	8599		
Bolognola (MC)	25,9	138	49	23	5		12	66	47,83%	
Caldarola (MC)	29,2	1806	464	214	32		253	749	41,47%	
Cessapalombo (MC)	27,6	508	163	80	11	7	20	201	39,57%	
Gagliole (MC)	24,1	632	215	88	3		4	222	35,13%	**BETWEEN 30% e 50%** of the population
Monte Cavallo (MC)	38,5	132	21	9			20	41	31,06%	
Montegallo (AP)	48,5	529	198	101	3		44	245	46,31%	
Pioraco (MC)	19,5	1129	270	127	24		75	369	32,68%	
total	213,1	4874	1380	642	78	7	428	1893		
Acquacanina (MC)	26,8	122	37	23				37	30,33%	
Acquasanta Terme (AP)	138,4	2885	753	356	19		6	778	26,97%	
Amandola (FM)	69,5	3623	487	225	3	13	2	505	13,94%	
Camporotondo di Fiastrone (MC)	8,8	557	122	43	2		17	141	25,31%	
Castelraimondo (MC)	44,8	4578	638	280	18		25	681	14,88%	
Colmurano (MC)	11,2	1260	181	78				181	14,37%	
Cossignano (AP)	15,0	976	94	41				94	9,63%	
Force (AP)	34,3	1321	203	83			14	217	16,43%	
Gualdo (MC)	22,2	812	189	76	1		20	210	25,86%	
Monte San Martino (MC)	18,5	757	91	33				91	12,02%	
Montefortino (FM)	78,6	1162	294	123				294	25,30%	**BETWEEN 10% e 30%** of the population
Montemonaco (AP)	67,8	586	145	72				145	24,74%	
Palmiano (AP)	12,7	189	22	12				22	11,64%	
Roccafluvione (AP)	60,6	1994	231	111				231	11,58%	
San Ginesio (MC)	78,0	3479	810	371	33	9	92	944	27,13%	
San Severino Marche (MC)	194,3	12716	2053	897	108		214	2375	18,68%	
Santa Vittoria in Matenano (FM)	26,2	1325	231	94				231	17,43%	
Sarnano (MC)	63,2	3280	576	245	52		43	671	20,46%	
Serrapetrona (MC)	37,6	954	168	70	11		25	204	21,38%	
Smerillo (FM)	11,3	366	60	24				60	16,39%	
Tolentino (MC)	95,1	19939	3304	1449				3304	16,57%	
total	1.114,9	62881	10689	4706	247	22	458	11416		

Tab.2 Marche Region, the earthquake impact on the housing system. Details of the most severely affected Municipalities

The earthquake hit over 30% of the homes in 16 municipalities, with over 50% homeless population in 9 municipalities, which were heavily damaged (Tab.1, Tab.2). In the municipality of Camerino as many as 3,500 inhabitants and the entire university population had to be evacuated.

A few years after the earthquake, the Municipalities are still facing the transition from the emergency phase, characterized by a mainly sectoral-operational approach, linked to the temporary nature of solutions, to the phase in which implementation urban plans are concretized[2]. These plans may envisage public and private building refurbishment interventions, related to building aggregates or individual structural units[3].

Ultimately, the earthquake further plundered territories that already did not have the minimum habitability requirements, in terms of accessibility and provision of basic utilities and services. The decision to build SAE temporary settlements was complex and potentially uneconomic in these foothills and mountain areas.

This choice was motivated by the desire to maintain the local community, in most contexts mainly made up of over 65 elderly people (Santagata & Scarola, 2019), and to fight against depopulation.

According to the *Sendai Framework for Disaster Risk Reduction* (2015-2030)[4] a multidisciplinary approach is required for an appropriate disaster risk management involving lifestyle, a proper natural and cultural heritage

2 Reference regulatory framework: Special Commissioner's Order no. 25: Criteria for the delimitation of urban centres and special interest centres that were most severely affected by the earthquake that occurred on August 24, 2016; Special Commissioner's Order no. 39: implementation planning guidelines related to reconstruction of historic town centres and urban centres that were most severely affected by the earthquake that occurred on August 24, 2016.

3 Reference regulatory framework: Special Commissioner's Order no. 19: Measures designed to restore and rebuild buildings severely damaged or destroyed by the earthquake that occurred on August 24, 2016, for residential use, according to anti-seismic rules.

4 The 2015-2030 *Sendai Framework for Disaster Risk Reduction* was adopted at the *Third World Conference of the United Nations* in Sendai, Japan, March 18, 2015. It is the result of consultations with stakeholders, launched in March 2012 and of intergovernmental negotiations held from July 2014 to March 2015, supported by the United Nations Disaster Risk Reduction programme, at the request of the United Nations General Assembly.

conservation and enhancement model, agri-forestry-pastoral management system, artisanal and industrial manufacturing techniques, urban and infrastructural growth design and planning schemes (Sargolini, 2017). The Disaster Risk Reduction dimension should become an integral part of the regulations enforceable by the Regional and Municipal authorities, integrating the risk "component" in the urban-regional project (La Greca, 2018).

However, it should be noted that «nevertheless a wide knowledge about natural risks afflicting Italian territory and an articulated regulatory framework, the available data about risks are not exhaustive, and risk reduction policies and multidisciplinary pro-active approaches are only partially fostered and applied» (Di Giovanni, 2016).

The *United Nations Office for Disaster Risk Reduction*[5] reiterates the main actions to be implemented:

- preparing individuals, communities and economic and social organizations to deal with natural disasters and related risks, by means of appropriate measures to strengthen the responsiveness and resilience of communities;
- take action in the post-disaster phase to build better, by seizing reconstruction as an opportunity to mitigate the impact of any future disasters. All this is summed up in the expression *Building Back Better* (Esposito et al., 2017), i.e. a principle that applies not only to buildings or physical infrastructure but also to a broader context.

4. Some results: design suggestions to address the unresolved issues in the post-earthquake approach

This paragraph analyses the best practices implemented in Italy in various post-earthquake experiences. These results are summarized in some design suggestions to be followed to cope up with the post-earthquake problems. This theme is not thorough in the extensive research literature on risk before and during disasters. As a matter of fact, only very few studies addressing the post-disaster, rehabilitation and reconstruction phase are available (Lin et al., 2020). The suggestions indicated fall within a more general context of vulnerability ad seismic hazard studies, which play a significant role in the comprehensive risk mitigation and emergency seismic planning (Liu et al., 2020), as clearly shown by Tira (Tira, 2017) in his explanation of the three components that constitute the basic structure of Risk (Hazard, Exposure, Vulnerability) (Tira et al., 2006).

Criteria for the definition of implementing urban plans

In this transition phase, it is interesting to compare the different experiences of application of criteria for the identification of Implementing Urban Reconstruction plans (Commissioner's Order no. 25[6]).

The benchmarking of various experiences implemented in the earthquake-stricken areas of the Marche region has pointed out three alternative choices in identifying the areas where actions have to be implemented through town planning tools:

- urban settlement fabrics with "unitary boundary definition" coinciding with the "red zone" boundaries (to be defined in the emergency phase) for the implementation of safety measures of the urban centres. These boundaries include urban settlement fabrics, buildings, open areas and public spaces, with a

5 The *United Nations Office for Disaster Risk Reduction (UNDRR)* was established in 1999 as a dedicated secretariat to facilitate the implementation of the *International Strategy for Disaster Reduction (ISDR)* and is mandated by General Assembly resolution of the United Nations (56 / 195), to serve as a focal point in the UN system for the coordination of disaster reduction and to ensure synergies among the Disaster Reduction Strategy activities of the United Nations system and the activities implemented by regional organizations in the socio-economic and humanitarian fields. It is an organizational unit of the Secretariat of the United Nations and is led by the *Special Representative of the Secretary-General (SRSG)* of the United Nations Special for Disaster Risk Reduction.

6 Commissioner's Order no. 25 dated 23 May 2017, "Criteria for the setting of boundaries of urban centres of special interest that are most severely affected by the earthquake that occurred on August 24, 2016".

unified and inclusive vision of the whole context. In these areas, it will be possible to apply a single implementation tool. Hence, the Implementation Plan can be developed by directly applying the criteria and guidelines set forth by Commissioner's Order no. 39[7];

- urban settlement fabrics with "partial boundaries" (present situation for about a third of the approved contexts). In these areas the implementation Reconstruction Plan includes only a portion of the settlement core and reconstruction must be coordinated with interventions complying with the Commissioner's Order no. 19[8] through the (voluntary or mandatory) identification of unitary building aggregates, Minimum Intervention Units (UMI), and specific interventions (Fig.1) concerning each single structural unit. In these contexts, the formulation of appropriate preventive actions (such as, for example, the realization of SUM) will necessarily be subject to the drafting of an additional urban planning instrument, such as, for example, DDR, Reconstruction Guiding Document, provided for by Commissioner's Order no. 39;
- urban settlement fabrics characterized by "discontinuous boundaries" (accounting for 10% of total approved boundaries): buildings, sections of urban fabrics, streets or open spaces. As a general principle, these landlocked fragments inside the restricted area will be subject to the provisions set out by Commissioner's Order no. 19 by means of projects for building aggregates, UMI or individual private building units undergoing reconstruction; or coordinating specific initiatives in compliance with general objectives and guidelines.

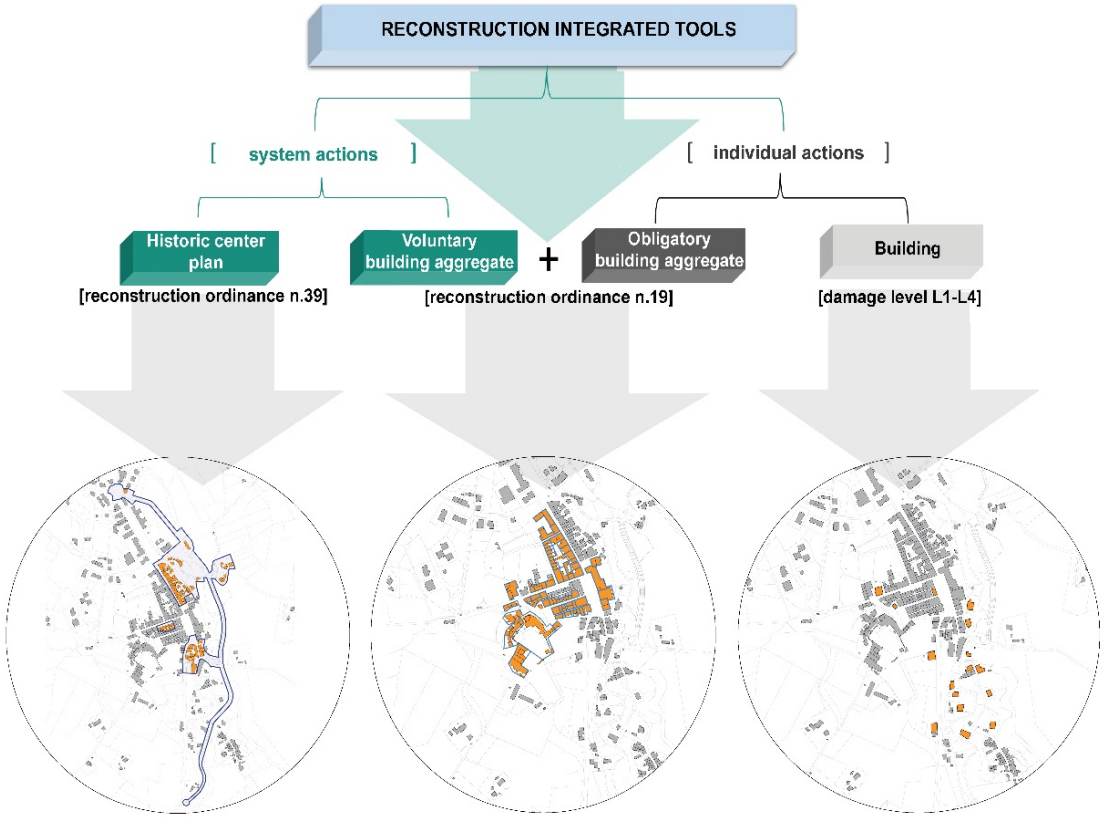

Fig.1 Reconstruction integrated tools: System-wide and specific interventions. Example applied in the Municipality of Caldarola, MC.

7 Commissioner's Order no. 39 dated 8 September 2017, "Guiding Principles for the implementation planning related to reconstruction work in town centres most severely affected by the earthquake that occurred on August 24, 2016". The Presidency of the Council of Ministers (published in the Official Journal, no. 227 on 28 September 2017, SO).

8 Commissioner's Order no. 19 dated 7 April 2017 on "Measures for the redevelopment and reconstruction according to improved seismic criteria of buildings for residential use, which were severely damaged or destroyed by the earthquake that occurred on August 24, 2016". Special Government Commissioner for Reconstruction in the municipal territories of the regions of Abruzzo, Lazio, Marche and Umbria affected by the earthquake that occurred on August 24, 2016.

A third critical element that stems from the uncoordinated use of boundaries in intervention areas (Commissioner's Orders no. 39 and no. 19) is given by the difficulty of synchronizing public action under the Implementation Plan with the private housing stock reconstruction action.

Criteria for the selection of the areas for settlement of emergency temporary wooden housing modules

To address the issue of the location of emergency temporary buildings, it is necessary to consider the "time" factor as an intangible component of the project, alongside the more deeply established concept of "place" (the context). Integrating the time dimension into the Plan means to design (or redesign) the cities in terms of "processes", according to the use-reuse-recycle loop, and plan intervention strategies in progressive terms. Time is a crucial component that marks the emergency stages of recovery and development. Time is also an intangible element of innovation of the urban structure, its relationship with its surrounding territory, its possible socio-economic and ecological-environmental regeneration. The so-called "temporary" interventions may, therefore, risk negatively affecting the overall quality of the contexts in which they occur. Such actions may change the existing social components and activate new spatial and functional relationships that defy any design intent.

These trends are particularly visible in the Italian areas affected by earthquakes, where the so-called "emergency temporary" accommodations stand the test of time and are rarely dismantled. Hence, housing facilities that are designed and built to serve as provisional accommodation solutions, end up by progressively becoming part of the urban landscape. Even when they shall be eventually removed, tangible signs of permanent change will remain in land use, caused by the foundation slabs, underlying utilities, technological and transportation infrastructures, open space setup. The set of emergency works and their poor integration into the existing town infrastructures raise questions about the effectiveness of a purely emergency-based approach. The so-called temporary interventions (in particular, housing, services, shops, schools) are often placed in areas that do not allow a functional, morphological, environmental and landscape integration with the existing contexts (Fig.2).

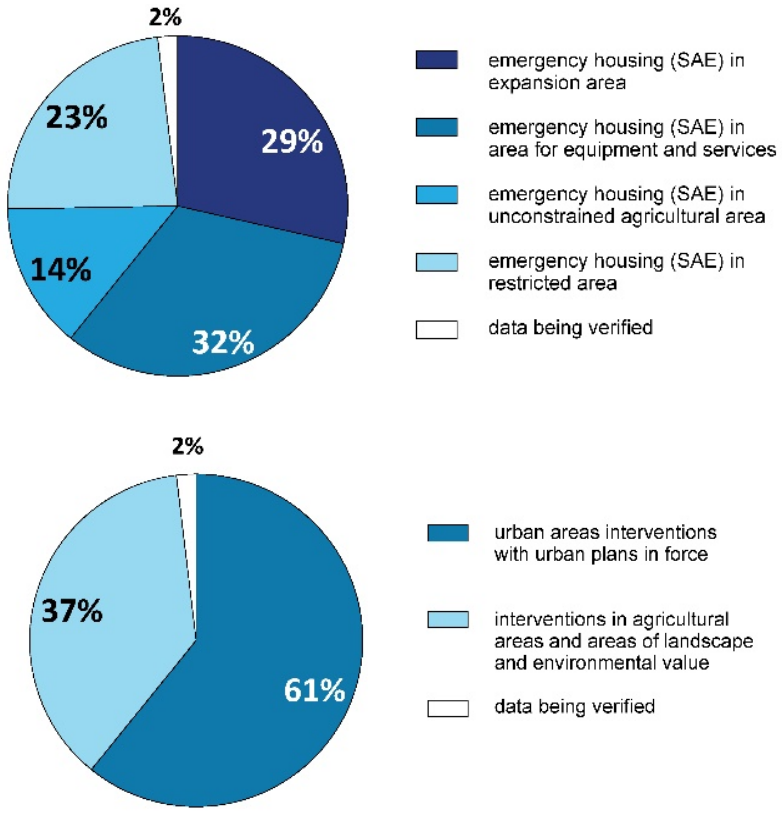

Fig.2 Percentages of urban areas in which the SAE areas are located

Some examples may be found in a few locations in central Italy where the projects, designed to be just temporary for a limited period of time, actually turned into virtually permanent solutions becoming an integral and structural part of the landscape and a physiological part of the towns themselves.
The goal would instead be to set up temporary housing areas according to new criteria and guidelines leading to a greater integration with the community and with the landscape. In the event of the occurrence of a future earthquake, it would therefore be necessary to assess in advance the identification and setting up of emergency preparedness areas (waiting, sheltering-admission, gathering), in addition to those guidelines already envisaged by the Civil Protection provisions set out by CLE (Limit Emergency Condition): accessibility to the areas, number of aggregate elements interfering with the area in question, first aid facilities, formal and dimensional information, service infrastructure, morphology and location of the area, type of soil, type of instability, possible landslides, groundwater, surface water, hazards and danger of flood areas. It is therefore necessary to design a stable prevention and early warning system throughout the territory and to identify equipped areas that may play a dual role: both during the ordinary daily-phase and in the emergency phase during a seismic crisis.
Ultimately, the new criteria should be able to ensure integration with the context and the landscape, in order to ensure a better level of connectivity with the existing environment, protect and enhance natural and historical heritage and check the compatibility between temporary functions and pre-earthquake daily functions.

Criteria for the correct localization of new temporary settlements close to small historical centres
After the earthquake of 2016, in some municipalities of Marche the new residential areas (in which building modules in wood partially prefabricated) were installed to accommodate the population affected by the earthquake, were located close to the historic town centres, in areas already defined by the Urban Plan as building areas. In this way, both a visual and functional relationship was thus ensured between the new and old settlements.

Criteria to enhance the quality and functionality of the axes connecting the historic centre with other urban districts
Some university studies (Colarossi et al., 2019) have proposed a reversal of the post-earthquake intervention strategy: during the slow regeneration process of the historical town centres affected by the earthquake, it is proposed to immediately start the priority redevelopment of the urban axes that connect the most severely damaged historic city centre to less affected neighbourhoods. These axes, protected in the event of new seismic occurrences, play an incentive role for the rebirth of the historic town centre, whose redevelopment is much slower.
These equipped interconnection axes will thus allow not only a faster economic recovery, but also have a socialization and environmental value.
Ultimately, this strategy aims to create structuring axes able to accelerate economic and social requalification of the access areas to the historic city centre, and to promote subsequently the reactivation of protected stretches of public and private areas that penetrate into the "red zone" with a gradual segmentation and reduction of the boundaries of the area delimited by metal fences and made inaccessible due to the danger of collapse.
Other studies, on the other hand, carried out by Università Politecnica delle Marche, point out that "there is a significant lack in the application of the Human Rights-Based Approach to disability in local disaster planning" and aim at "Implementing existing strategies and building new knowledge on accessible evacuation, communication and accommodation" (Gatto et al., 2018), in the event of an emergency, for the disabled.

5. Conclusions

An earthquake shatters the fragile balance of a territory and makes it necessary to rethink the lifestyle pattern rooted in these places. By examining the experience of previous difficult post-earthquake situations, it is clear that in the last major seismic event, there has been a general difficulty to seize the right opportunity to rethink existing settlement patterns (Di Ludovico et al., 2020). These territories were experiencing a crisis even before the earthquake due to the structural decline and aging of the population and activities, degradation of urban and rural housing, historical, architectural and artistic buildings.

These buildings are scattered across a wide territory and are characterised by a fragile settlement model, they are not adequately protected in the event of natural disasters and lack territorial infrastructure networks and safe first-aid facilities.

The tragic event of an earthquake can be rather seen as an opportunity to reduce vulnerability and build resilience. In this context, social capital plays an important role in generating and maintaining risk reduction behaviours (Monteil et al., 2020).

In any case, it should be considered that «disaster risk awareness and acceptability» must be «addressed with a view to the new hierarchy of risks (socio-economic, health, emerging) generated by the crisis» (Norton, Atun & Dandoulaki, 2015), among which the most relevant is that of the pandemic.

Ultimately, the post-earthquake phase should lead to a paradigm shift in the lifestyle of this wide territory based on: a permanent protection of the urban-territorial risk; a networked technological service system providing better services to the local community and businesses; a new functional relationship system between small towns in areas affected by the earthquake and urban centres outside of the earthquake-stricken areas (through transport incentives, cooperative firms, itinerant services for manufacturing activities, etc.) strengthening of cooperation relations and economic and social exchange between communities living in the mountain, hillside and coastal areas.

In conclusion, in the marginal territorial systems (Ventura & Tiboni, 2016) that are not easily accessible, such as inland areas, regional and urban planning should focus on mitigation of risks, seismic vulnerability and the consequent need for changing lifestyles. Therefore, the new strategic land use objectives should include future visions shared by many small towns, circular economic processes associated with new forms of governance based on advanced technological networks providing regional and supra-regional remote protection and assistance.

Finally, the lesson learned from the Italian experience shows that the defence from the worst man's enemy, namely devastating natural disasters, be they local or global, lies in the development and enhancement of the most important resource, namely: human capital.

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Image Sources

Fig.1 and 2: Authors' elaboration;

Tab.1 and 2: Authors' elaboration on Istat Marche data.

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