

Original Research Article

Unveiling the Concept of Spatial Resilience in Urban Design: A Systematic Qualitative Review*

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Abstract

Problem statement: In response to a wide range of challenges and problems arising from social and economic change, spatial resilience as a late theory of urban resilience is being developed and conceptualized in both theoretical and practical areas. However, the conceptual implications of spatial resilience, especially in the field of urban design, have not been clearly explained yet and its implications in other fields have been used sparsely in the field of urban design.

Research objective: Spatial resilience in many respects represents a new-multidimensional discourse approach to place-based urban resilience, where the urban system produces and reproduces adaptability and variability vis-a-vis change. This paper seeks to develop a general framework to create a resilient place based on the relationship between spatial resilience and urban design. Moreover, it aims to determine the conceptual framework for the urban spatiality of resilience.

Research method: This study examines the spatial resilience literature based on the conceptual framework of the RPA. This study performed a systematic review of spatial resilience literature in four stages by searching the term “spatial resilience” in the Scopus database from 1973 to May 2020. Finally, 14 articles were selected for content analysis.

Conclusion: Spatial resilience implies the place-based and local aspects of the urban system and its integration with higher scales. Intra- and inter-scale interactions and trade-offs transformability and adaptability, innovation and creativity, co-evolution, and place identity are the five influential features of spatial resilience. Beyond traditional resilience with an engineering approach, spatial resilience emphasizes the integration of resilience policies with other policies and programs that affect the nature of places and how they operate.

Keywords: *Spatial resilience; Resilient place; Co-evolution; Urban design, RPA.*

Introduction

Signified by the increasing occurrence of extreme

climate events (Lu, Zhai & Zhou, 2020), natural disasters and environmental changes (Sharifi,

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2019a), uncertain socio-political status (Quigley, Blair & Davison, 2018), and recently the COVID-19 outbreak (Lak, Hasankhan & Garakani, 2020), the urban system is facing the challenge of frequent pulses of stress and risk. Increased uncertainty and numerous changes compel cities to find new development and planning methods to tolerate threats. As a major constituent element of cities (Lu et al., 2020; Mehmood, 2016), the place has a significant role in the urban design and can have an impact on the capability of urban systems to survive and develop on a local scale (Godschalk, 2003; Lu et al., 2020).

Urban resilience in the past decade, with the recognition of a process of change, has undergone a substantive change from a change of physical-structural view to ecological-social and perceptual-environmental. Urban resilience has been defined in the recent literature as the capacity of systems and communities to survive, adapt and grow in the face of increasing pressures and shocks they may face (Meerow, Newell & Stults, 2016; Vaništa Lazarević, Kekovic & Antonic, 2018). In addition to analyzing risk conditions and periods of recovery and reorganization, resilience involves analyzing the underlying characteristics of society, and therefore resilience is thought to be beyond vulnerability. This issue emphasizes on the one hand the permanent and unpredictable changes of the urban system and on the other hand the multiple stages of stability in urban systems and has led the traditional view of risk assessment engineering to a more comprehensive and adaptable approach. In this regard, in the subject literature, urban resilience has been conceptualized in a multi-equilibrium and non-equilibrium situation. Resilience is the capacity of the urban system to maintain key functions, but it does not necessarily mean returning to the status quo ante. The multi-equilibrium approach of resilience, which is rooted in ecological resilience, considers returning to previous conditions and resilience as one of the resilience options, and adaptability and acceptance of change in the urban ecosystem are other options

that are presented and selected according to the context (Desouza & Flanery, 2013). In this view, by accepting adaptability in the system, the concept of creating resilience in terms of adaptation and change is opposed to the traditional concept of resilience and stability against change (Ahern, 2011) and emphasizes the ability and participation of the local community for adaptive adaptation outputs. Hence, resilience is defined not only for mitigation of threats (ie through vulnerability reduction) but also for adaptability to the impact of threats (Cobbinah & Poku-Boansi, 2018).

From an interpretive and non-equilibrium perspective, resilience emphasizes the interdependence of man and the environment, and there is no steady-state in the face of constant change (Pickett et al., 2004). In this context, the newly emerging resilient urban design approach has been defined to enhance the ability of a place to adapt to leading changes (Lak et al., 2020). Although theories about the concept of resilience date back to the early 1970s, their application in urban planning and design is a newer phenomenon, and although theoretical frameworks for resilience have been proposed with a spatial concept, the term is still ambiguous in urban design (Davoudi et al., 2012).

Spatial resilience has appeared in the literature of the past two decades as the latest generation of the resilience concept in the wake of the third wave of resilience discourse (evolutionary resilience, non-equilibrium resilience, and socio-ecological resilience), and scientific publications about this subject have had a rising trend, especially in the past five years (Coaffee, 2013; Cumming, Morrison & Hughes, 2017; Li, Shi, Qureshi, Bruns & Zhu, 2014). Spatial resilience has been explored in various fields, namely environmental sciences (35.3%), biological and agricultural sciences (19.5%), social sciences (18.8%), and other fields (collectively 26.4%). This concept has been researched in 13 scientific areas in total (Fig. 1), which are mainly related to ecology and natural disasters (Dzubakova et al., 2018; Lucash et al., 2019; Mellin et al., 2019; Morschek, König & Schneider, 2019).

In the recent literature on spatial resilience,

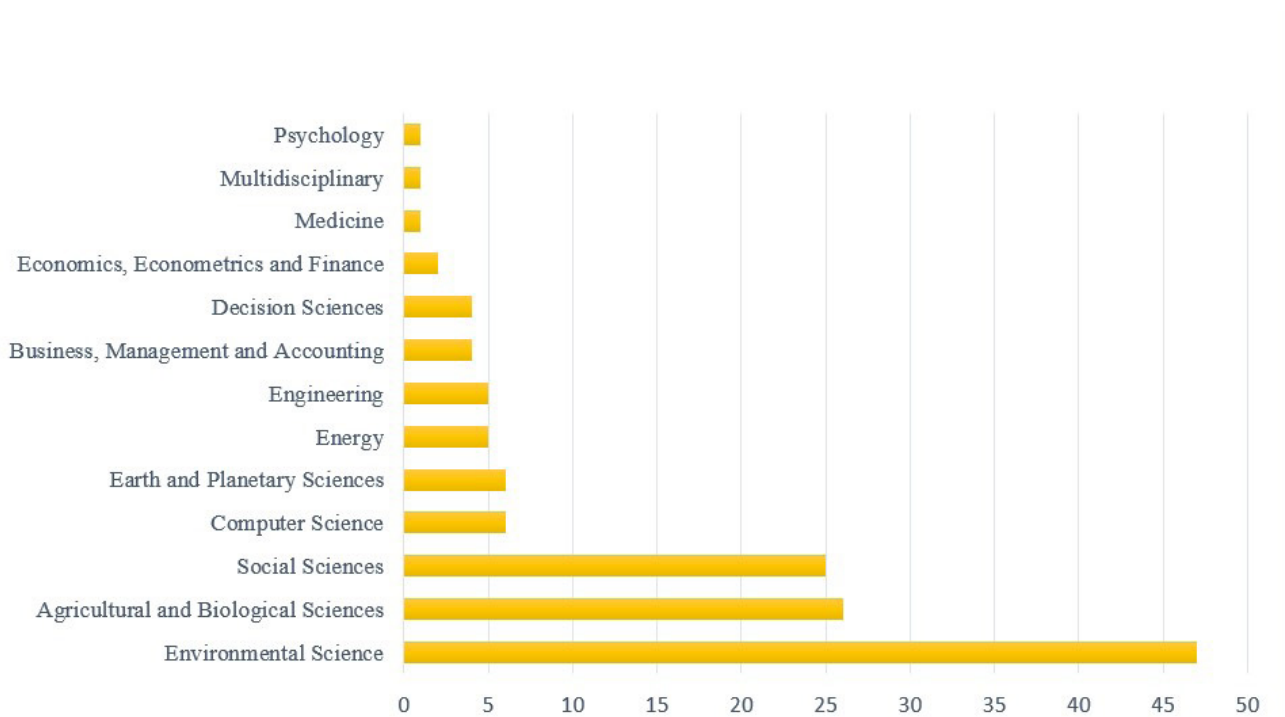


Fig.1. Spatial resilience documents by their types, including 72% papers, 9% conference papers, 7% reviews, 9% book chapters, and 3% Notes. (Scopus database from 1973 to April 2020). Source: Authors.

although the emphasis has been on innovative spatial dynamics, there is still no precise and complete definition of spatial resilience (Brunetta & Caldarice, 2019). In the literature, the focus has been on the relationship between subject and object in resilience, and the place is understood as the focal point where there are interactions between different spatial scales. Analytical study of place-building components is an important basis for understanding neighborhoods’ adaptive capacity. Non-physical characteristics of resilience are clearly related to non-physical characteristics of the place such as interaction and active presence of residents and motivation for collective action in managing and maintaining the quality of the built environment. To better understand spatial resilience and its role in urban design scale and reduce ambiguities and contradictions in its definition, this article tries to review the constructive features of spatial resilience through a four-step search in the literature and explain the definitions of spatial resilience. This study draws upon the conceptual framework of place (RPA) in the article (Shafiei-dastjerdi et al., 2021),

and the research method, discussion, and conclusion of this article have been in line with the framework.

Significance of the study

Cities have always been in constant and frequent change and have been a workshop for the production of knowledge, creativity, and innovation (Mengi & Guaralda, 2020). Many places today seek to maintain and develop competitive advantages, despite the ever-increasing environmental complexity. The concept of placemaking has evolved from a theoretical principle and a phenomenological concept to a management and marketing tool used to activate and enhance space (Guaralda, Mayere, Caldwell, Donovan & Rittenbruch, 2019). Defining placemaking is very challenging due to the complexity of the factors that affect the experience of a place as well as the growing influence of global and transnational competition. Places face a wide range of uncertainties that have led to identity crises in cities (Mengi & Guaralda, 2020). This means the need for new and hybrid methods in the face of continuous urban change. Traditional methods or

mechanisms usually lack the ability to cope with the increasing complexity of the external environment. As a result, complementary and adaptive methods and mechanisms must be provided to deal with these changes at different scales of the city, especially at the local scale (Omholt, 2013; Mengi & Guaralda, 2020). In this context, the theory of ecological and social systems considers place as a part of a communication system that simultaneously emphasizes the connection and integration of internal elements through adaptability due to its connection with the external environment.

Spatial resilience as a subset of the theory of ecological and social systems in many respects represents a new and multidimensional discourse approach to urban resilience with a focus on location. Where the urban system in the face of continuous or momentary change through the reinforcement of all tangible (physical and structural) and intangible (cognitive-perceptual and behavioral) dimensions, produces and reproduces the characteristics of adaptability and variability. These features reduce uncertainty when used in various analyzes of a place and help strengthen the identity of the place or the brand of the place. The spatial resilience framework is intended to reinforce the hard and soft factors of place (form and structure, perceptual and cognitive, behavioral) in relation to external changes.

Method and search strategy

In this study, a systematic review was performed in four stages (Fig. 2) to analyze the spatial resilience literature to explore, integrate, and report the results in a repeatable manner (Liberati et al., 2009; Okoli, 2015).

Extensive search stage: A total of 77 papers were found via searching the term “spatial resilience” in the Scopus database from 1973 (when Holling’s paper about resilience in ecology was published) to April 2020 with the language set as English.

Screening stage: Irrelevant fields such as agricultural landscapes, biotic and abiotic disturbances, marine ecosystems, soil and plant processes, and coral

reefs were removed, and the number of papers was reduced down to 12.

Selection stage: After the collection was prepared, two forward and backward searches were performed. In these two searches, the selected papers’ cited-by and citations were analyzed using Scopus based on the same screening criteria. Subsequently, three documents were added to the previous collection after the removal of irrelevant papers.

Concept extraction stage: The total number of papers selected through the above three stages was 15. At this stage, the concepts related to spatial resilience and deemed relevant by the authors were extracted via content analysis. In addition to the explicitly defined aspects, implicit aspects were also derived for the preparation of an exhaustive list of the concepts and definitions.

Findings

The concept of spatial resilience was introduced several decades after Folke and Nystrom presented the concept of resilience in their research entitled “Spatial resilience and coral reefs” (Cumming, 2011). “Spatial resilience is the dynamic capacity to cope with disturbance and avoid thresholds at spatial scales larger than individual ecosystems” (Nystrom, Folke, 2001, 407). Early research on the “spatiality of resilience” focused on coral reefs, emphasizing the ever-changing variations of human origin throughout the seascape. Spatial resilience is simply defined as ecological resilience at larger spatial scales (ie, beyond local habitats) or, more precisely, the ways through which larger-scale resilience affects local resilience and vice versa (Allen et al., 2016).

The findings of this study indicate the existence of a wide range of interpretations of spatial resilience in various fields (Shafiei-dastjerdi, Lak, Ghaffari, & Sharifi, 2021). In most articles, the spatial understanding of resilience focuses on the spatial aspects. Urban resilience is discussed in all social, ecological, economic, political, and infrastructural dimensions on a city scale and falls into the

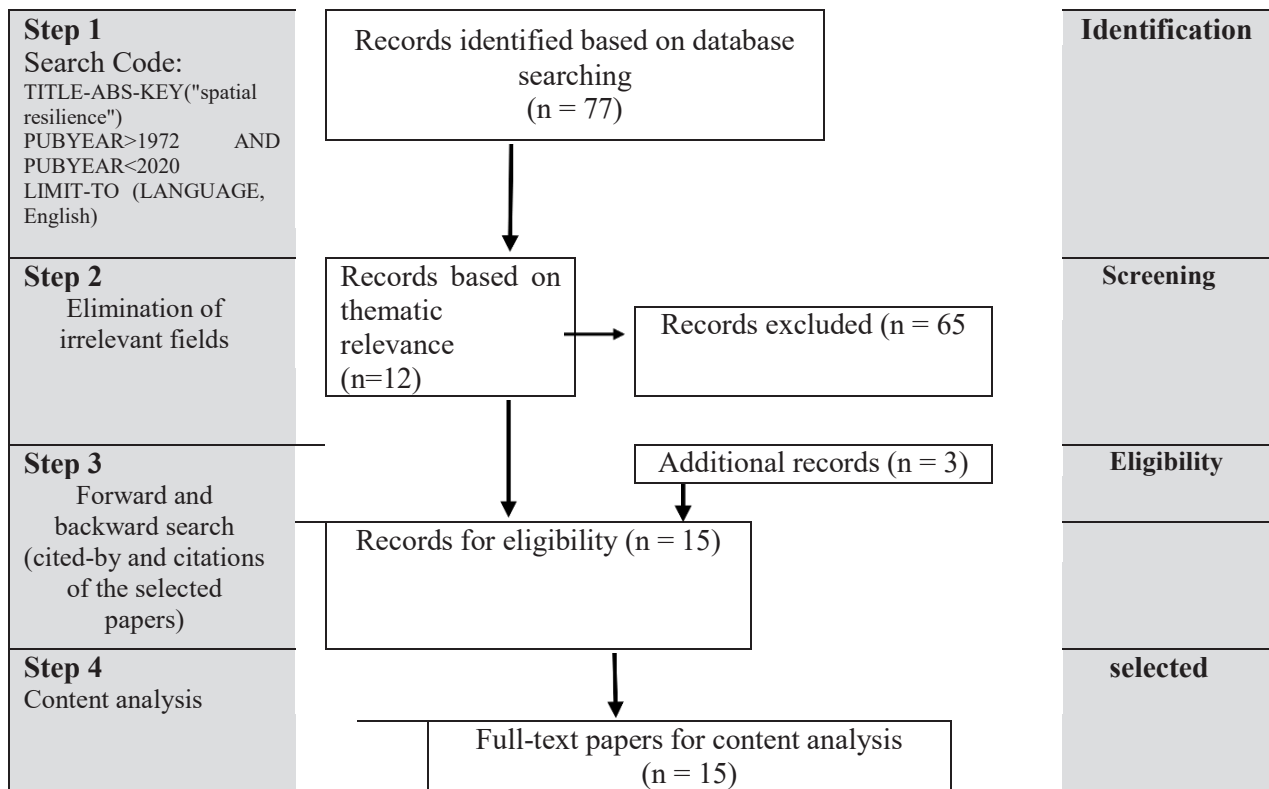


Fig. 2. The PRISMA (Page & Moher, 2017) diagram of our spatial resilience study. Source: Authors.

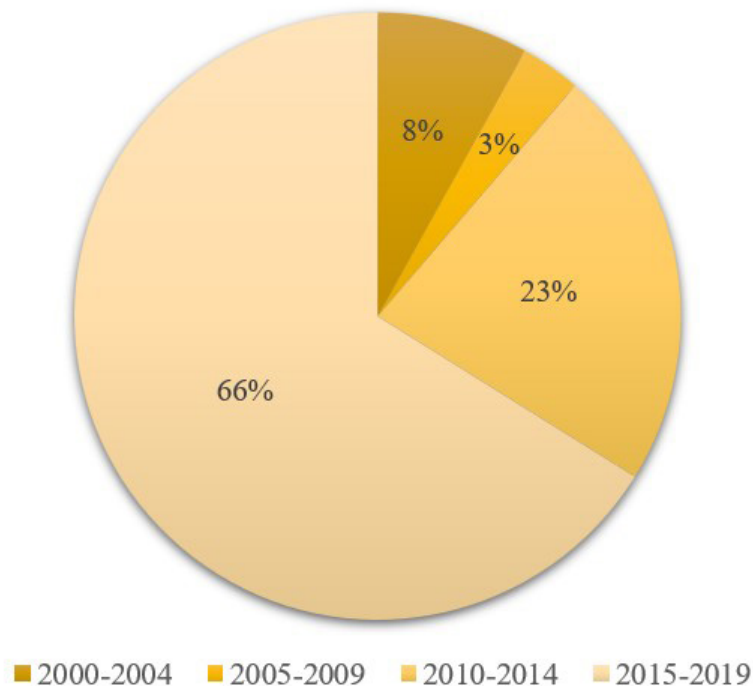


Fig. 3. Percentage of spatial resilience studies from 2000 to 2020 in five-year periods. (Scopus database from 1973 to April 2020). Source: Authors.

category of large-scale planning. In the essence of spatial resilience, places and contexts, along with different types of relationships, are associated with

transcendental scales, hence focusing on the local scale. Morphological parameters related to the elements of the urban form and its semantic-cognitive

dimensions are examined on the mesoscale. Spatial resilience, focusing on the local scale, examines and analyzes the effects of other scales on urban form resilience. Definitions and characteristics of spatial resilience were extracted by analyzing the content of selected articles (14 articles) related to the field of urban design in the fourth stage of the research, in Table 1. In this section, the main structure of the author in relation to the spatiality of resilience is extracted. In the column of funds and aspects of spatial resilience, in addition to the main funds and features mentioned in the article, the keywords used are also listed below the funds.

Lu and his associates introduce spatial resilience as an interpretation of the resilience of urban spaces. This study tries to provide a theoretical framework of resilience by explaining the relationship between resilience and urban spaces to reduce urban risks (Lu et al., 2020). Brunetta and Caldarice conceptualize spatial resilience by examining infrastructure performance and interdependence between sectors in various physical, economic, institutional, social, and political dimensions (Brunetta & Caldarice, 2019). Allen et al. Have introduced spatial resilience as one of the important components of resilience theory to realize resilience and quantify its concepts, and to evaluate it, the contribution of spatial features that cause resilience in ecosystems and other complex systems has been considered (Allen et al., 2016).

Cumming et al. have conceptualized spatial resilience as a process that works in several spatial situations and scales. In this paper, spatial and scale effects, connectivity, spatial heterogeneity, and context are introduced to understand the resilience of complex, key and important systems (Cumming et al., 2017). Nel and his associates have introduced connectivity as one of the resilience indicators related to urban morphology and have tried to link urban morphology with resilience through the concept of connection, thus leading to the field of spatial resilience (Nel, Bruyns & Higgins, 2019). Barnes and Nell have address the issue of spatial resilience in the South African Land Use

Management and Spatial Planning Act. According to this law, the principle of spatial resilience refers to flexibility in spatial plans, policies, and land use management systems, and is designed to ensure sustainable livelihoods in communities (Barnes & Nel, 2017). Brunetta and Salat describe spatial resilience as the adaptation and evolution of an integrated system and consider composite indicators of spatial development necessary for spatial resilience, linking environmental components with cultural, social, and economic values (Brunetta & Salata, 2019). Contreras blames the lack of coordination and interaction with existing cooperation networks in the community and the lack of spatial planning in new settlements around Aquila (Italy) after the 2009 earthquake as the reason for the delay in the reconstruction of the city center (Contreras, Blaschke & Hodgson, 2017). Cumming has conceptualized spatial resilience in terms of resistance and adaptability to spatial changes inside and outside the system (Cumming, 2011a). Flaxman and Vargasmanno introduce spatial adaptation in the context of the “alternative future” scenario and consider it based on social and technological infrastructure (Flaxman & Vargas-Moreno, 2012). Kärholm, Nylund and Fuente, (2014) introduce the concept of spatial resilience in retail industry planning in Malm, Sweden, and use it as a concept to confirm the interdependence of different retail areas.

Discussion

Resilience is considered an essential feature for urban development today and place as a major component of urban textures (Lu et al., 2020; Mehmood, 2016) plays an important role in urban design and can affect the ability of urban systems to survive (Godschalk, 2003; Lu et al., 2020). In the literature of spatial resilience, concepts such as multidimensional network (different urban scales) and interactions and exchanges between them, adaptability of place to permanent stability and immutability, innovation and creativity of local

Table 1. Content analysis of the selected papers. Source: Authors.

| Study | Study focus | Aspects of spatial resilience |
|----------------------------------|---|--|
| Cumming & Epstein, 2020 | Landscape sustainability | Co-evolutionary dynamics; interactions between landscape structure and institutions; spatial feedbacks. |
| Lu, et al., 2020 | Urban spatial resilience | Urban space scale;urban spatial structure; spatial density; land use; urban spatial form;urban spatial network |
| Brunetta&Caldarice, 2019 | Sustainable Development Goals | Co-evolutionary; Interdependence between sections; different spatial dimensions |
| Brunetta&salat, 2019 | Measuring the vulnerability | Co-evolutionary dynamics; adaptation; transformation; self-organization. |
| Nel et al., 2019 | Urban morphology | Connection, redundancy, and efficiency of the urban form |
| Contreras et al., 2017 | Involvement of the collaboration networks | Interactions between groups and institutions; involvement of the collaboration networks; livable settlements; co-evolutionary dynamics. |
| Barnes, 2017 | interpretation of the spatial resilience | Place identity; multi-scales; adaptive capacity; quality of life. |
| Cumming et al., 2017 | Social-ecological systems | Place identity; multi-scales; heterogeneity; networks; co-evolutionary dynamics. |
| Peres, Plessis & Landman, 2016 | Resilience and sustainability | The practice of urban planning; spatial properties. |
| Allen et al., 2016 | Approaches to quantifying spatial resilience | Ecological memory; place identity; multi-scales; connectivity; spatial attributes; interactions between ecosystems and institutions; co-evolutionary dynamics. |
| Greiving, Ubaura & Teslair, 2016 | Spatial resilience delivery | Multi-scales; interactions and communication between ecosystems and institutions; spatially feedbacks. |
| Kärholm et al., 2014 | the interdependence of urban retail areas | Interdependence elements; multi-scales; adaptations; place identity. |
| Flaxman & Vargas-Moreno, 2012 | Urban change and policy uncertainty | Participation; multi-scales. |
| Cumming, 2011a | Aspects of spatial resilience | Multiple spatial and temporal scales; spatial feedbacks; place identity; connectivity; adaptation; learning; memory; thresholds. |
| Cumming, 2011b | landscape ecology, resilience, and sustainability | Place identity; connectivity; context; multiple scales; spatial attributes; interactions; adaptive capacity; memory. |

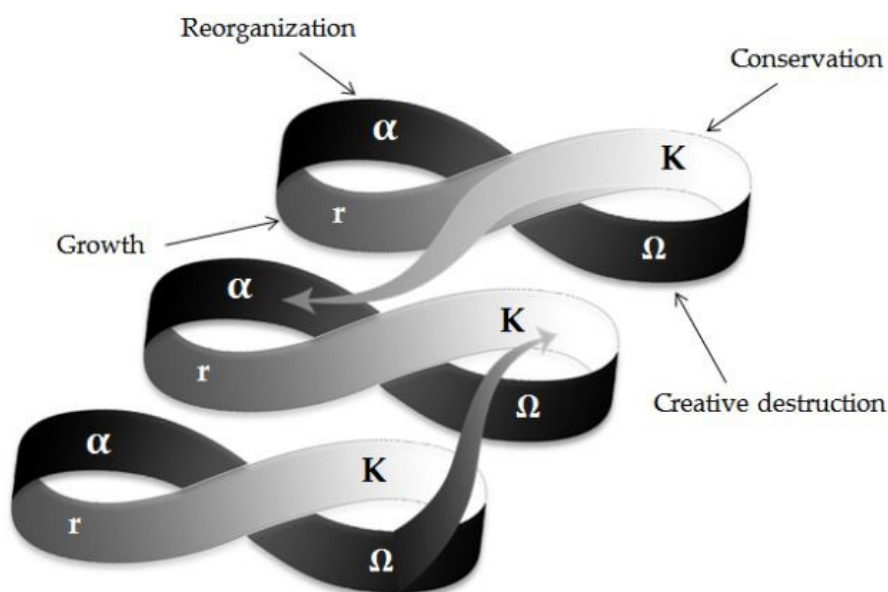


Fig. 4. Panarchy adaptive cycle (adapted from Gunderson and Holling, 2002). Source: Authors.

communities, synchronicity and integration between city form, content (meaning and values) and performance (efficiency), are evident to enhance the resilience of the place and create the livability and vitality of the place under changing economic, social and environmental conditions (Sharifi & Yamagata, 2018) (Fig. 5).

• **Cross-scaling and trade-offs between them**

The panarchy model combines different adaptive cycles in a nested hierarchy to show the changing and multiple states of the system (Fig. 4). These adaptive cycles show that changes are controlled by interactions between slow and fast variables (Dhar & Khirfan, 2017). These cycles involve four basic stages of ecosystems: reorganization (revitalization), exploitation (birth), conservation (growth), and release (creative destruction) (Gunderson & Holling, 2002). Socio-economic and ecological systems are mainly related to a set of interdependencies and feedback (Cumming, Morrison & Hughes, 2017).

The urban form consists of several dependent and nested scales. The urban form can be described as the spatial pattern of human activities, the physical configuration of a city, and the relationships between urban elements on three different but interconnected scales (macro, meso, and micro) (Sharifi, 2019b). The macro-scale refers to the overall shape of the city and some key aspects such as city size, type of urban development, population distribution pattern, and occupations. The Mesoscale focuses on the composition of urban neighborhoods in the form of urban areas (regions) and the microscale is related to the structure of the neighborhood (local area), blocks, plots, open spaces, and streets. Urban form reflection is influenced by the Spatio-temporal feedback and exchanges that occur between these scales. The economic, social, and environmental characteristics of each scale affect other scales of the urban system. Spatial resilience, focusing on the local scale, examines and analyzes the impact of other scales on urban form resilience. In this regard, the role of urban morphological elements affecting interactions and

exchanges between different urban morphological scales such as urban and interurban transportation systems, interface spaces and urban spaces, and other centers of dense exchanges, has been seriously considered in studies. Recently, to catch up with the Covid-19 pandemic, these structural elements pose more threats to urban areas and put people and neighborhood residents at greater risk for epidemics. Accordingly, it has been considered as one of the most challenging strategies to control the epidemic and create an optimal balance in the connections and relations between urban areas (Lak et al., 2020). Accordingly, there is a need to create a conceptual framework for the formative urban form with a resilient location approach with respect to the relationships and interactions between different urban morphological scales.

One of the characteristics of spatiality is the relationship between scales and not being isolated on a focal scale (Contreras et al., 2017). The smallest action and action on a scale can lead to a fundamental change and disruption on the largest scale (Cumming, 2011a). Therefore, it is argued that any spatial boundaries will not be feasible simply by imposing top-down standards on planning and design (Barnes & Nel, 2017). The centrality of the role of the neighborhood in the smallest urban scale and its inseparable relationship with the larger scales is emphasized (Cumming et al., 2017). Interactions and exchanges exist both on an internal scale between the constituent elements of a place and between a place and a scale beyond it (Cumming, 2011b; Cumming & Epstein, 2020). During these exchanges, the place is exposed to continuous changes due to social and economic changes, and the capacities of the place are strengthened through self-adaptation and self-organization (Brunetta & Caldarice, 2019).

• **Adaptability and transformability**

Adaptability is a key feature of resilience (Beatley, 2014). Adaptability in the field of climate resilience is the adjustment in natural or human systems in response to environmental hazards,

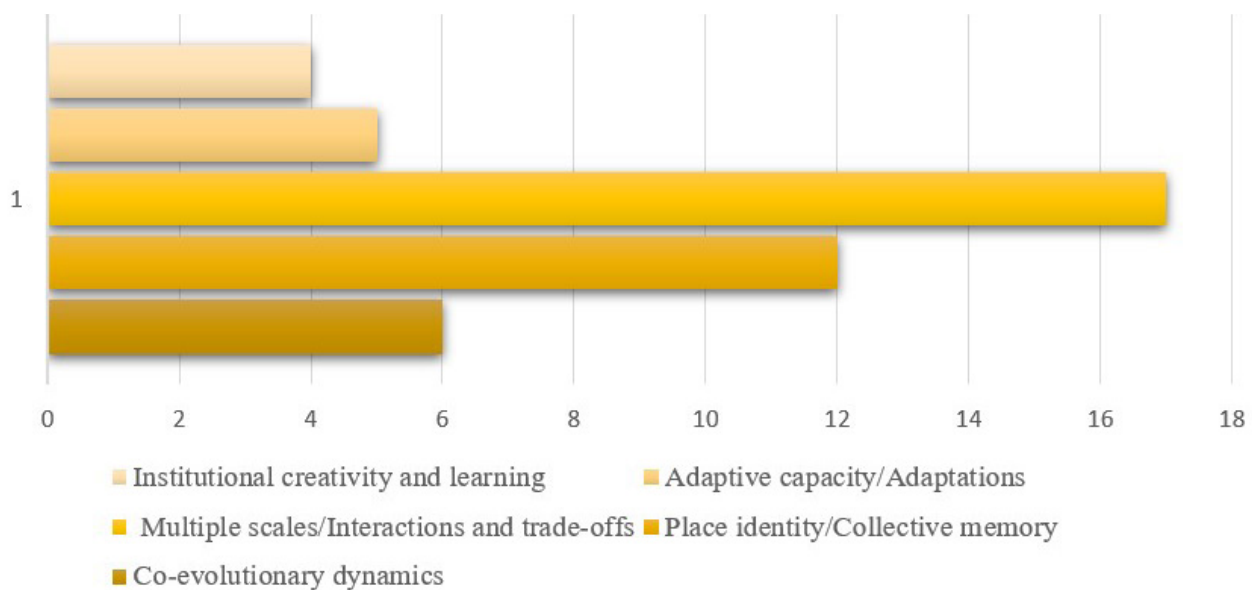


Fig. 5. Frequency of the quintuple insights in the literature. As can be seen, inter-scale and multi-scale trade-offs and interactions are the main features of a resilient system’s spatiality. Spatial resilience focuses on place identity at the central core of the urban system, and the co-evolution of all elements of place becomes possible via adaptive capacity. Source: Authors.

which leadsto harm reduction and seizure of opportunities (IPCC, 2001, 365). Adaptability to climate change is also one of the key concepts of resilience that are widely accepted in the literature (Dhar & Khirfan, 2017). In the planning literature, the emergence of resilience is related to adaptability to climate change, and many see resilience as a bridge between urban planning and adaptability (Davoudi et al., 2012). In particular, in the field of urban design, the built environment accommodates new or retrofitted forms (or practices) through gradual change to adapt to climate change and the resulting uncertainty (Lennon, Scott & O'Neill, 2014; León & March, 2014).

In any area, improving the adaptability capacity of a system can reduce exposure to change, thereby reducing system vulnerability and improving system resilience (Adger, 2006). Adaptability research often prioritizes local action in which local and spatial planning play an important role in achieving successful adaptability (Klein et al., 2007; Measham et al., 2011). The spatial resilience of a place is determined by its adaptive nature and its evolution from the current state to the new

state. In a comparative system, the relationship between the elements and components of a place is of particular importance (Cumming & Epstein, 2020); because functions are activated at a lower cost (Barnes & Nel, 2017).

• **Innovation and Creativity**

Among the four panarchy stages, the regeneration stage (the “αα” stage in Fig. 4) is very important in terms of preventive planning and design and shows the time for system innovation and reconstruction. This stage has a high degree of uncertainty and can create the highest resilience for the place. This stage provides opportunities for planning and design. At this stage, the resilience of the place is increasing and it can reach its highest level. Intervention planning can use this opportunity to increase the resilience of a system (for example, an urban area).

Spatial resilience depends on a territorial system (Brunetta & Caldarice, 2019) to generate innovative bottom-up ideas and practices that then are embedded into the integrated policies of spatial development. In this viewpoint, “the concept of spatial resilience is closely related to the creativity of local communities and the openness of institutions” (Contreras et

al., 2017), allowing individuals to respond to unexpected situations through creative action. Communities and institutions initiate direct relationships in which they both learn (Allen et al., 2016), innovate, and become inclined toward managing new challenges. Spatial resilience is a response to change and a new paradigm for spatial development that depends on a certain degree of self-organization in a community (Brunetta & Caldarice, 2019) and institutional creativity in territorial systems. In this regard, for example, strengthening the infrastructure for more effective use of mobile phones, smart applications and the Internet in monitoring the monitoring of the epidemic of Covid 19 at the city level and strengthening public learning and innovation are key measures (Lak et al., 2020).

• Co-evolution

The “YY” stage (Fig. 4) of creative degradation in the Panarchy adaptive cycle is when the system experiences “variability” and crosses thresholds at different scales, followed by the “ $\alpha\alpha$ ” stage of reorganization leading to new paths (Davoudi et al., 2012). From an evolutionary perspective, the omega phase is defined as a window of opportunity with the potential to transform social and ecological processes into completely different and more desirable paths (Davoudi, et al., 2012). Evolutionary resilience, called socio-ecological resilience, challenges the idea of equilibrium and means not returning to the pre-event situation and the ability of complex social and ecological systems to adapt and change in response to stress and stressors (Davoudi et al., 2012). In fact, changing and revitalizing the system creates social, economic, and ecological power (Shaw, 2012).

Spatial resilience is unbalanced and dynamic. All or part of the components evolves simultaneously through interaction with each other (Contreras et al., 2017). The prerequisite for the completeness of an urban system is its unbalanced dynamics, which provides an opportunity to create

knowledge and understanding through the capacity to learn, adapt and evolve on a local scale and beyond (Brunetta & Salat, 2019). In fact, spatial resilience is characterized by the full and self-adaptive capacity resulting from the learning and innovation of human factors in relation to environmental factors (Cumming & Epstein, 2020). This approach means moving beyond the focus on construction-based interventions or simple land-use practices for “defense” and “settlement” and requires a reassessment of the relationship between built and unbuilt elements (Lennon et al., 2014). In this regard, as an example, we can mention the change of the concept from flood control to flood management and the promotion of harmonious coexistence between humans and flood as an important step to conduct scientific development and new concepts of water management (Ning, 2006). In this view, flood risk is not only a threat to the city and its inhabitants but also an essential component of urban structure and urban development (Balica et al., 2013). Hence, the need for a new approach to urban resilience is felt beyond infrastructures such as dams, embankments, or canals (Abdulkareem & Elkadi, 2018).

In this regard, the concept of “latent environment” can be used as an example that emphasizes the role of non-physical factors in resilience and shows the understanding of the degree of resilience in public and local spaces. Public space is the result of many possible behaviors and interpretations of its users. For a space, three main areas related to perception can be distinguished: exploited capacities, recognized but not used potentials, and unrecognized potentials (Anderson, 1978). The degree of resilience and latency varies according to the second and third potentials. This enables local communities to integrate fully with environmental elements through the personalization of local spaces and can facilitate improvement and recovery efforts (Dhar & Khirfan, 2017).

• Place identity

Resilience has recently been conceptualized with the aim of “increasing the adaptive capacity of places” in terms of social, economic, political, and environmental changes (Barnes & Nel, 2017; Chelleri et al., 2015). A resilient place is essentially defined as the capability of a place, community, or city to adapt to changes in urban metabolism and system performance that may occur in the future (Yang & Quan, 2016). A literature review shows that interaction between physical (Lak et al., 2020) and non-physical (i.e., social institutions and groups) dimensions of place will form place identity. When facing a change, a place’s identity redefines all components within the framework of its semantic role in that place like a linking thread and remains adaptive (Allen et al., 2016). The concept of spatial resilience highlights the evolution of heterogeneous and dynamic components. It emphasizes the importance of the socio-ecological heritage of the place, and the ability of the place to experience change while maintaining its meaning, history, identity, and inherent potential for adaptation and learning (Cumming, 2011a; Liao, 2012; Mehmood, 2016; Nelson et al., 2007).

Conclusion

Spatial resilience as a recent approach in the evolutionary resilience discourse has made significant progress in various areas of resilience literature over the past decade. However, different definitions of it can be seen in the background of the subject. One of the main implications of spatial resilience in the literature is the issue of multidimensionality and interactions between different morphological scales. On this basis, the indoor environment and the external environment, each of which plays a specific role and characteristics in resilience, have been conceptualized in the spatial resilience literature. In the literature, the issue of adaptability capacity is a key feature of spatial resilience, so that even to reduce vulnerability, adaptation

to progressive conditions and transformation to a stable situation is emphasized. Applying the creativity of local institutions and communities to increase the self-organizing capacity of the local community is considered in spatial adaptation. Spatial resilience is non-equilibrium and dynamic resilience, as successive changes affect the elements and components of a place. All or part of these components evolves simultaneously through interaction with each other. In this view, the risk of natural disasters is not considered a “disaster” or “catastrophe”, but as a “natural event” is one of the essential components of urban structure and urban development. Also in spatial resilience theory, environmental and local context are considered to increase the resilience ability of a place, and the importance of place, connection, integration, and context for resilience is emphasized. In this theory, the identity of place in the face of change while adaptability, as a connecting string, redefines all the components in the context of their semantic role in place. Spatial resilience theory can potentially improve practice (urban design) by rebalancing contemporary discourses to better evaluate aspects of urban design practices. This study requires further research and in-depth analysis to define more accurate and operational dimensions. The novelty of spatial resilience in the field of urban design and the limited resources in this field were the limitations of the research. In future research, five insights can be developed with operational and tangible criteria.

Reference list

- Abdulkareem, M. & Elkadi, H. (2018). From engineering to evolutionary, an overarching approach in identifying the resilience of urban design to flood. *International Journal of Disaster Risk Reduction*, 28, 176–190.
- Adger, W. N. (2006). Vulnerability. *Glob Environ Chang*, 16(3), 268–281.
- Ahern, J. (2011). From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning*, 100(4), 341–343.

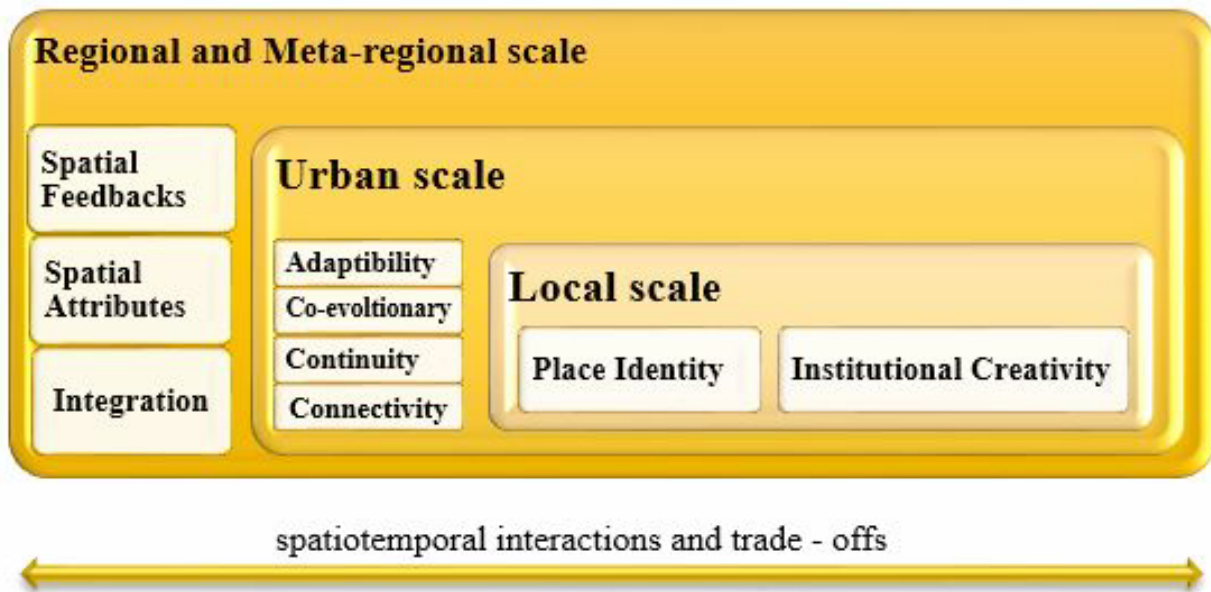


Fig. 6. A conceptual framework for defining spatial resilience. The neighborhood scale and place identity are the main elements of spatial resilience, in which the institutional learning and creativity of the local community are effective in dealing with external changes. Beyond the neighborhood scale and on the city scale, trade-offs and interactions are formed between internal and external factors. In this situation, having continuous adaptive capacity is the primary condition for having a resilient place. The co-evolution of the components of place during inter-scale interactions is crucial for spatial resilience while preserving the original identity and function. Spatial resilience contributes to spatial characteristics of the feedback that creates resilience in the urban context and vice versa. Source: Authors.

- Allen, C. R., Angeler, D. G., Cumming, G. S., Folke, C., Twidwell, D. & Uden, D. R. (2016). REVIEW: Quantifying spatial resilience. *Journal of Applied Ecology*, 53(3), 625–635.
- Balica, S. F., Popescu, I., Beevers, L. & Wright, N. G. (2013). Parametric and physically based modelling techniques for flood risk and vulnerability assessment: A comparison. *Environmental Modelling and Software*, (41), 84–92.
- Barnes, A., & Nel, V. (2017). Putting Spatial Resilience into Practice. *Urban Forum*, 28(2), 219–232.
- Brunetta, G. & Caldarice, O. (2019). Spatial Resilience in Planning: Meanings, Challenges, and Perspectives for Urban Transition. In T. Leal Filho, W., Azul, A.M., Brandli, L., Özuyar & P.G., Wall (Eds.), *Sustainable Cities and Communities*. Cham: Springer.
- Brunetta, G. & Salata, S. (2019). Mapping urban resilience for spatial planning-A first attempt to measure the vulnerability of the system. *Sustainability*, 11, 2331.
- Chelleri, Lorenzo, Waters, J. J., Olazabal, M. & Minucci, G. (2015). Resilience trade-offs: addressing multiple scales and temporal aspects of urban resilience. *Environment and Urbanization*, 27(1), 181–198.
- Coaffee, J. (2013). Towards Next-Generation Urban Resilience in Planning Practice: From Securitization to Integrated Place Making. *Planning Practice and Research*, 28(3), 323–339.
- Cobbinah, P. B. & Poku-Boansi, M. (2018). Towards resilient cities in Ghana: Insights and strategies. *Futures*, (101), 55–66.
- Contreras, D. Blaschke, T., & Hodgson, M. E. (2017). Lack of spatial resilience in a recovery process: Case L’Aquila, Italy. *Technological Forecasting and Social Change*, (121), 76–88.
- Cumming, G. S. (2011a). *Spatial Resilience in Social-Ecological Systems*. In *Spatial Resilience in Social-Ecological Systems*. Springer, London.
- Cumming, G. S., Morrison, T. H. & Hughes, T. P. (2017). New Directions for Understanding the Spatial Resilience of Social–Ecological Systems. *Ecosystems*, 20(4), 649–664.
- Cumming, G. S. (2011b). Spatial resilience: Integrating landscape ecology, resilience, and sustainability. *Landscape Ecology*, 26(7), 899–909.
- Cumming, G. S. & Epstein, G. (2020). Landscape sustainability and the landscape ecology of institutions. *Landscape Ecology*, (35), 2613–2628.
- Davoudi, S., Brooks, E., & Mehmood, A. (2013). Evolutionary Resilience and Strategies for Climate Adaptation. *Planning Practice and Research*, 28(3), 307–322.
- Davoudi, S., Shaw, K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., Fünfgeld, H., McEvoy, D. & Porter, L. (2012). Resilience: A Bridging Concept or a Dead End? “Reframing” Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planni. *Planning Theory and Practice*, 13 (2), 299–333.

- Desouza, K. C. & Flanery, T. H. (2013). Designing, planning, and managing resilient cities: A conceptual framework. *Cities*, (35), 89–99.
- Dhar, T. K. & Khirfan, L. (2017). A multi-scale and multi-dimensional framework for enhancing the resilience of urban form to climate change. *Urban Climate*, (19), 72–91.
- Dzubakova Katharine, Peter Hannes, Bertuzzo Enrico, Juez Carmelo, Franca Mário J., Rinaldo Andrea and Battin Tom J., (2018), *Environmental heterogeneity promotes spatial resilience of phototrophic biofilms in streambeds* *Biol.* Retrieved February 8, 2022, From <http://dx.doi.org/10.1098/rsbl.2018.0432>.
- Flaxman, M. & Vargas-Moreno, J. C. (2012). Using “Spatial Resilience Planning” to Test Climate-Adaptive Conservation Strategies. In *Restoring Lands-Coordinating Science, Politics and Action*. Dordrecht: Springer.
- Godschalk, D. R. (2003). Urban Hazard Mitigation: Creating Resilient Cities. *Natural Hazards Review*, 4(3), 136–143.
- Greiving, S., Ubaura, M., & Tesliar, J. (Eds.). (2016). *Spatial planning and resilience following disasters: International and comparative perspectives*. Bristol: Policy Press.
- Guaralda, M., Mayere, S., Caldwell, G., Donovan, J. & Rittenbruch, M. (2019). The InstaBooth: an interactive methodology for community involvement and place-making. *Journal of Place Management and Development*, 12(2), 209–226.
- Gunderson, L. H. & Holling, C. S. (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. Chicago: Island Press.
- IPCC. (2001). *Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability*, Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
- Kärholm, M., Nylund, K. & Prieto de la Fuente, P. (2014). Spatial resilience and urban planning: Addressing the interdependence of urban retail areas. *Cities*, (36), 121–130.
- Klein, R., Toth, F., Denton, F., Downing, T., Huq, S., Richels, R., ... & Burch, S. (2007). *Inter-relationships between adaptation and mitigation*. In The Fourth Assessment Report of IPCC Working Group II, Impacts: Adaptation, and Vulnerability. Cambridge University Press.
- Lak, A., Hasankhan, F. & Garakani, S. A. (2020). Principles in practice: Toward a conceptual framework for resilient urban design. *Journal of environmental planning and management*, 63(12), 2194–2226.
- Lennon, M., Scott, M. & O’Neill, E. (2014). Urban Design and Adapting to Flood Risk: The Role of Green Infrastructure. *Journal of Urban Design*, 19(5), 745–758.
- León, J. & March, A. (2014). Urban morphology as a tool for supporting tsunami rapid resilience. A case study of Talcahuano, Chile. *Habitat International*, (43), 250–262.
- Li, Y., Shi, Y., Qureshi, S., Bruns, A. & Zhu, X. (2014). Applying the concept of spatial resilience to socio-ecological systems in the urban wetland interface. *Ecological Indicators*, (42), 135–146.
- Liao, K. H. (2012). A theory on urban resilience to floods—a basis for alternative planning practices. *Ecology and society*, 17(4), 5–48.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J. & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine*, 6 (7).
- Lu, Y., Zhai, G., Zhou, S. & Shi, Y. (2021). Risk reduction through urban spatial resilience: A theoretical framework. *Human and Ecological Risk Assessment: An International Journal*, 27(4), 921–937.
- Lucash, M. S., Ruckert, K. L., Nicholas, R. E., Scheller, R. M. & Smithwick, E. A. H. (2019). Complex interactions among successional trajectories and climate govern spatial resilience after severe windstorms in central Wisconsin, USA. *Landscape Ecology*, 34(12), 2897–2915.
- Measham, T. G., Smith, T. F., Gorddard, R., Morrison, C., Withycombe, G., Brooke, C. & Preston, B. L. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, 16(8), 889–909.
- Meerow, S., Newell, J. P. & Stults, M. (2016). Defining urban resilience: A review. *Landscape and Urban Planning*, (147), 38–49.
- Mehmood, A. (2016). Of resilient places: planning for urban resilience. *European Planning Studies*, 24(2), 407–419.
- Mellin, C., Matthews, S., Anthony, K. R. N., Brown, S. C., Caley, M. J., Johns, K. A., Osborne, K., Puotinen, M., Thompson, A., Wolff, N. H., Fordham, D. A. & MacNeil, M. A. (2019). Spatial resilience of the Great Barrier Reef under cumulative disturbance impacts. *Global Change Biology*, 25(7), 2431–2445.
- Mengi, O., & Guaralda, M. (2020). Multidimensional management framework for creative places. *Journal of Place Management and Development*, 13(3), 297–317.
- Morschek, J., König, R. & Schneider, S. (2019). *An integrated urban planning and simulation method to enforce spatial resilience towards flooding hazards*. Proceedings of the Symposium on Simulation for Architecture and Urban Design. Atlanta, Georgia, Society for Modeling & Simulation International (SCS).
- Nel, D., Bruyns, G. & Higgins, C. D. (2019). Urban design, connectivity and its role in building urban spatial resilience. *Universal Decimal Classification*, (711), 921–930.
- Nelson, D. R., Adger, W. N. & Brown, K. (2007). Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*, 32(1), 395–419.

- Ning, L. (2006). From philosophy to action: accomplishing harmonious coexistence between man and flood. *Irrig, Drain*, (55), 247–252.
- Nyström, M. & Folke, C. (2001). Spatial resilience of coral reefs. *Ecosystems*, 4(5), 06–417.
- Okoli, C. (2015). A guide to conducting a standalone systematic literature review. *Communications of the Association for Information Systems*, 37(1), 43.
- Omholt, T. (2013). Developing a collective capacity for place management. *Journal of Place Management and Development*, 6(1), 29–42.
- Peres, E., Du Plessis, C., & Landman, K. (2017). Unpacking a Sustainable and Resilient Future for Tshwane. *Procedia Engineering*, (198), 690–698.
- Pickett, S. T. A., Cadenasso, M. L. & Grove, J. M. (2004). Resilient cities: Meaning, models, and metaphor for integrating the ecological, socio-economic, and planning realms. *Landscape and Urban Planning*, 69(4), 369–384.
- Quigley, M., Blair, N. & Davison, K. (2018). Articulating a social-ecological resilience agenda for urban design. *Journal of Urban Design*, 23(4), 581–602.
- Shafiei-dastjerdi, M., Lak, A., Ghaffari, A. and Sharifi, A. (2021). *A conceptual framework for resilient place assessment based on spatial resilience approach: An integrative review*. Retrived February 8, 2022, <https://doi.org/10.1016/j.uclim.2021>.
- Sharifi, A. (2019a). Resilient urban forms: A review of literature on streets and street networks. *Building and Environment*, (147), 171–187.
- Sharifi, A. (2019b). Urban form resilience: A meso-scale analysis. *Cities*, (93), 238–252.
- Sharifi & Yamagata, Y. (2018). Resilient Urban Form: A Conceptual Framework. In Y. Y. A. Sharifi (Ed.), *Lecture Notes in Energy*. V. 65. Cham: Springer.
- Shaw, K. (2012). “Reframing” Resilience: Challenges for Planning Theory and Practice. *Planning Theory & Practice*, 13(2), 308–312.
- Vaništa Lazarević, E., Keković, Z. & Antonić, B. (2018). In search of the principles of resilient urban design: Implementability of the principles in the case of the cities in Serbia. *Energy and Buildings*, (158), 1130–1138.
- Yang, P. P. J. & Quan, S. J. (2016). Urban Form and Energy Resilient Strategies: A Case Study of the Manhattan Grid. In H. Yamagata, Y. & Maruyama (Eds.), *Urban Resilience: A Transformative Approach*. Cham: springer.

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