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The cover image shows the Irpinia hills at sunset, highlighting the enhancement of two renewable energy sources: sun and wind.
The photo was taken by Giuseppe Mazzeo in August 2022, in S. Andrea di Conza, Avellino, Italy.

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The weapons of the city against pandemic assaults

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Abstract
The cyclical spread of the pandemic requires a modification of the urban and territorial planning tools and a national anti-pandemic urban and territorial plan. The objective of the paper is to present some proposals for the protection from Covid risk, with a flexible reorganization of the times, spaces of the city and the territory. The working methodology consists in the revision of procedures for the protection from seismic risks and their expansion and complexification for the protection from pandemic risk. Some summary results of the study concern suggestions for the search for a symbiosis between the city of concentration, peripheralization and diffusion with the introduction of flexible, temporary and variable uses. But the possibility of reducing socio-spatial inequalities in cities, regions and the Country can be pursued not only in the context of European Recovery Plan funding, but also with a thorough review of the tools for protecting against global risk. The conclusions show that, with the recurrence of "mutant" pandemics, the city abandons the certainty of a continuity, in alternating phases, of development, the stability of uses and times of use of the urban space, favored by the permanence of habits and forms of consolidated life, and it will become a transforming city, a two-faced city.

Keywords
Seismic risk and pandemic risk; Flexible, unstable, insecure cities; Symbiosis between centralized and widespread settlements.

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1. The ongoing disciplinary debate: urban planning to rethink the times of the pandemic

The context of the study is the scenario of the cyclical spread of pandemic events that require a rethinking of the organization of the city and the regional territory in terms of flexibility of use of spaces, change in the times of use of the city, diffusion of equipment and economic activities on the territory, proximity services.
In the absence, in most of the current town planning tools, of elements concerning the prevention from seismic risk, it is useful to recall the disciplinary bases set in the last thirty years on the relationship between territorial systems and seismic vulnerability (Caldaretti et al., 1987), between future city and seismic protection (Fera, 1991), between vulnerability and urban space (Fabietti, 1999).
In the last two decades, some studies have been carried out on social resilience to national disasters (Pelling, 2003) and on vulnerability and adaptability to risks (Adger et al., 2004).
In a more recent disciplinary context, new investments and disciplinary attention to risk prevention and mitigation are required (Paleari, 2018).
In recent years, studies have been launched to address interactions between Covid-19 and environmental contexts (Paez et al., 2020) and to evaluate planning and geographical aspects related to the pandemic in Italy (Murgante et al., 2020) and to situations of aggravation of the spread of the virus caused by the presence of settlement densities (Hamidi et al., 2020). Different approaches to the health of the post-Covid city (Florida et al., 2021) have been used, even proposing methodologies to deepen the risk scenarios in Italy (Murgante et al., 2022) and to define actions and plan strategies (Capolongo et al., 2018). It also comes to the application of simulation tools to outline possible post-Covid scenarios in cities (Batty, 2022; Batty, 2021; Batty, 2020).
Of particular interest on the subject is what is presented in the special issue *Covid-19 vs City-20* of TeMA Journal, where an extensive editorial (Gargiulo, 2020) illustrates the contents of the volume, in which the effects of the pandemic Covid-19 in rural areas are described (De Luca et al., 2020). Flexible forms of planning are also investigated, adaptable to the spaces to be governed in the post Covid (Pontrandolfi, 2020).
Finally, health risk monitoring (Tiboni et al., 2020) and sustainable urban development solutions are proposed as a response to a dramatically urgent need (Tira, 2020a).
Ultimately, it is acknowledged that the spread of the pandemic is favored by high urban density, poverty and marginalization (Borjas, 2020; Balducci, 2020a). Hence the need to rethink dwelling in overall terms (Tarpino & Marson, 2020) and to combat social inequalities.
In the ongoing debate on the future dynamics of settlement choices, various instances invite us to seriously consider the negative impacts generated by the pandemic on the urban form and its relations with the territory (Sbetti, 2019) and to strongly re-propose the productive model of urban and rural space (Tarpino & Marson, 2020).
Consequently, while some opinions consider a flight from cities to the nuclei of inland areas to be foreseeable (Fuksas, 2020), other interpretations evaluate possible more moderate settlement reallocation solutions (Boeri, 2020; Spada, 2020). Furthermore, the city's ability to overcome disasters is acknowledged by resorting to forms of social solidarity (Indovina, 2020).
Therefore, on the one hand, the transformation of the villages spread over the territory into places of welcome for the population that temporarily moves away from urban centers and for the emigrants must be encouraged and, on the other hand, it must be avoided that they become *élite* environments (Barca, 2020).
Territorial planning must therefore seek new hierarchical relationships between polarizing areas, peripheral areas and internal areas, rejecting bad policies capable of accentuating, rather than reducing, inequalities (Barca, 2020).
In other words, it is essential to restore, in a fair way, social relations between densely populated and sparsely inhabited areas, between public and private areas (Pasqui, 2019), obtaining the important result of favoring

the supply of services to local communities (Clemente, 2020) and encouraging interpersonal relationships in the neighborhoods (Balducci, 2020a).

2. The objectives of the paper in line with the objectives of the European Union

The European Union has established some guiding objectives, which can be summarized in supporting an ecological transition, planned in time and space, which involves the enhancement and protection of the environment, the diffusion of green cities and the development of the green economy.
It is also recommended to mitigate the imbalances between centralized settlements and widespread settlements, decrease environmental risk, reform public administration with extensive reduction of bureaucracy and disseminate health services throughout the regional territory.
The paper pursues these objectives with specific reference to some unsolved issues of Urban Planning and Territorial Planning for the protection of pandemic risk.
Strategic lines are identified for a model of life different from the past, with an integration between centralized settlement systems and widespread systems related by efficient infrastructural networks.
An operational objective is the updating of some contents of the urban and territorial planning tools, made able to respond to the changing needs of securing from global risks.
The objectives pursued and the related programmatic proposals are obviously realistic only if supported by the Next Generation EU plan for relevant projects of international interest.

3. The methodology: from seismic to pandemic risks

The applied methodology starts from the consideration of the seismic risk structure (Fig.1) and introduces a conceptual extension related to the pandemic risk structure.

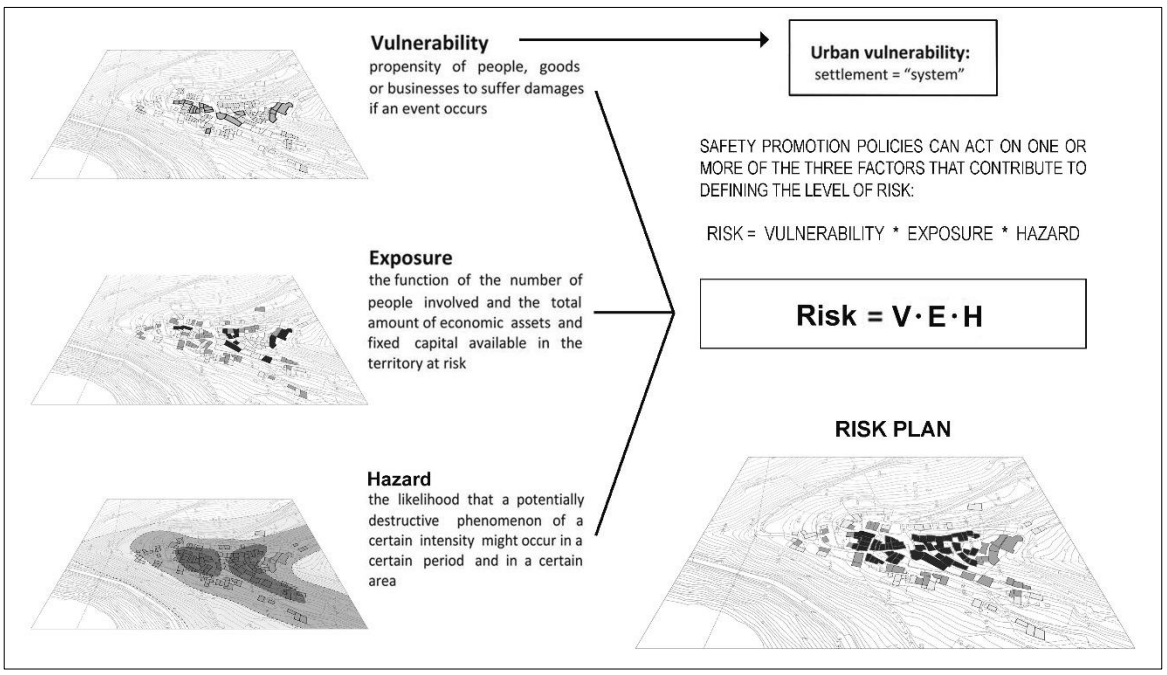

Fig.1 Structure of seismic risk (Tira, 2017). The risk measurement can be obtained as a sum of the contribution of the components of Vulnerability, Exposure, Hazard

Following the methodological path introduced here, the components of the seismic risk structure shown in the diagram of Fig. 1 can find a correspondence in the pandemic risk structure proposed in this work, where:

- vulnerability concerns the propensity (potentiality, territorial diffusion and level of the health structure at the service of the population, accessibility and social and economic organization) of the population of certain territorial and urban contexts to suffer greater or lesser damage in the event of a pandemic;
- the Exposition identifies the areas with greater or lesser densification of the population and of its productive activities and the strategic value of centralized or isolated settlements;
- The Danger is the probability of viruses to affect in certain periods and in certain different environmental and social contexts (for statistical, economic, technological reasons) such as the cities, the suburbs, the countryside.

The methodology introduced is developed by examining, first of all, some positive and negative results, found by authors in the prevention, emergency, and post-earthquake phases, that highlight the opportunity to plan the post-earthquake phase in advance, considering it a priority over the emergency phase (Bedini & Marinelli, 2021). This approach then introduces new and peculiar programmatic suggestions for preventive defense against pandemic risks (Bedini & Bronzini, 2019; Bedini & Bronzini, 2018).

If an earthquake breaks the fragile existing equilibrium of the territory and makes it necessary to rethink the model of life in centralized and widespread settlements, a pandemic instead overwhelms the pre-existing models and requires a radical transformation of the ways of life and work.

In any case, it must be considered that the awareness and acceptability of the impending dangers must be addressed from the perspective of the new hierarchy of risks: health, environmental, socio-economic.

The methodology of this study therefore firstly implements the shared disciplinary assumptions on the subject of seismic risks, suggesting then some contents to also plan a possible "coexistence" with pandemic risks and support social and economic recovery.

In this logic, an emergency plan, even a pandemic one, should not be launched in the absence of a preventive plan, life-saving defense tools and a contextual planning-management of the rebirth. In other words, each phase (preventive, emergency and post-crisis) must be planned in advance, consistently with the previous and subsequent phases. In any case, the management protocols should require the simultaneous implementation of emergency health plans and socio-economic regeneration plans.

To expand the concept of protection from seismic risk to pandemic risk, a method of comparing seismic risk with pandemic risk is prepared in relation to some strategic aspects (Plans for minimum urban structures, flexibility of urban spaces and times; mitigation of territorial imbalances, integration between city and country), able to highlight how the shared design elements of seismic protection can be integrated with pandemic protection elements. The specification of the related project suggestions, highlighted in the results achieved, is a further element of originality of the research.

4. Some early results

A first innovative result of this work can be summarized in the proposal to integrate the contents of the Minimum Urban Structure (SUM) (Bedini & Bronzini, 2021; Bedini et al., 2019), planned for protection from seismic risk, and to define a Minimum Urban Pandemic Structure (SUMP), at urban level and at territorial level, which prepares the minimum elements for protection from global risk.

In particular, in the SUMP proposed here at the urban level shall be identified: elements characterizing the areas of flexible zoning in normal conditions or in a state of pandemic emergency; structures to be used for widespread healthcare activities, including with the reactivation of deactivated hospitals, first aid and local clinics, school complexes with variable uses; squares and pedestrian paths with limited flows, with delimitation only of the usable areas in case of restrictions; widespread hotels to accommodate quarantined population; neighborhood health centers for the supply of tampons and vaccines; outdoor public areas for temporary use for catering, trade, etc.; urban containers of considerable size, to accommodate the population in conditions of protection and confidentiality.

In the SUMP at territorial level, proposed here, shall be identified and localized: equipped centers will be located to serve large areas, always easily accessible, in all weather conditions, to emergency vehicles; centers equipped with autonomous electric generators, telematic services, areas for the provision of health services, with places of isolation, etc.; platforms for air ambulances; disused school buildings and sports venues, deconsecrated churches, urban containers that can be used for mass vaccination; adequate rural buildings suitable for quarantine sites; private buildings that can be used as occasional residences; Covid free "islands" to safely accommodate teams of doctors and nurses.

In order to specify the advanced design suggestions for protection against pandemic risks, the shared positive results achieved for the mitigation of seismic risks are reviewed, as already anticipated in the methodology. Their usefulness and applicability is also verified in situations of viral spread.

a. Among the interventions for the mitigation of Vulnerability should be considered: a progressive adaptation of the times and the functional rhythms of the city (Zaoli, 2020; Bonfiglioli, 2013; Colarossi & Latini, 2008) to the changing needs for isolation of the population as a function of monitoring the evolution of the virus; the repositioning of public transport stops, the variation in their frequency and the change in the timetables of shops and public offices (Tira, 2020b), which allow a greater distancing of users in public transport in the event of an increase in the speed of contagion (Tira, 2020b); the planning of post-covid public mobility in big cities (Ravagnan, Cerasoli & Amato, 2022); the reconsideration of the relationships between mobility, urban space and health, paying particular attention to walking as a reference for sustainable mobility (Cirianni, Comi & Luongo, 2022); the organization of the city into human-sized neighborhoods (Balducci, 2020b), which also favors home health and social assistance and food supplies to the elderly and vulnerable people, their monitoring and their transport to medical facilities in the emergency situations, in case of contagion; the enhancement of slow mobility and the planning of flexible use (Monti, 2020) of urban areas, depending on the evolution of the emergency situation. In the event of pandemic, schools to be allocated to places of temporary isolation, or sports spaces to be used for the positioning of first aid, medical tents, vaccination hubs, etc., district plans with urban facilities that can be reached in 15 minutes (Abdelfattah et al., 2022; De Luca, 2020; Tira, 2020b), with particular attention, in the event of pandemic, to health and emergency services; identification of areas for epidemic prevention (Epidemic Prevention Area, EPA) (Wei, 2020); definitive overcoming of deterministic urban plans with the introduction of a flexible zoning, with variable uses, in situations of normality or in emergency conditions, at urban (Zaoli, 2020), municipal and vast area level, of particular interest in case of need to limit crowding to reduce infections; simplification of all urban planning bureaucratic procedures, of the modalities and times for drawing up plans (Tira, 2020b), in order to adapt to the speed of spread of pandemic events according to the monitoring of situations at risk; simplification of the approval process of urban planning and building practices to respond quickly to changing settlement needs, even temporary ones, with the drastic reduction of bureaucracy and the long waiting times of the public administration, with increased guarantees of efficiency, flexibility and equity.

   The choices to combat seismic damage clearly respond also to the needs of defense from viral spread, with the delimitation of "red zones", both within urban centers and vast areas, with different levels of protection and isolation / integration.

b. The protection against risks, both seismic and pandemic, related to the Exposure, due to residential and productive densification, involves a contrast to territorial imbalances. To this end, a timetable for an ecological and digital transition can be formalized, setting out the modalities, timing and funding for a substantial change in living, working and leisure conditions. A transition that connects centralized urban areas and widespread villages, with the implementation of broadband networks, energy control, the reorganization of the waste system and separate collection, the spread of slow mobility for the re-appropriation of historical and environmental values.

In situations of spread of contagion it is essential to define of a masterplan of vast area with identification of rural or urban-rural buildings for the quarantine of entire families, hotels with rooms for the isolation of individual members of family groups, small historical centers to be allocated to Covid free "islands", of maximum protection, equipped centers with high accessibility, places of irradiation and branching of the diffused services; local health and outpatient emergency services for home medical care, widespread school services.

Ultimately, modalities, times, financings, incentives must be codified for mitigating the imbalances between centralized settlements, peripheral areas and widespread settlements of the inland areas (Balducci, 2020a) at high environmental risk (Ventura & Tiboni, 2016) in order to transform the diffused settlements in attractive places in the periods of social distancing (Compagnucci, 2020) and of temporary migration from urban centers.

In pandemic emergency situations, thousands of rural buildings and small historic centers will be able to house the population, temporarily forced to move from centralized cities.

In this way it will be possible to create new forms of symbiosis between fragile areas and urban centers which will remain the engines of economic change.

c. In the context of seismic risk to counteract the Hazard is shared the need to give new new impetus to green production activities in internal areas (Bedini & Bronzini, 2021), such as the "Production Landscape" (Bedini & Marinelli, 2017; Abbasi, 2017), with a program of strategic incentives, the approach of Urban Agriculture (Torquati et al., 2015) and the agricultural park plans (Giacchè, 2014).

   Such a focus on the countryside as a place of life and work, to mitigate the potentiality and likelihood of the virus spreading, reinforces the urgency of implementing a new pact between city and countryside to relaunch the development and integration of resources, on the one hand widespread and underused, on the other centralized and consolidated (Bronzini & Bedini, 2015; Bedini & Bronzini, 2016). It is also a question of encouraging the dissemination of practices already tested for consultancy activities to local companies present in the places of diffusion, such as the "Itinerant University Chair of AgriCulture" (Giacchè, in press), services to credit assistance companies, home health professional activities for humans and animals. In this context there is support for quality production in the inland areas, for the provision of collective services to local businesses, for the promotion of highly qualified "itinerant" commercial services and activities.

   The same development of a "door to door" service system becomes indispensable in periods of lockdown. Of particular relevance are the home care by doctors and nurses in internal areas, the provision of basic necessities and assistance for carrying out medical and administrative procedures.

   With the repetition of pandemic cycles it is not possible to transcend the city-countryside pact and the strategy of the productive landscape considered here, since the dominant centralized social and productive model has shown all its limits and problems in situations of health risk.

5. Conclusions

Earthquakes and pandemics have profoundly changed the perception of security. Preventive risk protection must therefore be declined against both seismic instability and viruses that can affect body and mental health. In conclusion, this work comes to the following three innovative proposals:

a. The methodology for defining the seismic risk structure is implemented, expanding it with the elements of the pandemic risk structure related to Vulnerability, Exposure, Hazard.
b. New contents and design suggestions are specified, to be introduced for the protection and containment of the risk of pandemic spread, starting from some shared strategies related to the flexibility of the destinations of use, spaces and times of the city, to the enhancement of the human dimension of neighborhood, to the mitigation of territorial imbalances between centralized areas and scattered

settlements and between city and countryside, pursuing their symbiosis, indispensable in emergency situations.

c. A new type of operational plan "The minimum pandemic structure, SUMP" is introduced, at urban and territorial level, which integrates the SUM to pursue a protection from global risk. Reception systems are suggested in the thousands of villages scattered throughout the territory, for citizens fleeing from centralized areas in the event of a pandemic. Places where the cyclical need to avoid concentrations, both of people and of densely built spaces, can be conjugated with the precious environmental function performed by the areas of settlement spread.

In all cases of risk, unresolved endemic problems emerge: the rupture of the pre-existing space-time dimension, the anachronism between deterministic vision and dynamic conception of the rapidly evolving city, the planning of the future in conditions of uncertainty, the programming of flexible uses of spaces in urban plans as an alternative to static destinations of use.

Finally, it emerges that it is impossible to develop and apply risk protection instruments without overcoming territorial fragility and spatial-temporal inequalities, without revaluating the role of scattered settlements, in line with the driving function of the urban centres, placed in safe conditions.

This study started from the proposals of strategic lines for protection against seismic risk, suggested by the research itself and many other studies; it has developed with peculiar methodological and operational suggestions for the defence from pandemic risk, specifically presented in this paper; its future developments, already underway, concern theoretical and practical insights for the settlement protection from the danger of war, with the ultimate aim of defining an operational method of mitigation of global risk.

From the conclusive results it can be said that the pandemic will certainly leave an indelible mark on living conditions and will lead to the search for new tools to counter social, health and spatial inequalities and foster an indispensable symbiosis between settlements "protected", at high and low density, towards an uncertain, unstable, insecure future.

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