

# TeMA

Journal of  
Land Use, Mobility and Environment

Urban sprawl processes characterize the landscape of the areas surrounding cities. These landscapes show different features according to the geographical area that cities belong to, though some common factors can be identified: land consumption, indifference to the peculiarities of the context, homogeneity of activities and building typologies, mobility needs exasperatedly delegated to private cars.

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MOBILITY AND COMPETITIVENESS

## MOBILITY AND COMPETITIVENESS

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# TeMA

Journal of  
Land Use, Mobility and Environment

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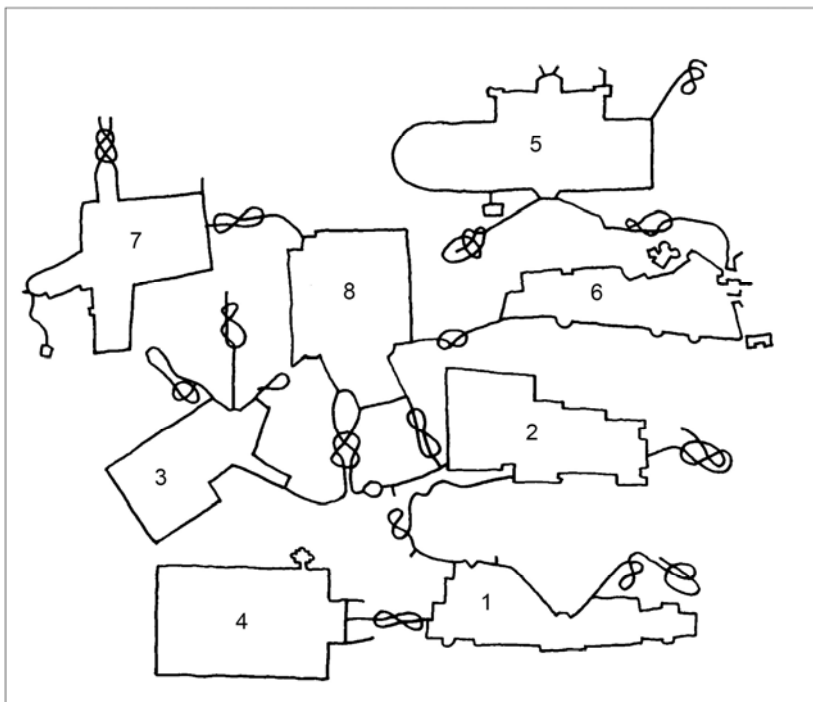
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## URBAN SPACES AND SAFETY

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### ABSTRACT

The concept of vulnerability understood in the traditional sense as a "single manufactured good" is insufficient when it comes to describing the real conditions of an urban system's vulnerability within which an indefinite variable of factors interact with one another thereby determining the damage caused by an earthquake. These interacting factors constitute so-called "urban vulnerability" which town planners use in order to contribute to the field in the form of analysis definition and interventions in the mitigation of seismic risk on an urban scale.

The research paper "Relational Spaces as Safe Places" positions itself firmly in the vein of town planning research which focuses on the mitigation of seismic risk, and which intends to blaze a new methodological trail that aims to identify safety traits in urban spaces. The research paper's starting point is the assumption that empty urban spaces, given the indications provided by the principal organs for Civic Protection, have come to be seen as the spaces designed to accommodate the public in cases of emergency. This can generate new thought regarding town planning by reviewing early post-earthquake urban designs where the rules were laid out for earthquake-proof cities: a "chessboard" plan with wide streets, both straight and perpendicular, empty spaces like squares and markets positioned along the longitudinal streets, and buildings with regular layouts all at right-angles. These simple guidelines, which are often disregarded and distorted in modern towns, are extraordinarily relevant and oriented towards new definitions of the urban traits of quality and security.

### KEYWORDS:

Vulnerability, relational spaces, safety

## 1 SEISMIC RISK AND PLANNING: FROM SECTORALITY TO INTEGRATION

The need to look at land systematically so as to be able to suggest criteria for environmentally sustainable planning has been expressed since the Sixties in the United States by Jan McHarg who is recognised, today, as one of the founding fathers of the environmental method. McHarg was undoubtedly a forerunner in the sense that he was one of the first to have realised that the process of planning, on any given scale, must necessarily proceed from an understanding of an area's 'natural facts', whether one is referring to a previously urbanised space or to a space which needs urbanising. McHarg placed emphasis on the topic of risk reduction which had been neglected by earlier planning strategies and which, instead, needed to be dealt with by examining the compatibility of the land's characteristics and their possible uses.

In the United States, as is also the case in Italy, McHarg's philosophy and environmental method did not immediately have a revitalising effect on the field due to a historical lack of interest on the part of both institutions and the sciences regarding the environment. It is no coincidence that McHarg's text, which has now achieved cult status, was published in Italy twenty years after it was first drafted, meaning that the environmental method suggested by McHarg remained 'exclusively his' for too long (McHarg 1969). Indeed, only today has it been recognised that the understanding of natural processes and the improvement of monitoring and predicting techniques is fundamental if the consequences of natural disasters are to be minimised and if localised choices and regional vocations are to be rendered more compatible.

Of course, a sector-based vision of the subject will provide norms and regulations which are equally as sector-centred<sup>1</sup>; in fact, the topic of security against risks, in particular seismic security, in the normative Italian framework was dealt with for many years by following an approach geared towards either the securing of individual buildings or checking the compatibility of the predictions made by urban planning strategies and the actual geomorphic conditions of the area. Consequently, seismic risk calculation analyses had little effect on town planning choices inasmuch as no planning strategies emerged which were capable of managing the processes of urban transformation in order to reduce seismic risk.

On the topic of seismic risk, the first references made in national legislation to town planning and spatial planning can be found in the anti-earthquake law of '74 in which an attempt was made to deal with the implementation of safety measures for buildings from a point of the view of the dangers of the area in question<sup>2</sup>. Article 13, in fact, requires that townships obtain, during the development stage of town-planning strategies, an opinion from the Public Works Office regarding the compatibility of the town-planning predictions and the area's geomorphic conditions. However, this regulation is absolutely generic and gives no indications whatsoever regarding how such compatibility should be gauged and, in any case, it limits testing *exclusively* to geomorphic elements, without any reference to the dynamic characteristics of the region (Fera 1991).

From this date onwards, the idea developed that the full restitution of the implications associated with seismic risk, in terms of mitigation strategies, needed to be dealt with by the fields of land and town planning. One could say, in fact, that the topic of risk in general, but in particular seismic risk – seeing as

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<sup>1</sup> The need for a more effective way of controlling territorial transformations which is able to limit damage to the environment has fostered, over the past decade, the birth of large production of regulations regarding diverse environmental sectors (air, water, sound, industrial risk etc.) which has also introduced new respective strategies to the sector (traffic planning within towns, programmes regarding the quality of air and water, sound plans, waste disposal plans, etc.). From this there has developed a framework of plans and sector-based competencies which are so well articulated that they actually risk weighing down and rendering increasingly complex the management of land and the environment; as a consequence, the need has arisen for a general planning framework capable of integrating into its competencies these diverse environmental sectors through comprehensive strategies for both spatial and urban transformation.

<sup>2</sup> I refer to the law of the 2nd February 1974 n. 64 "Measures for constructions with specific regulations for seismic zones".

they do not fall directly into the traditional “categories” of town planning – delayed in adopting the necessary multi-sectorial traits that only town planning could give back to it.

With regards to seismic risk, town planners’ interest was piqued in the ‘80s in the aftermath of the Irpinia earthquake when it was observed that the principal cause for buildings collapsing was the badly chosen positioning of the settlements (on slopes or ridges); this brought to light the need to “reason” in terms of prevention, looking at both geomorphic aspects, linked mostly to the specific dangers of the area, and those urban elements which we will analyse after a preliminary discussion on “urban vulnerability”.

Of course, since Imbesi wrote that town planners’ interest regarding the challenges posed by risk had not developed at all, only ten years have passed and we have witnessed a profound change, particularly with respect to the spatial aspects of seismic risk reduction<sup>3</sup>.

Imbesi traced town planners’ lack of attention back to a planning system which, at the time, was very inflexible and linked to rigid forms of control and legal constraints which, despite being imposed on urban planning models, were rarely actually implemented on the land itself. In fact, until the second half of the ‘70s, only a very partial vision of seismic risk had been achieved; a vision which considered seismic risk only in terms of an emergency which “came into play” immediately after the event itself. Even earthquake engineering, to which the most part of the responsibility for the setting of criteria for seismic risk mitigation was assigned, restricted its studies to the structural behaviour of individual buildings in cases of earthquakes and neglected the study of the implications of the interactions between buildings found in determined urban contexts (Imbesi 1991).

However, town planners’ interest in bringing innovations and developments to the discipline soon came across two difficulties:

- one linked to the presence of technical regulations which are exclusively dedicated to the “structural” problems of buildings and which do not “regulate” suggestions from the town planning discipline;
- one linked, on the other hand, to the town planning regulations which were then in force that were difficult to actually implement on the land, resulting in efforts being made in the field to innovate so as to regulate the themes of spatial defence and the implementation of safety measures in settlements.

Regarding the protection of land, the institution of liability is certainly the concept with which large-scale planning was identified in the ‘80s due to the landscape planning introduced by laws 431/85 and 183 on land protection. Today, the direction of large-scale environmental planning is turning towards strategies which are more flexible than the imposition of liability. For example, by defining compatibility frameworks which are suitable to the region’s vocations with respect to the uses of the land as taught by McHarg, or by integrating into the planning process environmental considerations when establishing the possible uses of the land (Strategic Environmental Assessment). Interventions in the field of land protection, as has already been mentioned, deal with the distribution of competencies that not even the transferral of operational tasks to the land use bodies set in place by ordinance 112/98 managed to create a definitive structure, thereby risking prolonging the delays and the inefficiencies which have typified recent years. Even with respect to both natural and man-made risk reduction, notwithstanding the urban drift and industrialisation of the post-World War II period – which entailed a notable increase in the vulnerability of land – environmental planning has at its disposal tools which do not follow a uniform framework of reference, but which are fragmented in their competencies and are prevalently linked to the managing of emergencies.

Only recently has the discipline of town planning been provided with a renewed legislative framework and with more suitable instruments which are capable of dealing with environmental issues. In particular, the

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<sup>3</sup> Imbesi was probably one of the first town planners to have confronted, since the ‘80s, the topic of the mitigation of seismic risk applied to town planning.



theme of seismic risk has become fully part of town planning regulations and of those planning tools which, finally, are directly assigned to mitigation.

## 2 URBAN VULNERABILITY

Town planners' interest regarding the reduction of the damage caused by seismic events has focused attention on the methods employed to assess seismic risk and, consequently, on the parameters which contribute to reducing it.

Town planners have mainly paused to focus on vulnerability in order to bring innovations to both analysis methodology and to suggestions regarding mitigation.

In the research paper "Exposure, vulnerability and seismic risk in Messina", Fera (1991) synthesises the parameters of vulnerability in an urban system – which are not far from those identified by Benerjee (1981)

– into three macro-categories:

- *physical vulnerability of spatial systems and grid systems*, assessable mostly via the physical vulnerability of single elements;
- *functional vulnerability*, or a system's incapacity to exercise its function fully and correctly even in the absence of damage to one or more of its elements;
- *economic and social vulnerability*, or the resident population's ability to deal with an emergency in social, psychological and financial terms<sup>4</sup>.

Certainly, embarking on vulnerability assessments as detailed as this in the heart of an urban system is not always feasible, not only because of obvious economic difficulties, but also because of the unavailability or lack of the necessary facts (Cremonini 1994). Undertaking surveys on the vulnerability of the "strategic" elements of an urban system and identifying from amongst them a "minimum" system onto which to concentrate security measures, renders the implementation of safety measures in urban centres easier and quicker.

A recent town-planning approach to the topic of urban vulnerability sees in the Minimum Urban Structure a method that is capable of giving a twofold answer to both the need to recover an urban centre and to render it strong enough to manage a seismic event, for the purposes of an emergency (Fabiatti 1999)<sup>5</sup>.

The definition of the Minimum Urban Structure was born from a dual consideration:

- there are not enough resources to safeguard the entire public or private building heritage and, yet, as risk mitigation plans and programmes are readied, it is necessary to fix adequate priority criteria for a more efficient allocation of the available resources;
- public authorities' capacity for action and intervention in the field of town planning policies are greater and more efficient when they involve interventions on behalf of real estate and relational spaces; on the other hand, interventions involving private building heritage can be incentivised, guided and oriented (only rarely are they made prescriptive), but they are still subordinated to the will and convenience of the intervening private client (Fera 2002).

The Minimum Urban Structure's method does not consist, then, of an ulterior criterion of urban vulnerability assessment, but it comes beforehand, identifying those elements to which to direct surveys and

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<sup>4</sup> Benerjee identified ten indicators of urban vulnerability: the redundancy of engineering systems, the possibility of recovery according to the form of the features and the age of buildings, accessibility according to the layout and the technical features of the area's driveability, the possibility for evacuation, dangerousness induced by natural or man-made elements, the vulnerability of the buildings, the spatial and temporal distribution of the systems of urban activity, socio-economic recovery capabilities, the quota of at risk residents, levels of social preparation for emergencies.

<sup>5</sup> The definition of the Minimum Urban Structure prompted the anti-seismic recovery plan for the historic centre of the Township of Rosarno (Province of Reggio Calabria), an experimental initiative from the National Seismic Service and the National Institute for Town Planning which was carried out in 2000 thanks to the European Community's Funds for Regional Development.

interventions for the implementation of safety measures. The need to focus surveys and interventions on just a few structuring elements in an urban centre responds to both the requirements linked to questions of emergency required by the Plans for Civil Protection prescribed by law n. 225/92 – regarding the need to identify under “normal” conditions those urban parts and elements necessary in order to manage a seismic event (secure road systems, strategic buildings, empty areas) – and to the requirements set out by the Recovery Plans (law n. 457/78), which are, however, altered so as to be suitable for new anti-seismic purposes. The Minimum Urban Structure constitutes the essential structure of an inhabited centre (the vital functions of a centre are all part of it) that must subsist regardless of whether an event occurs or not.

The act of identifying the Minimum Urban Structure allows, therefore, one to direct vulnerability surveys and the consequent mitigation interventions to all those elements which constitute it, neglecting, at least in the first stages, all the rest. Moreover, the Minimum Urban Structure is not a definite and rigid structure; it is flexible and guarantees large margins of urban safety, which entails the pre-definition of those elements of it which could feasibly be replaced. In fact, in the process of configuring the Minimum Urban Structure elements which are potentially replaceable are identified and registered by choosing those redundant elements which guarantee that the urban system functions in emergency situations (De Paoli 2001).

In general, it can be said that the Minimum Urban Structure aims to achieve the following goals:

- the conservation of historical memory, through conservation and the implementation of safety measures in those places, public spaces and buildings which represent the history of an urban centre’s “life”;
- the requalification of public heritage, that is to say of the spaces and buildings with which the townspeople relate due to the roles and functions that they serve;
- the establishment of an emergency system which is capable of maintaining a certain level of functionality even in the aftermath of a seismic event and which, afterwards, helps the urban centre to regain functionality.

Relational spaces are part of this Whole, and are understood as those elements of the urban structure to which the local community relates and in which integration processes are activated. Relational spaces are, therefore, places where socialisation takes place which are usually situated in the historic part of the town and which represent its “historical memory”. The implementation of safety measures in these relational spaces responds to a dual objective: it helps to conserve the identity of a place and to improve its emergency system, thereby helping the urban centre to recover full functionality.

### 3 RELATIONAL SPACES, EMERGENCY AND VULNERABILITY

Ever since ancient times, roads and, above all, squares have represented those elements which best characterise a town in their role as places where civic life and social relations take place. After the earthquake of 1783 which hit Southern Italy, these spaces were used so as to “escape from earthquakes” (Vivenzio, 1783) and, therefore, ever since then they have been considered safe places in the context of earthquake prevention. Meeting points are, then, those urban spaces with optimum liveability potential in which the most part of an urban centre’s social and economic activity takes place. Such an observation solicits new considerations regarding the redevelopment of urban centres in seismic areas.

Today in Italy, the Augustus Method<sup>6</sup> sets out the following areas dedicated to emergency situations:

- grouping areas;
- homeless or emergency camps;

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<sup>6</sup> The Augustus Method was fine-tuned by the National Civil Protection Department which acts as a guide at all stages of managing an emergency.

- meeting points.

Meeting points are identified in the Civil Protection Plans and are “tested” through exercises under “normal” conditions when a previously designated segment of the resident population leave immediately along safe paths, followed by the rescue staff. To this end, meeting points are identified – including squares, wide points in roads, car parks, public and private courtyards – according to both their ease of access and their lack of potential risks (landslides, overflows, fires, collapses, etc.).

Empty urban areas, according to the indications provided by the Italian Civil Protection Service, are those spaces where the resident population should be accommodated in emergencies. This suggests that new planning ideas should be launched much along the same lines as those suggested in early post-earthquake, urban designs where the rules were laid out for anti-earthquake town planning: a “chessboard” plan with wide streets, both straight and perpendicular, open spaces like squares and markets positioned along the longitudinal streets, and buildings with regular layouts all at right-angles (Vivenzio 1783). These simple rules, which are often disregarded and contorted in modern towns, are extraordinarily current and oriented towards new definitions of the urban traits of quality and security.

The need to deepen research into the vulnerability of relational spaces, understood as strategic places with which to deal with emergencies, arose from the need to define the minimum requirements of “meeting points” as safety standards. The identification of “emergency camps”, however, already responds to the parameters set out by the Italian Civil Protection Service which uses purpose-made evaluation frameworks to judge minimum security conditions (geometric, town and environment related, functional, danger and risk related). With relation to the meeting points, they must be identified within the urban centre in safe places, but without specifying suitable features; due to this, research<sup>7</sup> focuses on identifying minimum security and performance-based measures so as to foster optimum usefulness in times of emergency and under normal conditions. Research aims at identifying from amongst relational spaces criteria for good advance planning which derive from:

- the urban nature of the area;
- the surrounding security conditions.

This allows for the achievement of a twofold objective, the improvement of functionality in times of crisis and of the urban nature of the area. So as to be able to achieve this goal the document “Suitability requirements of safe places” was drawn up; it is useful in setting out the functional characteristics of regions (structural design, morphology, accessibility and usability, the way it reacts to construction, presence of vulnerable elements) and in marking out vulnerability indicators which, arranged according to indications regarding their levels of influence, define, in short, an area’s propensity to exposure to damage caused by seismic events.

### 3. 1 SAFE PLACES AND URBAN STRUCTURE. THE CASE OF REGGIO CALABRIA

The history of Calabria has been deeply influenced by the succession of catastrophic earthquakes which have razed to the ground entire inhabited centres and which have completely changed the settlement structure. The seismic events which have most interested the region are the earthquakes of 1783 and 1908 which, respectively, were of an intensity equal to 8.5 and 11 on the Mercalli intensity scale (AA. VV. 1990) which affected thousands of victims as well causing the total destruction of the majority of inhabited centres.

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<sup>7</sup> By ‘research’ I refer to the study undertaken by the architect A. De Paola “Relational Spaces as Safe Places”, supervised by architect Rosa De Paoli, in the context of the Advanced Post-university Training Course for Experts in the Promotion of the Cultural and Environmental values of the region, *ProMoTer*, financed by Calabria’s Regional Operational Programme 2000-2006.

The 1783 earthquake is undoubtedly the most well-documented and analysed seismic event due to the interest that the Bourbon government demonstrated for both the planning and the implementation of reconstruction work, and also because of the backwardness of the Calabrian provinces at the time. The consequent reconstruction work was one of the first ever examples of anti-seismic, spatial planning projects and economic planning. Indeed, the 1783 earthquake marked a different understanding of town planning, more geared towards a classical, late eighteenth century approach which was more attentive to the positioning of new sites according to the dangerousness of the region, of military protection and of sanitation regulations. As a consequence, a clear difference formed in the settlement-spatial typology and, above all, in the urban-morphological typology.

For the first time, use was made of spatial planning and urban design as defensive measures against earthquakes and the rules of the “anti-seismic town” were defined via:

- suitable choices for the positioning of settlements. The abandonment of unstable places and a movement towards more geologically stable and level areas;
- designs and urban forms appropriate for the task of rendering a town more resistant via the demarcating of regular and orthogonal roads and the formulation of Construction Regulations<sup>8</sup>. Wide roads, straight and perpendicular, so that even buildings were regular and at right angles (a chessboard-like pattern); with large squares, markets and main buildings positioned along the longitudinal roads.

The reconstruction plans for those urban centres destroyed by the 1783 earthquake are examples of great cultural prominence in which elegance and monumentality were harmoniously combined, as typified XVIII century town planning, with their requirements being dictated by anti-seismic safety concerns (Figure 1).

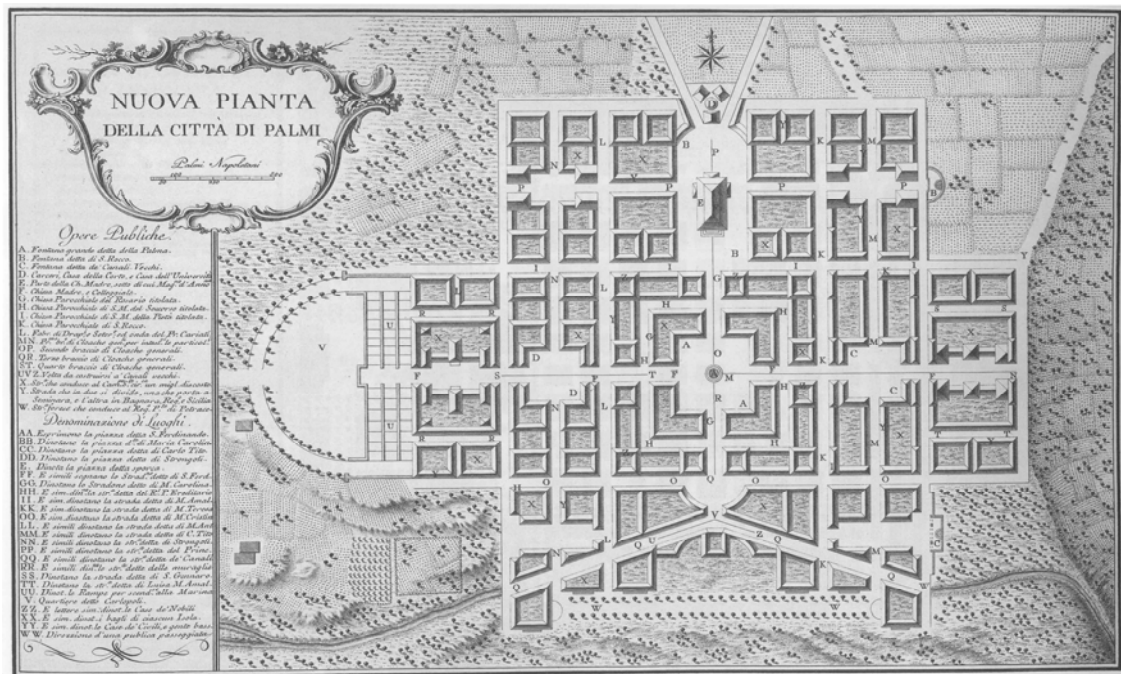


Fig. 1 A case of reconstruction after the earthquake of 1783 (Palmi, RC)

<sup>8</sup> The *Construction Regulations* were formulated so as to regulate the rebuilding of urban centres by setting criteria according to: the height of the buildings in accordance with the road surfaces; the number of floors proportionate to the number of inhabitants; the sides of buildings on to which the construction of large balconies is banned, but on to which small, light balconies can be built if they are as far as possible from the building's corners; the application of construction systems which use wood-based structures; the cladding of buildings in brickwork and mortar in order to improve their resistance (a construction system introduced by engineers from Lisbon during the reconstruction following the earthquake of 1755).

Post-earthquake reconstruction marked the beginning of the transferral of populations from the mountainous internal region of Calabria towards the coastal strip where the new urban settlements were positioned. This was to be a momentous change in Calabria's history which would continue into the next century as a consequence of the construction of the first railway.

The earthquake and seaquake of December 28<sup>th</sup> 1908 represent the most destructive events (Baratta 1910), in terms of both destruction and lost human life. Messina and Reggio Calabria were, in fact, razed to the ground, obliterating all traces of the city's buildings, alongside approximately 90,000 victims.

As a consequence of the event, the first ever anti-seismic regulations were promulgated (Royal Decree, 18<sup>th</sup> April, 1909) amongst which was the first example of territorial macro-zoning, in which the settlements damaged by the seism were listed and in which technical and hygiene-related norms for reconstruction were declared. These norms regulated the building process by placing restrictions on the height of buildings (maximum two floors, no more than 10 metres high) which depended, in turn, on the width of the central road (minimum of 10 metres). Norms for protection against seaquakes were also declared which did not allow for any development up hill from the railroad by a distance varying from 30 to 50 metres. The two cities, entirely reconstructed after the seism, today have very few examples of buildings from their past, the loss of which is truly incommensurable in terms of cultural heritage.

Reggio's Reconstruction Plan was entrusted to the engineer Pietro De Nava, assessor of the town's public works, who collaborated with the town's engineers and civil servants from the Public Works Office. At the heart of the plan there was a new set of regulations which referred to "Obligatory technical and hygiene-related rules for restoring, rebuilding and building from scratch public and private buildings in the towns hit by the earthquake of December 28<sup>th</sup> 1908 and others which preceded it". The Reconstruction Plan proposed overruling the limits imposed on the old built-up area of the town for new safety reasons which induced horizontal rather than a vertical expansion. De Nava's project amplified the "chessboard" layout, using it as a base from which to both redesign the new building network and to re-position settlements by modifying the interaction between "empty and full" spaces.

The Plan anticipated various functional specialisations for the different zones within the city:

- Bureaucratic – administrative, as well as residential, for the centre;
- Commercial – industrial for the new neighbourhood scheduled to be built adjacent to the port;
- Residential – intensive for the other areas in the centre;
- Residential – extensive in the areas adjacent to the extension of the central axis of the main street.

More recently, seeing as the areas covered by the De Nava Plan have been saturated, the urban centre has adapted to the new and permissive anti-seismic legislation and has chaotically thrown itself into peripheral areas which do not have norms set by a town-planning strategy<sup>9</sup>. Therefore, research has been focused on the safety of the spaces included in the De Nava Plan which is, today, distorted in both its contents and form.

The role and social value of public space in the city of Reggio Calabria takes on the same particular significance of all Southern Italian towns where the climate and cultural traditions mean that public space is truly lived in. A recent study<sup>10</sup> classifies Reggio Calabria's public spaces, including "potential spaces"<sup>11</sup>, into

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<sup>9</sup> The De Nava Plan would remain the favoured urban planning method until 1969. Several changes were made to it over the years.

<sup>10</sup> This refers to the "Survey on the condition of public spaces and green areas in Reggio Calabria" by the Department of Landscape, Territory and City (OASI) at the Mediterranean University of Reggio Calabria, Architecture Faculty, responsible scientist Prof. Fera G.. Township of Reggio Calabria, 2006.

<sup>11</sup> "Potential Spaces" are public spaces defined by certain formal and qualitative traits of a particular value which, however, are underused for several reasons (e.g. because they are in undeveloped areas or are used as parking spaces etc.).

350 groups from green areas to public spaces for a total of 950,000 square metres of land, of which approximately a third are concentrated between the urban centre and the suburbs.

The attraction cultivated by such spaces highlights a prevalence of neighbourhood areas (211), then district areas (97) and, finally, there are the communal spaces (42).

The methodology used in order to identify the suitability requirements of safe places was applied to certain sample areas in the urban centre, using the assessment template “Suitability Requirements for Safe Places” (Fig. 2) which reconfigures safety parameters and indicators (Tab. 1).

The selection of the areas concerned two areas in particular which are representative of the conditions of settlements in the city of Reggio Calabria:

- the city centre, chosen for its cultural merit and because the majority of relational spaces are to be found in it (Piano De Nava);
- the consolidated periphery (Sbarre) in which slum-like areas and commercial areas with developmental potential coexist.

PARAMETERS	INDICATORS
Size of the areas and the resident populations	– ratio of metres squared/ inhabitants
Accessibility and usability	– n° driveable entry points (width > 6.6 metres) – n° pedestrian entry points – n° physical barriers
Relation to building work	– distribution grid – buildings with sides facing open spaces
Elements which increase vulnerability	– width of road < H buildings – vulnerability of the buildings – critical elements

Tab. 1 Parameters and Indicators for open spaces vulnerability

The results underscored a higher level of vulnerability in the suburbs, due to their worse accessibility and greater density of construction work. The majority of the suburban areas lack, moreover, an urban nature and therefore are rarely used as relational spaces by the residents or the township’s administration who tend to prefer to be in the historic centre so as to be able to launch various initiatives, increasing problems linked to mobility and congestion. Urban areas situated in the historic centre, however, as well as being of a highly urban nature, reveal contained levels of vulnerability because they are adequately accessible, even if in certain cases buildings’ sides are moderately vulnerable.

The topic of implementing safety measures in public spaces requires a more in-depth analysis of two subjects:

- the safeguarding of the historic identity of those spaces which are considered representative of the cultural and social memory of a town, mainly squares, but also spaces of an unusual morphological nature which were inherited from the past with physical and limited dimensions, architectural emergencies, and recent damage to buildings;
- the “cleaning” of newly urbanised public spaces, arising from the planning of the expansionary process of a town, often with no spatial definition, architectural quality, or balance with relation to the urban scale.

During the process of integrating old with new and quality with safety, some mediation must be sought between the need to conserve the “memory” of a place and the need to enact “modern” functions such as preparations for emergencies. The safety criteria dictated by the need for reconstruction in the wake of the 1783 earthquake in Calabria, contributed to the creation of “clean” spaces, the regularity and balance of which is unheeded by the impersonal urbanisation of the modern age. Moreover, the far-sightedness of the planners of the time makes one reflect on the extent to which the “evolution” of town planning has not

prevented, over the course of time, the avoidance of simple rules which would have rendered the urban project in-keeping with both safety and aesthetic criteria.

#### 4. A "HISTORIC" SPACE

Amongst the examples examined in this paper, Piazza Italia is the most representative of the "historic" relational spaces situated in the political-administrative heart of Reggio Calabria (Corso G. Garibaldi), in the centre of the urban "chessboard" structure of the Mori Plan it was conceived very much according to the late eighteenth century vision, in which the central square arose from a planned urban design. The Piazza is an open space of a geometrically regular form and it is inserted into the centre of an urban context of particular architectural prestige; in the "wings" of the construction a homogeneous architectural style, "Liberty", can be identified which can be traced back to the 900s. The "wings" are separated by roads of which three can be driven on (Via Cattolica dei Greci, Via San Francesco di Sales e Via Miraglia) and of which one is pedestrianized (Corso G. Garibaldi). The buildings which demarcate the space usually have ground floor rooms which are used as public offices or as shops.

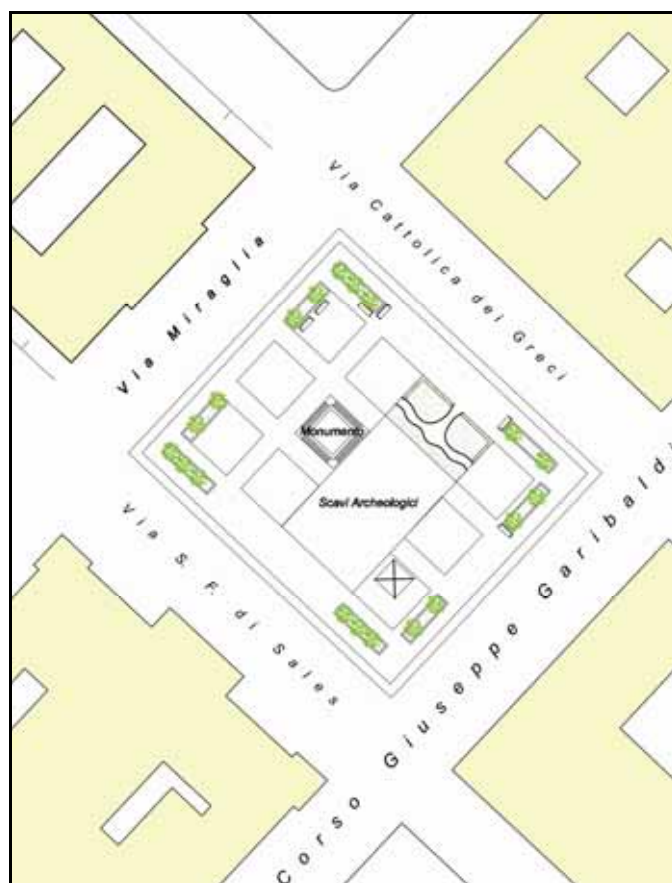


Fig. 2 Reggio Calabria, Piazza Italia

The Piazza is characterised by the presence of a monument dedicated to Italy (1868), or an archaeological area which is an integral part of the piazza, and by various furnishing elements. Lamppost illumination guarantees good lighting in all parts of the square. The ground, made of stone, covers most of the piazza's surface and is interrupted by flowerbeds with a formal arrangement of trees with plentiful foliage and low-lying plants.

It is used by all ages as a place for rest, walking and, occasionally, for demonstrations of various kinds. Piazza Italia is above all crossed by a large number of users who go, on a daily basis, to the Town Hall, the Prefecture and the Provincial Administration which surround the square itself. The image that is created by this is one of a very aesthetically pleasing space of high quality and which has a historic symbolic value for the context in which it is found.

The space is, thus, safe with a medium level of noise pollution and a good level of comfort for its users who are guaranteed respite by the square's intimacy and by the presence of trees which provide some partial shade.

The dimensions of the space in comparison with the resident population is more than sufficient seeing as the ratio of square metres/inhabitants is  $\leq a$ , despite the fact that the population rises by 30% due to the high functional vocation of the area. Its accessibility is very good and its usefulness too due to the suitable levels of pedestrian and vehicular access in case of eventual rescue operations (roads which are wider than 6.6 metres). The level of synthesis vulnerability deriving from a reading of the framework of the "Suitability Requirements of Safe Places" is low, therefore it can be considered suitable for emergency cases.

		REQUISITI DI IDONEITA' DEI LUOGHI SICURI									
Dati generali	N° Scheda	Data	Squadra	Regione		Provincia	Codice Istat Provincia				
	Comune	Codice Istat Comune		Frazione	Circoscrizione n°		Zona Censuaria n°				
	Denominazione dello spazio aperto			Indirizzo: Via/Piazza/altro							
	Dati dimensionali: Lunghezza mt.		Larghezza mt.	Superficie totale mq.			Superficie calpestabile mq.				
Dimensionamento delle aree rispetto alla popolazione edifica	INDICATORE DI VULNERABILITA'	PARAMETRI DI VALUTAZIONE E INDICI DI INFLUENZA					Dato rilevato	Prova %	Valore ponderato		
	Rapporto mq/abitanti	$\geq 1$	$\geq 0,5 < 1$		$< 0,5$			8			
Caratteristiche morfologiche	Pendenza del terreno	0-9%	10-29%		30-50% a presenza di salti di quota di media entità	Maggiore del 50% a presenza di forti salti di quota			10		
		0	6		8	10					
Accessibilità fruibilità	N° Accessi carribili all'area con larghezza superiore a 6,6mt.	> di 3	3	2	1	0		10			
		0	3	5	7	10					
	N° Accessi pedonali all'area	> di 4	4	3	2	1		10			
		0	3	5	7	10					
Barriere fisiche	Assenza di barriere	Con barriere						6			
0	10										
Presenza di reti di distribuzione (elettrica - idrica)	Presenti	In parte			Assenti			5			
	0	5			10						
Rapporto con l'edilizia	Fruiti edificati sullo spazio	Senza frutti edificati	Fruiti parzialmente edificati			Edificato su tutti i fronti			10		
		0	5			10					
	Strade con larghezza inferiore all'altezza dei fabbricati prospicienti (Rapporto h/l)	Nessuna	1 strada con h/l = 1	2 strade con h/l = 1	3 strade con h/l = 1	4 o più strade con h/l = 1			10		
0	3	5	7	10							
Vulnerabilità degli edifici prospicienti	Bassa	Media			Alta			25			
	2	6			10						
Elementi di identificazione della vulnerabilità	Presenza di elementi di criticità	Bassa	Media			Alta					
		2	6			10			8		
LIVELLO DI VULNERABILITA'											

Fig. 3 The assessment template "Suitability Requirements of Safe Places"

## 5. INDICATORS OF VULNERABILITY FOR OPEN SPACES

### *Ratio of square metres/inhabitants*

The indicator refers to the resident population of a 70 metre space (Galderisi 2004), whose span of influence is smaller than the area in question. The 70 metres represent the immediate surroundings of a urban, built up space, therefore a meeting point will have to be set up in such a way that it can accommodate the population that lives in the area. In those areas which have a highly functional as well as residential



vocation, the value of the resident population has increased by 30% since it has to be considered that a seismic event could occur in working hours when the area is frequented by the highest number of people.

#### *Incline of the terrain*

The morphology of the terrain on which urban areas stand can significantly increase the seismic effects of an earthquake, placing strain on the overall levels of vulnerability of the urban area. In particular, the incline of the terrain can prompt additional collapsing.

The levels of inclines considered here are:

- > 50% or the presence of sharp inclines;
- from 30 to 50% presence of medium inclines;
- from 10 to 29%;
- from 0 to 9% maximum permitted incline (Ministerial Decree n° 246/1987).

#### *Driveable entry points wider than 6.6 metres.*

Accessibility is the most important indicator of an urban area's vulnerability.

Its road network must be able to respond to exacting requirements as it must be able to guarantee:

- safe connections from the urban centre to the outside;
- connections between public spaces and strategic buildings in order to accommodate and let the population stream out of the area in cases of emergency.

The vulnerability indicator refers to the quantity of driveable entry-points into the area which are wider or equal to 6.60 metres (dual carriageways) and which, thus, guarantee that the emergency services can enter the area. The influence index for the greatest vulnerability was assigned to those areas without access roads of the minimum size required.

#### *Pedestrian access points*

The possibility of accessing an area by foot changes the levels of the area's vulnerability; more access points, of course, indicate that an area is better equipped for emergencies.

#### *Physical barriers*

'Physical barriers' refer to all those obstacles (fences, for example) that prevent easy access to the area both in the daytime and at night.

The presence of distribution networks, above all those for electricity and water, in the area obviously render it more useable and functional.

#### *Rows of buildings*

Interaction with building sites and construction on the whole is one of the factors which most influences the evaluation of vulnerability. "Rows of buildings" refer to those buildings in a line on the edge of a space. Building works in these areas are, on the whole, the most dangerous and vulnerable factor for emergencies, whereas totally open spaces are not vulnerable at all.

#### *Roads which are narrower than the height of the buildings which overlook them*

It is useful to analyse the relation between the width of the road surface and the height of the buildings which overlook it, using as a safety guideline that which is indicated in the Ministerial Decree 16/1996, paragraph 3, so as to identify the parts of the road which could be entirely blocked by the collapse of certain buildings. Of course, the sections of road which are most vulnerable are those where the height of buildings/width of road ratio is  $\geq 1$ .

#### *Vulnerability of buildings*

The vulnerability of buildings is dealt with in frameworks level 1° and 2° of the National Group for Earthquake Defence for those buildings made of brick and of reinforced concrete.

### *Presence of critical elements*

Here are considered all those potential factors which could jeopardise safety, and, therefore, those “elements” which could induce an increase in the vulnerability of spaces:

- vertical connections (staircases);
- thin elements (civic towers, small towers/domes, monuments, water tanks), which due to their enhanced height could lead to greater vulnerability in the system;
- urban fittings higher than one metre;
- retaining walls;
- small bridges and/or underpasses.

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