

Assessing Flexible Places for Adaptive Urban Design: A New Method and the Case of Cittaducale

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Abstract: Each place has its own peculiarities, determining that the resilience and adaptation to diverse types of risks will be different, requiring different time and methods for mitigation as well. The coexistence of several risks determines further resolution difficulties as commonly, since risks are sudden and unforeseen, there is a tendency to treat the last risk more carefully, neglecting the previous one even if it is just as important. Most of the methodologies used to analyse areas affected by different risks are aimed at focusing in particular on seismic risks without considering those relating to intangible aspects linked to the identity of the places or aspects related to urban health and liveability. And, more in general, in relation to design aspects, urban methodologies do not consider all the results of the analyses, maybe for the difficulty deriving from translating the complexity of collected data in project interventions. Starting from these premises, the objective of the article, elaborated within the SISMI and PRIN 2020 research projects is to propose an original methodology capable of analysing the places affected by multiple risks and planning its resilience attentive to its cultural resources and to its liveability. To this end, the proposed method will be aimed at creating flexible and adaptive places and the case-study of Cittaducale will be illustrated. Criticalities and qualities of this place affected by an earthquake in 2016 will be reported and project interventions to transform its risks into opportunities will be shown.

Key words: Flexible places, adaptive urban design, public spaces, sustainability, urban regeneration, cultural heritage enhancement.

1. Introduction

The places affected by earthquakes have different characteristics, which depend both on the extent of the earthquake, and the consequent damage to property and people, and on the different types of cultural resources of the site. Earthquakes that cause the destruction of entire centres are different from catastrophic events that cause little damage to some buildings. Nevertheless, the perception of risk for the population can still be strong, so much to cause indirect effects and induce people to abandon certain areas or change their habits. Added to this are the dimensions, morphology and density of the place concerned which influence the effects of the earthquake in different ways. An event that strikes a densely populated historic centre characterized by monuments and prestigious buildings is different

from an event that strikes a place that is poorly built and sparsely inhabited or used above all for holiday periods. The effects may concern urban, social, economic, environmental damage or a combination of these [1].

Moreover, especially in the nowadays territories, it is happening more and more often that crises of different types occur simultaneously making resolution difficult, especially in areas and/or populations already characterized by fragility [2-4].

Still, the Covid-19 pandemic is an emergency that has been characterizing the global territories for over two years, changing habits and places in a manner that was initially rapid and then slower, but in any case, marked the private sector that becomes public for smart working, public spaces not used or used with distancing in periods of greatest emergency, changing needs of visitors and travellers, economies, and together with

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them the places of commerce in reconversion [5].

Other risks that join those mentioned above are urban ones, due to the poor maintenance of buildings and urban fabric, that of identity, due to globalization, that of urban health and liveability, due to scarce attention to healthy public spaces, to the presence of architectural barriers, poor maintenance of roads and pedestrian and cycle paths [6-12].

The coexistence of more than one risk determines further difficulties in resolving because commonly, since the risks are sudden and unexpected, planners tend to treat the last risk more carefully, leaving out the previous one even if it is equally important, and very often without taking into account the positive or negative example of the event that previously occurred in another place, also for reasons due to different or non-integrated regional legislation [13-15].

Spaces with a good degree of resilience are spaces that are able to adapt to change. It is also true that adaptivity, like the term resilience, has many declinations which can lead to different interpretations. Adaptive planning, adaptive governance, adaptive management, adaptation of institutions, adaptation of the city, of its public spaces, of its buildings are some of the declinations that are commonly used giving different meanings to the concept of adaptivity. To clarify its limits in the planning domain, it is possible to refer this to the material dimension and the organizational and institutional dimensions. The material dimension is about people, the environment, and the land, while the organizational and institutional dimensions are about the domains in which planning and activities act to link institutions with the material dimension. Adaptive planning can thus mean: that the people, places, or situation that are the objects of planning have dynamic behaviour and can exhibit that behaviour in the future; or that the processes of designing and implementing interventions are capable of being adaptive [9, 16].

Traditional approaches to planning do not consider adaptive behaviour as an initial point in the planning

phase. These are situations that require interventions that are decided upon later through planning action such as, for example, building a road to improve sudden deteriorating traffic conditions or building a residential neighbourhood in response to an unexpected increase in population [17, 18].

These cases could have been resolved even early in the planning process; instead, traditional planning deals with planning based on predictable realities and not on unforeseen changes.

The uncertainty and unpredictability of an event and its subsequent, often unknown, development are difficult elements to manage. In fact, the system as a whole cannot be understood only by observing the parts that compose it, which must instead be analysed together with their context, noting the reciprocal relationships and the ways in which the system reaches the best possible configuration.

Traditional approaches to spatial planning often do not take adaptive behaviour as a starting point, believing that urban interventions can be decided on the basis of facts and estimates that are available at the time of decision-making. If reality did not change by remaining similar to that considered during the decision-making process or otherwise predictable, there would be no reason not to continue with this form of planning. This form of planning is based on a static perspective, which assumes a transformation according to predictable patterns, whose starting points are: "actual: eliminating the anomaly responsible for the disturbed order in the here and now"; desired, i.e. ideal and evidence of context; potential, i.e. the tools to achieve a predefined end on which there is consensus [17].

Resilience and adaptation are to be considered fundamental in dynamic planning where the uncertain and the sudden become components of the planning process. These should have the same weight as the other components and urban planning tools should be renewed or modified to contribute to the management of any crisis in an appropriate way. While it is true that unforeseen events occur suddenly, it is also true that

adaptive and dynamic planning can better support the creation of a new equilibrium through the identification of flexible spaces [19-23].

Accordingly, flexible city is based on tools for architectural and urban planning and design, including financial and legal tools, which are not rigid and able to allow changes during implementation of projects, in case of unforeseen events or new requirements and needs.

The principles of the flexible city should be related to the entire lifespan of an urban project, starting from the early stages. An urban project is carried out in the medium-long term, and it is necessary for its sustainability and the reduction of risks to foresee that use, time and design are flexible. Over thirty years of time, it may happen that a commercial land becomes a residential building, or a design phase may be delayed, requiring adjustments to the masterplan that can only be made in the presence of a flexible tool designed for places where people can work and live well. Architects, urban planners, legal professionals, and developers, as well as the various actors involved in different ways in the design and construction process of the site or building, are required to design in an innovative way, offering the greatest possible degree of flexibility [22, 23].

Flexible planning makes it possible to use context-based features in a local scale as a starting point for the redevelopment project, resulting in lower investment costs, shorter construction time and greater support from stakeholders. The various design possibilities that can be realized with respect to the existing situation are identified through quantitative and qualitative analyses, of which the latter determine the implementation of flexible planning [24, 25].

Starting from these premises, aim of this paper is to propose an original methodology capable of analysing the places affected by multiple risks and planning their resilience in a suitable and attentive way to its cultural resources and its health and liveability [9].

The study was carried out in the framework of: SISMI project within the Centre of Excellence of the

Technological District for cultural heritage in the Lazio region, task 1.5 “Italian and international best practices and placemaking” (with the author’s co-responsibility) [14], and the research project PRIN 2020 SUMMA “Sustainable modelling of materials, structures and Urban spaces including economic-legal implications”—within the ISMed-CNR Unit (with the author’s responsibility) and the relative agreement between Sapienza Università di Roma and ISMed-CNR.

Objective of SISMI research was to identify methods for reconstruction which take in account social participation, safety, place identity and sustainability. Aim of SUMMA research is: to create an analysis and design methodology of the urban space to be applied to areas characterized by multiple risks which require integrated and flexible interventions and define post-event reconstruction/regeneration/enhancement strategies that reflect the quality of the buildings and public spaces and social inclusion. To both ends, the proposed method will be aimed at creating flexible and adaptive places. The article is organized as follows: the present section is devoted to the theory of adaptive and flexible places, the second section to the illustration of the method, the third section to the illustration of the results and discussion, and the fourth section to the conclusions.

2. Method

The proposed method is an original method that analyses the elements and risk factors of a place—in particular public spaces—the perception of them from their users and the quality of the site and identifies policies and/or design interventions for its safeguard and enhancement. The need of a new method stands in the current lack of tools capable to contemporaneously identify risks, perceptions of risks by people and quality of the places. Attention will therefore be paid to both detecting tangible and intangible aspects of the place in question (Table 1).

Table 1 Method protocol scheme.

Phase	Objective	Actions	Product
1	Identification of single “urban” risks	Observation of the places	Mosaic of the single risks
2	Analysis of factors contributing to the risks	Identification of the factors	Mosaic of concurrent risk factors
3	Analysis of the effects due to the coexistence of risks	Observation of the effects	Mosaic of effects
4	Risk perception questionnaires	Questions asked onsite to users of places and social network analysis	Mosaic of risk perception by place users’
5	Analysis of plans/projects/programmes/policies for adaptation	Identification of projects and plans that provide for adaptation to risks	Mosaic of plans/projects/programmes/actions
6	Analysis of potentialities and qualities	Identification of factors which contribute or can contribute to the quality of the place	Mosaic of the quality elements from the urban point of view
7	Multi-risks analysis	Identification of all present and probable risks, related factors, and user perceptions	MultiRisk map
8	Dynamic area identification	Identification of areas with potential flexible use	Mosaic of flexible uses
9	Dynamic project interventions	Identification of project interventions of adaptation/enhancement	Dynamic Map

**Fig. 1** Cittaducale, Piazza del Popolo.**Fig. 2** Cittaducale, Piazza Cerreto Piano.

The method aims to identify what are the present or possible risks, both single and especially multiple, that can affect public spaces, the factors that determine them and their perception from users of the places and project interventions for both adaptation and enhancement of places. The final product is represented by two maps, one that systematizes and integrates all the data collected separately in the previous phases in order to obtain a mosaic of risks, factors, user perception, the other that presents the adaptation and enhancement interventions identified.

The method is constituted by nine phases, namely: identification of single “urban” risks; analysis of factors contributing to the risks; analysis of the effects due to the coexistence of risks; risk perception questionnaires; analysis of plans/projects/programmes/policies for adaptation; analysis of potentialities and qualities; multi-risks analysis; dynamic area identification; and dynamic project interventions.

The first phase concerns the analysis of the place with the identification of the individual present or presumed urban risk. This is carried out by detecting these risks with the use of a special card: the risk is detected by observing the places and quantifying it with respect to its presence in slight, medium and significant [1, 14, 15].

The risks present that can be detected by observation concern: the risk of degradation, the environmental risk, the social risk, the cultural risk, the anthropic risk, the seismic risk, the health risk, the risk of low liveability, the risk of insecurity, the risk of loss of identity of places.

This finding is connected to the next one concerning the factors that can determine the risk, as the risk is detected by identifying these factors. It is therefore a predominantly qualitative survey as it is based on the observation of the place.

The second phase is carried out by observing which elements and factors influence or may influence the present or possible risk or risks. This observation is carried out with a form indicating the type of risk identified and the factor or factors that determine it.

The result is a mosaic of factors that influence or can influence the emergence of risks of different nature. Both the first and second phase are useful to the survey of the third phase.

The third phase concerns the observation and analysis of the effects that may occur if several risks analysed in the first phase occur or may occur simultaneously.

The database will detect the type of risk, the effect or effects and the relative amount of the detected effect, measuring those as slight, medium or notable. For example, if the public space concerns a city affected by seismic risk and at the same time the space has been created or rebuilt with a design that is not very attentive to the identity of the places, the place will not fulfil its function as a place for socialization, as regards the lack of security could be joined by that of the perception of space not linked to tangible and intangible culture.

There may be other mix of risks such as anthropic risk and pandemic risk that could lead to the effect of less use of the place due to spacing or the use of low-quality signage to indicate paths or places to sit for sanitary safety reasons.

The result will be a mosaic of the risks present with their effects and quantity detected. This result will be

compared with the outcome of the next phase.

The fourth phase concerns the risk perception questionnaire. This consists in the identification of the perception of risk or risks by the people who use the place. This aspect of the analysis is very important as from the answers it will be possible to understand how much and if people perceive each risk and if they think they can contribute to their resolution.

Questions include:

- (1) What general perception do you have of this place?
- (2) Do you think this place is affected by one or more types of risk?
- (3) What perception do you have of the risk or the risks to which it refers?
- (4) Do you think that these are permanent or transitory risks?
- (5) How do you think citizens can contribute to the resolution of the risk/s?
- (6) What is the quality of this place?

The fifth phase concerns the identification of the plans, programs and policies that are active in the place under analysis. An overview of the area will be carried out and research on the actions, if any, aimed at mitigating the different types of risk present or possible. These can be at different scales and of different types, of a general nature or very specific and sectoral.

The product will be a sort of mosaic with the description of the area in question and the indication of any plans, projects, programs or policies that may be present in the area that will make it clear if the risks under analysis are object of attention.

The sixth phase is the identification of the factors and quality elements of the place. The identification of the quality of the place is here understood as the presence of historical monuments of interest, historic buildings, public spaces, greenery, historical urban fabric, perspective views. The identification of the presence of these elements is also combined with the current use. This information is important to understand if that place is a resource or a potential and if its use can be

flexible or if that place or perception can also be enhanced in another way.

The result is a mosaic of the quality elements of the place with relative uses. The seventh phase concerns the creation of a map that presents all the present risks. The map will contain all the risks present in relation to public spaces, the factors that contribute to this perception of present or possible risk, the results of the questionnaire on the perception of risk by people and those identified on social networks and the quality elements of the place with its use.

The eighth phase consists in identifying the dynamic potential of the area. In this phase, observing the multi-risk map, both the most flexible spaces are identified on it at the same time where it is possible to think of a resilience and improvement/enhancement project. The result will be a sort of mosaic where areas of greatest risk are indicated where an action of adaptation and improvement/enhancement is most necessary.

Finally, the ninth phase will be the identification of dynamic project interventions, located in the areas already identified in the previous phase. These interventions concern the possible actions to be carried out to adapt to the risks and at the same time enhance the places in a liveability perspective. The result will be a dynamic map that will identify flexible interventions to be implemented both in the case of existing and possible risks. In this way each phase is important for the next one and all the results of the first eight phases together concur to the final construction of the dynamic map.

3. Results and Discussions

The case of Cittaducale in the province of Rieti in Lazio Region, which was affected by earthquake in 2016, will be summarized in the following to show an emblematic application of the method. Despite it was not having suffered major damage as several other nearby centres, the place is subject at risk of depopulation and isolation.

The first three phases, the results of which are

summarized below, concern the identification of risks and related determined factors and effects. In this regard, the first risk that is detected is the seismic one. The seismic sequence that affected central Italy starting from the event in August 2016 involved an area of approximately 8 km². The earthquake of 24 August destroyed villages and hamlets, including the municipalities of Accumoli, Amatrice and Arquata del Tronto. Gradually, the seism of 26 and 30 October, considered the strongest in Italy by the earthquake in Irpinia (Southern Italy), caused severe damage due not only to the urban and structural characteristics of the heritage but above all to the geological and physiographic characteristics of the territory. Even if Cittaducale was only minimally affected by the earthquake, with damage in particular to a few buildings, the seismic risk is still present.

The second risk is related to depopulation. The municipalities affected by the earthquake of 2016, such as Cittaducale, are mainly municipalities in the already economically depressed mountain area which the micro-economy induced by the so-called return tourism, or by the presence, in fixed periods of the year, of second-hand owners disappears with the earthquake.

In Cittaducale it is no longer the earthquake or the inaccessibility of some buildings that push people to leave, it is rather a mixture of reasons linked to the lack of job opportunities, cultural reasons and the weak drive to rebuild, by who lives elsewhere, the old family home. Added to this is the risk of isolation due both to the presence of few places used for socialization and to the presence of few connections of Cittaducale with the other territories of the province of Rieti, causing problems of connection with the neighbouring centres.

The fourth risk is the pandemic one. This risk is linked to the health emergency from Covid-19 which affects territories and people globally. This risk will remain over time even if with different effects on the places.

Finally, the identity risk was identified. The areas of the crater around Cittaducale have a significant cultural

heritage, rich in monumental and artistic architectural heritage. The presence of parks and nature reserves and thermal waters also constitute a significant landscape heritage, characterized by the presence of important archaeological areas and medieval towns. Cittaducale, city of foundation in the year 1308 built between two famous cities Lista on the west side and Cotilia on the east side in a very flourishing territory, is also characterized by a notable cultural heritage. But with the earthquake, many municipalities, villages, small villages spatially and temporally distant from the large urban centres, bearing an identity heritage of inestimable peculiarity, found themselves with transformed landscapes, disappeared places, damage to infrastructures, partial reconstruction, and an upset everyday life. Despite minor damage, compared to many other centres, the risk of loss of identity is still present.

The fourth phase concerns the questionnaire which was administered to fifty local passer-by users aged between 20 and 70. The questionnaire allowed the interviewees to express different types of opinions and consequently also their knowledge of the territory, its weaknesses and strengths. From these talks, reflections emerged on the missed opportunities, on possible solutions to reduce the widespread effects of depopulation.

To the first question, 50% of respondents, regardless of age, answered the calm of this place, the streets, squares - Piazza del Popolo and Piazza Cerreto Piano - the open spaces and valleys; the remaining 50% answered the many churches, palaces, the Angevin tower and the Napoli Gate.

To the second question, the answer given by 80% of the interviewees was the seismic risk; 40% added to this the risk of depopulation, since, although no particular damage has occurred, however, especially young people prefer to find work elsewhere, while 30% added the risk of isolation due to the lack of external connections and the pandemic risk. The remaining 20%, in particular people between 40 and 60 years old, answered the identity risk, as some places are little used

as well as buildings and could risk being used for functions not attentive to the historicity of this city.

To the third question, people replied that the seismic risk, probably because the damage due to the previous event was of little importance, is not perceived as a constant risk. The risk that 70% of the interviewees perceive is related to depopulation, while the remaining 30% replied that they also perceive the risk of isolation, partly also connected to that of depopulation, partly deriving from poor connections with the surrounding areas.

To the fourth question, 100% of the interviewees replied that the seismic risk is transitory while the depopulation risk is permanent; in particular, they added that the latter risk is permanent if the state of the places is not changed, making Cittaducale more attractive from a business and tourist point of view.

Regarding the fifth question, the answers were different: 50% of the population—especially locals between 30 and 50 years old replied that citizens could contribute, but it is important that there are also interventions by the public; the other 50% think that it is only the public who should mainly deal with the mitigation of risks and dangers.

Finally, regarding the qualities of Cittaducale, 100% answered Churches and monuments in general: of these, 30% added the Terminillo and Vittorino valleys and the Parks, also referring to the presence of nearby natural resources; another 30% added local products and cultural events, while another 40% added the tranquility of this place in general.

The fifth phase concerns the traditional type analysis. Cittaducale is a town built in 1308 on the Colle di Cerreto Piano, called the Ducal City in honour of his son Roberto, Duke of Calabria, heir to the throne.

Its urban layout consists of two perpendicular streets that cross each other giving rise to the main square, Piazza del Popolo within the Santa Croce district. The area covered by the case study concerns the historic centre that looks like a large space of naturalistic glimpses visible looking at the main decumanus corso

Mazzini and surrounded by the main monuments of Cittaducale. The historic buildings include Caroselli-Maoli seat of the Municipality, Bonaface with its particular loggia, the Episcopal palace seat of the Diocesan Museum, the cathedral of Santa Maria del Popolo and the convent church of Sant'Agostino with their respective bell towers, the crenellated Torre Civica, the Palazzo della Comunità, Capitano del Popolo and dei Priori and the octagonal fountain (Figs. 1 and 2) [26, 27].

The current Master Plan was approved in 2021; the provincial civil protection plan for seismic areas for the protection and monitoring of Cittaducale in relation to calamitous events is also in force [28, 29].

The qualities of Cittaducale, sixth phase of the method, concern both the general liveability atmosphere and the urban fabric of the Santa Croce district with the main axis of Corso Mazzini and the various monuments and Piazza del Popolo.

Another part of interest is the ancient walls with the Napoli Gate. The walls draw the boundaries of the first structure of the city dating back to its foundation made with very irregular blocks, and large square towers. Some sections have been demolished because they were heavily damaged by the earthquake of 1915. Currently there are visible and well-preserved traces near the aforementioned Gate and in the park of the Olives. Napoli Gate is the ancient access to the city and is composed of a portal and the Angevin tower about 30m high, which although were damaged over the centuries due to earthquakes, still remain an important trace of the past. The door allows direct pedestrian access to the main street of Cittaducale.

There is also the complex of the Terme di Vespasiano divided into four successive terraces with the natatio in the centre accessible by steep stairways placed symmetrically on the long sides. There are several environments whose structures reach 5m in height. On the northern facade there are alternately rectangular and semi-circular niches arranged on the sides of a room with a rectangular plan and with an apse on the back side. The site was frequented, not only for

thermal purposes, until the 12th century, but is currently not organized through regular openings despite the presence of an InfoPoint building but never used.

The Cathedral from the 300's immediately begins to slowly collapse due to the karst phenomenon. In the 19th century it was definitively abandoned when a rather superficial aquifer flooded the church, and for this reason it is still a place with an enchanted appearance today. For its beauty, it was one of the locations in the 1983 film "Nostalghia" by A. Tarkovaskij [28, 29].

The seventh phase concerns the construction of a mosaic map where risks, user perception and quality of the place are identified. The risks identified in this city are the seismic risk, the depopulation risk, the isolation risk and the identity risk. From the interviews carried out, the most perceived risk is the seismic one, probably due to the enormous damage of neighbouring countries, while the least perceived is the pandemic one detected by only 30% of the interviewees. The risk of depopulation and that of isolation are mentioned, as they are closely linked to each other, and in some way the consequence of the other.

Regarding the quality, the regular layout of Cittaducale allows even the occasional visitor to be able to orientate easily, its small size and a liveable atmosphere favours the slow and pleasant walkability of the town. The network of narrow streets surprises in the sudden glimpses of the green of the mountains or the valley. In some places the roads open towards small open spaces used mostly for parking. There are numerous historic buildings that arouse interest along the route such as the Dragonetti-De Torres, in Baroque style located in the middle of the upper course, or the buildings that house the pupil's school and the former forestry dormitory, an important and historical presence for Cittaducale since 1905.

The eighth phase concerns the identification of flexible areas, or the parts of Cittaducale where it is possible to think of an adaptive project capable of

accommodating different types of activities also with a view to enhancement. The areas identified concern in particular the squares and open spaces of the historic centre that are little used, buildings and churches of interest and routes.

The first spaces identified are those intended for parking that can be allocated to initial reception areas in the event of earthquakes but also for socialization and participation.

Then the numerous squares and open spaces to be connected to the central Piazza del Popolo in the redesign of the urban path to rebalance the attractiveness of the square and at the same time improve its liveability in periods such as the summer when it is little used. Other flexible areas concern the streets on the edge of the historic buildings, creating both a cycle-pedestrian path that connects these places of identity value, promoting sustainable mobility, and a connection between the railway stations and the already existing cultural tourist train.

Finally, the naturalistic-archaeological-religious itineraries, where small orientation and rest areas can be created, also inserting areas to be used for outdoor sports activities.

In the last phase, project interventions are identified to enhance existing resources by mitigating the various risks identified, enhancing its cultural resources and powering the already existent liveability atmosphere. To this end, four paths have been identified including architectural, landscape/naturalistic, religious, and arts and crafts.

In the architectural path it is possible to cross the squares of the historic centre—without architectural barriers—which will be used for initial reception areas in case of earthquakes, socialization, and enhancement of prestigious buildings of various eras in all other periods. The traces of the arcades incorporated into the building, the stone portals, the towers and bell towers become references for orientation. The route then opens towards the ancient city walls extending towards the archaeological area and the Church of S.M. di Sesto

which reciprocally become the beginning and end of the path.

In the landscape/naturalistic path Cittaducale can be connected to other hiking trails and paths, including the European route E1 (from North Cape in Norway to Capo Passero in Sicily, South of Italy), reshaping the place with its wider context. From this, which becomes of main interest, other paths and trails branch off that touch naturalistic areas where various outdoor activities can be carried out, also useful in periods of physical distancing (e.g. 1-2 m among people) due to Covid-19 pandemic restrictions.

In the religious path it is possible to visit the churches through an itinerary of sacred architecture that also includes a stop at the episcopal museum and the library museum of Santa Caterina up to the Capuchins as a place of meditation and contemplation. This path is linked to two interwoven paths incorporating that of San Francesco da Greccio, Rieti, Poggio Bustone up to Borgo San Pietro on Lake Salto and that of San Felice da Cantalice from the Sanctuary of San Felice all'Acqua to the house where he lived located in Corso Mazzini.

Finally, in the path of the arts and crafts, abandoned and disused production areas could be recovered for the transformation of local products and the creation of workshops/accommodation, in underused buildings, for new skills by strengthening native crops to be recovered and enhancing the Terme di Vespasiano with its healing waters. This path is in particular designed to involve in different ways locals and fragile people.

Suitable info points, Qr Codes and a web portal with apps to be downloaded by place users will report paths and show their characteristics and information concerning areas for first recover in case of seism or physical distance in case of pandemic and all useful information in period of crisis.

In this way, the various identified risks—seismic, depopulation, isolation, identity, pandemic—could find resilience, transforming them into opportunities for enhancing Cittaducale in sustainable way.

The method used was experimented in areas characterized by different types of risks. During the surveys, some observations came up, which will be reported below.

The main problems include: the survey of the risks, the users' perceptions and flexible area identification. Indeed, risks cannot always be predicted, as it is easier to understand the vulnerabilities than the risks; the coexistence of several risks has different effects according to the risks that are added together, the places where they occur, the percentages in which each risk occurs. Furthermore, every mitigation and enhancement must be planned on the single site. As regards the users of the places, they perceive the risks only if these occurred recently or if these persist over time, therefore the answers to the questionnaires must be adequately integrated with the information collected in the inspections. The qualities of a place must also be noted with respect to the potential of the surrounding areas. And, finally, the flexible areas that are identified can be such even only in certain periods and for this reason the project interventions can refer to more or less long periods of the year.

The potentials include in particular the method itself and the detection of quality factors for enhancement of the resources which are identified. As a matter of fact, the flexibility of the method makes it applicable to areas of different types and for different types of risk and the repeatability of the method, thanks to a survey protocol organized by phases and products, can be applied by everyone.

Accordingly, the other important potentialities include: the possibility of identifying enhancement and risk resilience interventions that derive directly from the results of an analysis; and the detection of risks from a qualitative point of view, that is linked to the intangible characteristics of a place and its cultural heritage.

Furthermore, there are many users to whom the method is addressed: to citizens in order to share vulnerabilities and risks and participate in their

resolution; administrators to understand, also from a qualitative point of view, the various risks of the territory and how to transform them into an opportunity to enhance cultural resources; to technicians, to identify flexible project areas for different uses; to tour operators, local product companies, businesses in general, in order to offer their products in an integrated manner.

The experiments carried out so far have verified the validity of the method and its protocol of investigations, but because of its flexibility, it can be updated if different types of risks peculiar to other places will be detected.

4. Conclusion

The article presented a methodology to analyse elements and risk factors of a place—in particular public spaces—the perception of them from their users and the quality of the site, and identify policies and/or design interventions for both its safeguard and enhancement. The method was applied to different places interested in risks of different kinds; the Cittaducale case study was proposed for the coexistence of multiple risks/vulnerabilities at the same time.

The identified risks are here associated to seismic, depopulation, isolation and identity factors. Among them, the most perceived risk by the population is the seismic one, probably due to the enormous damage of neighbouring countries, while the least perceived is the pandemic one detected by only 30% of the interviewees. The risk of depopulation and that of isolation are mentioned, as they are closely linked to each other, and in some way the consequence of the other.

However, many qualitative factors were observed in Cittaducale, including—also due to its small size—the liveable atmosphere, the slow and pleasant walkability of the town, the urban landscape and the numerous historic buildings along the routes.

The project interventions which were identified as a result of the method applied are devoted to mitigating

the various risks, enhancing the cultural resources and powering the already existent liveability atmosphere. To this end, four paths have been identified, namely: the architectural path; the landscape/naturalistic path; the religious path; and the path of the arts and crafts. Suitable info points, Qr Codes and a web portal with apps to be downloaded by place users will report these paths and show their characteristics and information concerning areas for first recover in case of seism or physical distance in case of pandemic and all useful information in period of crisis.

In this way, the various identified risks could be translated into opportunities for enhancing Cittaducale in sustainable way.

The various case studies that have been carried out have led to the identification of guidelines, always following the idea that the risk can be an opportunity to review aspects of the territory that can be improved and enhanced and therefore resilience can be interpreted as a component of sustainable regeneration.

According to the concept of flexibility and adaption, the following guide lines are meant as an output that can be continuously updated depending on possible new kind of risks or combinations of them which could be detected in further case studies.

The identification of the dangers related to a place must take place in a preventive manner, through analyses involving material and immaterial factors.

The identification of risks and possible damages must take place with reference to a single event or more potential events that can occur simultaneously.

The perception that the population or, more generally, the users of a place has, is a fundamental element in the study of dangers and risks and must be detected through appropriate questionnaires.

Fragile individuals must be taken into particular consideration both for the relief of their perception of risk and for the project of adaptation to them.

The survey of the urban qualities of the place—cultural heritage, materials, equipment—are elements to be considered in risk adaptation projects/policies, in

order to transform them into opportunities to improve liveability.

The resilience/risk adaptation project must be constantly monitored in order to be able to foresee sudden events and to be able to react in a sustainable manner.

Flexibility is one of the essential characteristics of the resilience/risk adaptation project and must be understood in different scales from micro to macro (e.g. from the building to the city) following a set of multiple factors, integrating urban, socio-economic, cultural and environmental aspects.

A resilience/adaptation project cannot be used in any place even if characterized by the same risks, but must be carried out ad hoc, as each site (historic centre, suburbs, regeneration area) has its own peculiarities to take into consideration.

The communication of dangers and risks as well as of projects, plans and policies for adaptation and resilience must be carried out in an appropriate manner for all age groups and abilities.

New technologies must be used to support both the communication of risks and dangers and for the disclosure of all the measures adopted or to be adopted in the event of a crisis of various types, through web portals, apps, social networks, sensors, interactive maps.

Future steps with respect to the proposed methodology concern the design of indices that give a numerical value to these risks in order to achieve a ranking of the safest and/or liveable cities with respect to the identified risks.

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References

- [1] Sepe, M. 2022. *Adaptive Places: Achieving Resilience, by Facing Risks*, WIT Transactions on Ecology and the

- Environment* (Vol. 285). Southampton: Wit Press.
- [2] Paton, D., and Johnston, D. 2001. "Disasters and Communities: Vulnerability, Resilience and Preparedness." *Disaster Prevention and Management: An International Journal* 10 (4): 270-7.
- [3] Parry, G. W. 1996. "The Characterization of Uncertainty in Probabilistic Risk Assessments of Complex Systems." *Reliab. Eng. Syst. Safe* 54: 119-26.
- [4] Komendantova, N., Scolobig, A., Garcia-Aristizabal, A., Monfort, D., and Fleming, K. 2016. "Multi-risk Approach and Urban Resilience." *International Journal of Disaster Resilience in the Built Environment* 7 (2): 114-32.
- [5] Sepe, M. 2021. "Covid-19 Pandemic and Public Spaces: Improving Quality and flexibility for Healthier Places." *Urban Design International* 26: 159-73.
- [6] Carmona, M., Heath, T., Oc, T., and Tiesdell, S. 2010. *Public Places-Urban Spaces*. Oxford: Architectural Press.
- [7] Sepe, M. 2013. *Planning and Place in the City. Mapping Place Identity*. London, New York: Routledge.
- [8] Sepe, M. 2020. "Regenerating Places Sustainably: The Healthy Urban Design." *International Journal of Sustainable Development and Planning* 15 (1): 14-27.
- [9] Sepe, M. 2022. *Designing Healthy and Liveable Cities. Creating Sustainable Urban Regeneration*. London, New York: Routledge.
- [10] Gehl, J. 2010. *Cities for People*. Washington: Island Press.
- [11] Francis, J., Giles-Corti, B., Wood, L., and Knuiman, M. 2012. "Creating Sense of Community: The Role of Public Space." *Journal of Environmental Psychology* 32: 401-9.
- [12] Sepe, M. 2020. "Preservation of Cultural Heritage in Post-seismic Reconstructions: A Method and a Case Study." *BDC* 20 (1): 167-80.
- [13] Bohland, J. R., Davoudi, S., and Lawrence, J. L. 2019. *The Resilience Machine*. New York: Routledge.
- [14] Sepe, M. 2020. "PlaceMaker. Ricostruzione dell'identità urbana nei luoghi colpiti dal sisma." In *Progetto SISMI-DTC Lazio. Conoscenze e innovazioni per la ricostruzione e il miglioramento sismico dei centri storici del Lazio*, edited by Caravaggi, L. Quodlibet: Roma-Macerata. (in Italian)
- [15] Depietri, Y., and McPhearson, T. 2017. "Integrating the Grey, Green, and Blue in Cities: Nature-Based Solutions for Climate Change Adaptation and Risk Reduction." In *Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Theory and Practice of Urban Sustainability Transitions*, edited by Kabisch, N., Korn, H., Stadler, J., and Bonn, A. Cham: Springer.
- [16] Zelinka, A., and Brennan, D. 2001. *Safescape, Creating Safer, More Liveable Communities through Planning and Design*. Chicago: Planner Press.
- [17] De Roo, G., and Porter, G. 2007. *Fuzzy Planning—The Role of Actors in a Fuzzy Governance Environment*. London: Ashgate, Aldershot and Routledge.
- [18] Davoudi, S., Brooks, E., and Mehmood, A. 2013. "Evolutionary Resilience and Strategies for Climate Adaptation." *Planning Practice and Research* 28 (3): 307-22.
- [19] Opdam, P. 2020. "Implementing Human health as a Landscape Service in Collaborative Landscape Approaches." *Landscape and Urban Planning* 199: 103819.
- [20] Zolli, A., and Healey, A. M. 2012. *Resilience. Why Things Bounce Back*. New York: The Free Press.
- [21] Adger, W. 2000. "Social and Ecological Resilience: Are They Related?" *Progress in Human Geography* 24 (3): 347-64.
- [22] Serre, D., Barroca, B., and Laganier, R. 2012. *Collective Work, Resilience and Urban Risk Management*. Abingdon: CRC Press Balkema, Taylor and Francis Group.
- [23] Chanlat, J. F., Davel, E., and Dupuis, J. P. 2013. *Cross-Cultural Management, Culture and Management across the World*. London: Routledge.
- [24] Friedman, A. 1997. "Design for Change: Flexible Planning Strategies for the 1990s and beyond." *Journal of Urban Design* 2: 277-95.
- [25] Bergevoet, T., and Van Tuijl, M. 2016. *The Flexible City: Sustainable Solutions for a Europe in Transition*. Rotterdam: Nai010 Publishers. (in Italian)
- [26] Muñoz, M. 1917. *Monumenti d'Abruzzo*. Roma: Cittaducale.
- [27] AAVV Scopri Cittaducale. 2023. <https://www.cittaducaleturismo.it>. (in Italian)
- [28] Comune di Cittaducale. 2022. "Nuovo Piano Regolatore." <https://www.comune.cittaducale.ri.it>. (in Italian)
- [29] Comune di Cittaducale. 2022. "Piano di Emergenza Comunale di Protezione Civile." <https://www.comune.cittaducale.ri.it>. (in Italian)