Understanding urban vulnerability, resilience and adaptation: a conceptual framework

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Abstract

Adaptation in cities is not an isolated process, but rather it is embedded in the broader debate on sustainable development, commons and public goods. Through examining adaptation, we touch upon the concepts of urban vulnerability and resilience and try to view cities as complex adaptive systems. Only through this wide optics we can understand climate change adaptation in its complexity. Our paper tries to review recent literature on resilience and adaptation using bibliometric metadata analysis on academic papers.

Keywords: urban resilience, bibliometric analysis, vulnerability, urban adaptation

Introduction

Research on vulnerability and resilience in cities has been gaining momentum in recent years. Despite its popularity both in academic research and in policy - making, a comprehensive theory is yet to be developed. Studying resilience in cities and its practical applications are of utmost importance in current circumstances. Gradually approaching climate change, migration, worsening socioeconomic inequalities, or even shocks such as global pandemic or war – these challenges will most likely become more salient or frequent in future. As more than half of the world population resides in cities, local authorities need to prepare a strategy for coping with chronic stresses as well as acute shocks.

Although the notion of resilience is widely used in policy and urban planning, its exact meaning still remains ambiguous. Stemming from ecological science, the concept of resilience has come a long way since it was launched to describe functioning of ecosystems. The discourse has moved from the deterministic engineering resilience towards the resilience in complex adaptive systems. This is specifically urgent in the context of adaptation on climate change.

Our conceptual paper tries to navigate through the most important concepts related to vulnerability, resilience and adaptation in cities, and to comment on their weak spots as well as their strengths. It also offers examples of urban resilience and adaptation initiatives and their frameworks for assessment.

1. Vulnerability and resilience – evolution of definition

Vulnerability assessment has become an important step in strategic urban planning and for coping with climate change (Amirzadeh et al., 2022), (Salas & Yepes, 2018). In general, vulnerability can be thought of as *"the degree to which a system or unit is likely to experience harm due to exposure to perturbations or stresses*" (De Sherbinin et al., 2007). In social sciences, it mostly consists of the three dimensions – system exposure to crises, stresses and shocks; inadequate system capacity to cope; and consequences and attendant risks of slow (or poor) system recovery (De Sherbinin et al., 2007). Putting it into the context of climate change, International Panel on Climate Change (IPCC) Assessment Report (McCarthy et al., 2001) defines vulnerability as "*the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes*". It is a function of the character, magnitude, and the rate of climate change, and the variation to which a system is exposed, its sensitivity, and its adaptive capacity. Vulnerability might stem also from inability to anticipate hazards and avoid them, not only from inability to cope with and recover from shocks after they occur (Hardoy & Pandiella, 2009).

Further IPCC report (Revi et al., 2014) adds that the notion is also applied to sectors, including food processing, tourism, water, energy, and mobility infrastructure and their cross-linkages, for instance, the dependency of perishable commodities on efficient transport.
Vulnerability to climate change in urban areas is viewed as "*an outcome (physical vulnerability) determined by exposure to climate hazards, sensitivity of urban infrastructures, populations or activities, and the resulting or potential impacts*" (Romero Lankao & Qin, 2011).

When stresses or adversities originating in environment happen simultaneously with perturbations emanating from society, the severity of impact might be more significant (De Sherbinin et al., 2007). Such as when economic crisis is followed by a natural disaster, capacity of the subject community to recover might be decreased. Lack of resources to implement pre-emptive coping measures to reduce expected losses can prolong the effect of economic crisis and enlarge the vulnerability of the system.

In academic literature, there have been attempts to gauge vulnerability – e. g. De Sherbinin et al. (2007) employ a comprehensive framework, which consists of evaluation of stresses and perturbations (climate-related and socioeconomic) on one side, and system characteristics (physical environment, infrastructure, socioeconomic conditions) on the other.

Vulnerability is often, but not always put into contrast with resilience. Matyas and Pelling (2015) consider the debate on the conceptual relationship between resilience and vulnerability as solved – resilience and vulnerability are, according to them, discrete categories. In fact, there are examples when these two terms do not exclude each other – for example and older person might be vulnerable, but also resilient in terms of their experience, learning and reflexivity. Martin-Breen and Anderies (2011) claim that vulnerability is the opposite of

resilience, but admit that these terms have different meanings in different contexts, and thus something can be perceived as either vulnerable and resilient when looking from different perspectives (especially when specifying “resilience to what”, which is most important in disaster management). Revi et al. (2014) clarify that vulnerability is often mentioned in relation to particular population groups, while resilience is a term more used when systemic capacity to protect them is being discussed.

The etymological origin of resilience is related to Latin word “resilio”, which means to jump or bounce back (Klein et al., 2004). According to the bibliometric analysis by Meerow et al. (2016), the discourse on resilience started by the seminal paper Resilience and Stability of Ecological Systems by Holling published in 1973. He stipulates that „*resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist.”* Although he emphasizes persistence as a key concept – the result of resilience, he notes that systems can have low stability and still be highly resilient at the same time. Further work in the field published since late 1980s developed an “extended ecological resilience”, which was defined as “*the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks*” (Martin & Sunley, 2015; Walker et al., 2006). Apart from ecology, resilience has been used also in psychology, as a measure of capability of individuals to deal with traumas and adversities (Martin & Sunley, 2015; Martin-Breen & Anderies, 2011).

Robustness can be a synonym to resilience in cases when short time scale is considered. While robustness ideas are typically used in the context where the system and the set of external shocks are fixed over studied short period, resilience is considered in situations when time scale is more stretched and the focus is on learning and transformation (Martin-Breen & Anderies, 2011).

Resilience is usefully understood as both a process and an outcome (Matyas & Pelling, 2015). Posing resilience only as an outcome can lead actors to focus of reactive, rather than proactive action. On the other hand, reducing the view of resilience as a process only can result in ambiguous formulation of goals.

Despite or maybe because of relatively long presence in multiple disciplines, the definition of resilience varies across academic literature. Based on bibliometric analysis, Meerow et al. (2016) conclude that “*existing definitions are inconsistent and underdeveloped with respect to incorporation of crucial concepts found in both resilience theory and urban theory*”. As a result, this “conceptual fuzziness” allows more actors to agree on common terminology, but on the flipside, hinders the effort to identify the right indicators and metrics. Matyas and Pelling (2015) find that resilience discourse is not settled on the question whether resilience is a normative concept or not. In social-ecological perspective, the term is purely

descriptive and does not propose normative judgements about stability of studied systems. Looking from another perspective, as ecosystems provide outcomes that are desirable or undesirable for certain actors within the system, resilience is not only normative, but implicated by the political and power structures (Matyas & Pelling, 2015). Brand and Jax (2007, cited in (Martin & Sunley, 2015)) criticize the rising ambiguousness connected to the term resilience, because there is no clear consensus on whether it is a positive or normative concept, rendering it difficult to operationalize and use in research. This subsequently hinders further development of resilience theory. On the other hand, Martin and Sunley (2015) think that use of resilience as a term in different fields and contexts might actually enrich the resilience discourse. Martin and Sunley (2015) warn that eagerness with which the concept is applied in policy is larger than our understanding of resilience, which threatens its meaningful application in practice.

Academic literature has traditionally adopted two main approaches to resilience – engineering and ecological. The engineering resilience is more rigorous and takes assumptions such as existence of a unique equilibrium or a normal state, the object's tendency to return to this state after a disturbance it can handle, and that the type of disturbances that are expected (Holling, 1996). Making these assumptions leads us to realization that we can grasp the aspects of resilience by relatively straightforward mathematical modelling and use it in practice to generate simple management strategies (Martin-Breen & Anderies, 2011). The engineering view is very close to the standard perception of equilibrium in mainstream economics, where shock pushes the economy from its path, and self-correcting forces then guide it back on its initial trajectory (Simmie & Martin, 2010). However, the idea of systems returning to normal might seem problematic to some researchers, as they find this implies returning to capitalist status quo (Hassink, 2009; MacKinnon & Derickson, 2013). This essentially neoliberal worldview prioritizes competitiveness, flexibility, self-help and market forces, where the self-correcting forces guide the system towards equilibrium (Martin & Sunley, 2015).

In reality, trying to keep everything stable might even threaten the resilience of the system, make returning to normal impossible and potentially leads to collapse of the system (Martin-Breen & Anderies, 2011). In some cases, status quo might be undesirable, e. g. as it exacerbates social inequalities or harms ecological systems. Martin and Sunley (2015) call this resistance to change and the subsequent preservation of dysfunctional or inefficient structures or systems a 'perverse resilience'. From this perspective, bouncing back to normal is not something society should strive for. In contrast, desirability of resilience is the point where Meerow et al. (2016) find no cleavage in academic literature - all authors in the studied sample perceive it as positive trait.

The idea of bouncing back is not the only problem of the engineering approach. The equilibrium models are analytically more comprehensible but suffer from inability to describe

behaviour of systems distant from equilibrium (Holling, 1973). Multiple-state equilibrium is envisioned in the strand called ‘ecological resilience’, and postulates that systems can shift from one equilibrium to another after encountering a disturbance (Meerow et al., 2016).
A relatively novel idea which challenges the one or multiple equilibria theories offers a model in which systems have no equilibrium and undergo constant changes (Meerow et al., 2016). ‘Bouncing back’ is therefore in this perspective rendered obsolete, as there is no initial state to jump back to (Meerow et al., 2016). The structures might be the same, but individuals or organizations change, which emphasizes the importance of reflexivity as crucial element of resilience (Matyas & Pelling, 2015).The problem with theoretical framework of resilience from ecological and complexity sciences point of view is the fact that it lacks human agency and is depoliticized, while the reality of urban planning is guided by political processes to a significant degree (Martin & Sunley, 2015).

Recently published study by Amirzadeh et al. (2022) contributed to the definition of resilience by shifting definitely from a static, equilibrium-based understanding of resilience to a more dynamic, non-equilibrium model. The paper introduces a comprehensive conceptual framework that includes systems, agents, and institutions, and it categorizes resilience into three main approaches: recovery, adaptation, and transformation. This framework aims to provide a clearer and more actionable understanding of resilience for urban planning and policy-making.

2. Complex adaptive systems (CAS)

Cities have been often framed as complex adaptive systems (Meerow et al., 2016), although in resilience discourse, many influential studies use the framework of non-linear dynamical systems (Martin-Breen & Anderies, 2011). These allow for complex behaviour, such as multiple stable attractors, but are not adaptive in their nature. As researchers are often interested in mechanisms of adaptation and novelty, they turn to frameworks in which these concepts are incorporated (Martin-Breen & Anderies, 2011).

In these studies, cities are no longer perceived as disordered, but rather, as Batty (2008) puts it, *as* prime examples of complex systems: emergent and far from equilibrium, necessitating substantial energy to sustain themselves. They exhibit patterns of inequality generated by agglomeration and fierce competition for space, and feature saturated flow systems that utilize capacity in ways that seem barely sustainable yet paradoxically resilient.

The main ideas related to complexity in economics are summarized e. g. in Beinhocker (2006) (reviewed by Gintis (2006)). This work constitutes “a frontal attack on Neoclassical economic theory”, which has been useful tool for many years, but should, according to Beinhocker, be replaced by more up-to-date view of economy. Inspired by biology, economy is assumed to follow evolutionary dynamic. It differs from the typical Walrasian economy in

several aspects – such as being nonlinear, generally far from equilibrium, and therefore Pareto suboptimal. Traditional view of rational homo oeconomicus is replaced by agents with incomplete (and costly) information trying to come up with non-optimal but still effective heuristics for coping with the challenges posed by complex environments. To compensate these shortcomings, agents have opportunities to participate in sophisticated overlapping networks. Whereas in Walrasian economy, macroeconomic properties can be derived from micro-level, in complex systems, this is not so straightforward. Instead, agent-based modelling can serve as an analytical tool which can help describe economic behaviour within the system. Evolutionary principles, such as differentiation, selection and amplification guide the processes towards growth and higher complexity. The role of imitation and learning is paramount in complex adaptive systems, where frequent interactions take place and elements influence each other through the mechanism of feedback loops.

As Martin-Breen and Anderies (2011) point out, there is also a conceptual distinction between systems resilience and complex adaptive systems resilience – they differ in adaptive capacity or adaptability. Adaptation is not a mere change following shift in conditions, it is rather the ability of systems to transform or build new systemic relationships and generate innovative ways of functioning. They further explain, that in resilient systems view, we would strive to maintain all its subsystems and their interactions. Whereas in complex adaptive systems, we ask which subsystems are no longer viable, and which we can allow to fail in order to focus on those we want to keep operating. In other words, in systems approach, we try to preserve the system itself, while in CAS, we focus on system outcomes, whether or not it means changing its structure (Spaans & Waterhout, 2017).

3. Regional, local and urban resilience

Resilience as a notion emerged in urban planning context in the 1990s, as a response to environmental threats resulting to changing social and institutional frameworks (Mileti (1999), cited in Lu and Stead (2013)). Gradually approaching challenge of climate change made planners and decision-makers realize that mitigation will not be achieved easily, and therefore favoured measures were those that were more adaptive and flexible on their path towards resilient strategies (Lu & Stead, 2013). The view of urban resilience differs across cultures – after 9/11, the US and UK tend to be more focused on shocks such as terrorist attacks, European mainland countries consider the main challenge to be the climate change (Coaffee, 2013). Measuring regional (or local or city) economic resilience has been treated in various ways – in case studies, resilience indices, statistical time series models or causal structural models (Martin & Sunley, 2015). The ideas of resilience in the framework of cities as complex adaptive systems have been put into practice by Rockefeller Foundation in their project 100 Resilient Cities Programme launched in 2013.

From theoretical point of view, urban resilience is mostly thought of as either multiple-equilibrium or non-equilibrium concept in scholarly literature, but still there are some who incline towards the more traditional equilibrium view (Meerow et al., 2016). Based on the reasoning that urban resilience is framed into specific context, and Meerow et al. (2016) attempt to synthetise the definitions used in scholarly literature into the following "*Urban resilience refers to the ability of an urban system - and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales - to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity."* Here, the nature of "disturbance" is not specified. Other authors and practitioners elaborate on that – for example Spaans & Waterhout (2017) describe how the program 100 Resilient Cities considers not only the acute shocks (such as earthquakes, fires, and floods), but also take into account stresses that damage the fabric of a city on a continuous basis.

(Xu Zeng et al., 2022) presented three major components of urban resilience: adaptive, absorptive, and transformative capacity.

(Shamsuddin, 2020) introduced the concept of the adaptive cycle, which describes the phases of urban resilience, including exploitation, conservation, collapse, and reorganization. This cyclical process underscores the dynamic nature of resilience and the ongoing evolution of urban systems

As for the elements of the urban system, the Rockefeller Foundation's definition asserts that resilience concerns individuals, communities, institutions, businesses and systems within a city (ARUP, 2014). Interestingly, their vision of resilient city is the city in which the actors facing adversities are able not only to survive and adapt, but also to grow.

ARUP (2014) makes further contribution to the debate by proposing seven qualities of resilient systems:

1. Reflective
2. Flexible
3. Integrated
4. Robust
5. Resourceful
6. Redundant
7. Inclusive

Reflexiveness and flexibility refers to the ability to learn and adapt based on past experience and current circumstances to better adjust to future challenges. In practice, this means systemic examination of evidence, adoption of new technologies, or even greater decentralization. The need for integrated solution reflects the view of city as complex system, in which actors interact and therefore consistency should be achieved across different levels.

Robustness of systems is linked to diversification and is manifested by ability to withstand shocks without significant damage or loss of function. Resourcefulness means that actors are capable to find solutions even in constrained circumstances. Redundancy here is understood as creating reserves in sensible manner, so that system is prepared to accommodate the disruptions and use the spare resources in times of need. Including all communities, and especially those most vulnerable, is crucial in the process towards resilience.

In ARUP's framework, these seven qualities are to be fulfilled across four main dimensions: *health and wellbeing, economy and society, infrastructure and environment, and leadership and strategy*.

4. Community resilience and economic resilience

While in natural world, adversity and change are often considered as disruptors, in human systems, change and uncertainty is a constant – they are inevitable. Community resilience can be defined as "*the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise*" (Magis, 2010). Community members deliberately cultivate individual and collective capacity in order to be able to respond to and influence change, to preserve and renew the community, and to develop new strategies for the future of the given community (Magis, 2010). Community resilience is not a static property, it changes with internal conditions and external stimuli, and the community's ability to respond and adapt. Communities are thus considered as dynamic human systems, that continue to be viable in the context of changing environment. Engagement of community resources can become a self-reinforcing cycle, when the responses towards adversities actually strengthen the community fabric and its resilience (Adger et al., 2005).

Household and family relationships have traditionally held an important role especially in poor communities, as they act as critical safety nets functioning before an outside assistance is available (Moser, 1998). If institutions are designed in an inappropriate way, they can, despite good intentions, erode these structures (Martin-Breen & Anderies, 2011).

Magis (2010) summarizes five main drivers which can facilitate resilience building in communities:

1. learning to live with change and uncertainty, and deliberately adopting measures to function in this context
2. strategic planning, collective action, innovation, and learning
3. diversification of resources
4. active participation of community members
5. engagement of community's resources

Community resources that are strategically invested in order to achieve community objectives are also called community capitals. These resources have not only economic character – they can be related to social phenomena – social, cultural, spiritual, and political resources (Magis, 2010).

Overall, communities' resources consist of natural capital, such as natural resources and ecosystem services, human capital of every individual, cultural capital referring to values and assumptions of the given community. These are complemented by financial capital, built capital consisting of community's physical assets and built infrastructure, or political capital, which is connected to power and ability to use resources and influence formal institutions concerning given community.

Magis conceives social capital as „*the ability and willingness of community members to participate in actions directed to community objectives, and the processes of engagement, that is, individuals acting alone and collectively in community organizations, groups, and networks*". Literature also offers the concept of community capacity, which is closely related to community resilience, but is more general, because it applies to various contexts, not only those when community system faces adversities and undergoes changes.

Magis (2010) proposes the following eight dimensions of community resilience: *community resources, their development and engagement, active agents, collective and strategic action, equity and impact*. This allows to formalize the concept and its components, and to identify corresponding metrics for assessment.

Successfully identifying resilient communities can be useful for policy – in those less resilient, activities aiming at increasing resilience can be organized. On the other hand, in resilient communities, special products or techniques for resilience building can be tested (Magis, 2010).

Resilient communities enhance the prosperity of the local economy. Martin and Sunley (2015) acknowledge the absence of a comprehensive theory on regional economic resilience, yet they define it as the ability of a regional or local economy to endure or bounce back from market, competitive, and environmental disruptions to its developmental trajectory. This may involve adapting its economic structures and social and institutional frameworks to either maintain or restore its previous growth path or shift to a new, sustainable path characterized by efficient utilization of its physical, human, and environmental resources.

They stress that resilience is a dynamic process comprising several components:

- *vulnerability* (the susceptibility of a region's businesses and workforce to various shocks),
- *shocks* (the source, nature, and impact of a disturbance, including its scale, nature, and duration),
- *resistance* (the initial effect of the shock on the region's economy),

- *robustness* (the capacity of a region's businesses, workforce, and institutions to adjust and adapt to shocks, including the influence of external mechanisms and public interventions and support systems),
- *recoverability* (the extent and nature of the region's economic recovery from shocks and the characteristics of the recovery path).

The above-mentioned definition of regional economic resilience tries to incorporate the crucial aspects of the concept within the theoretical framework of complex adaptive systems. Yet it still assumes existence of a 'developmental growth path', the idea that is being challenged in the contemporary economic discourse (Raworth, 2017). The definition also allows a transition to a new sustainable path, which is to be achieved by increasing productivity. The authors purposely omit the notion of long-term stresses to complement the representation of possible adversities besides acute shocks. They recognize the existence of slowly approaching pressures, but they prefer the term resilience to be only related to unexpected events.

5. Adaptation in Cities

Dealing with climate change can be approached through either mitigation, which aims at reducing the magnitude of changes, or adaptation, which focuses on making adjustments to minimize harmful impacts. Adaptation is defined as "the set of organization, localization and technical changes that societies will have to implement to limit the negative effects of climate change and to maximize the beneficial ones" (Hallegatte et al., 2011). Reactive adaptation occurs ex post, addressing impacts after they manifest. Proactive adaptation is prepared ex ante, aiming to reduce vulnerability or capitalize on forthcoming changes (Smit et al., 2000).

For greater efficiency, focusing on mitigation is optimal, as the uncertainty associated with climate change makes the costs of proactive adaptation higher, and reactive measures inherently do not prevent damage (Shalizi and Lecocq, 2010). However, since mitigation is most effective at a global level, it is crucial to emphasize adaptation on a regional scale. While the costs of adaptation measures are immediate, their benefits may take longer to materialize.

6. Bibliometric Analysis

In order to identify the crucial research papers dedicated to urban adaptation, and also to see the wider perspective on where this research is mostly produced, and how the field has evolved, we conducted a bibliometric analysis. The first step was to run a search in the Web of Science database with the following keywords: "vulnerability, resilience, cities". This search

yielded 5481 results, which we decided to narrow down by specifying we were only interested in articles from the selected disciplines[1].

Areas with less than 20 published articles or not related to the topic of this thesis were omitted. Finally, we narrowed the dataset to the following publishers: Elsevier, Springer Nature, Taylor and Francis, Sage, Wiley, Routledge and English language. Thus we obtained 2352 observations, which were analysed using Bibliometrix package in R. These observations include all the available information on published papers, as well as abstracts and references. Figure 1 shows that scientific knowledge on climate change adaptation in urban context has been proliferating. We can also see that the topic was virtually nonexistent in the academic discourse before 2006.

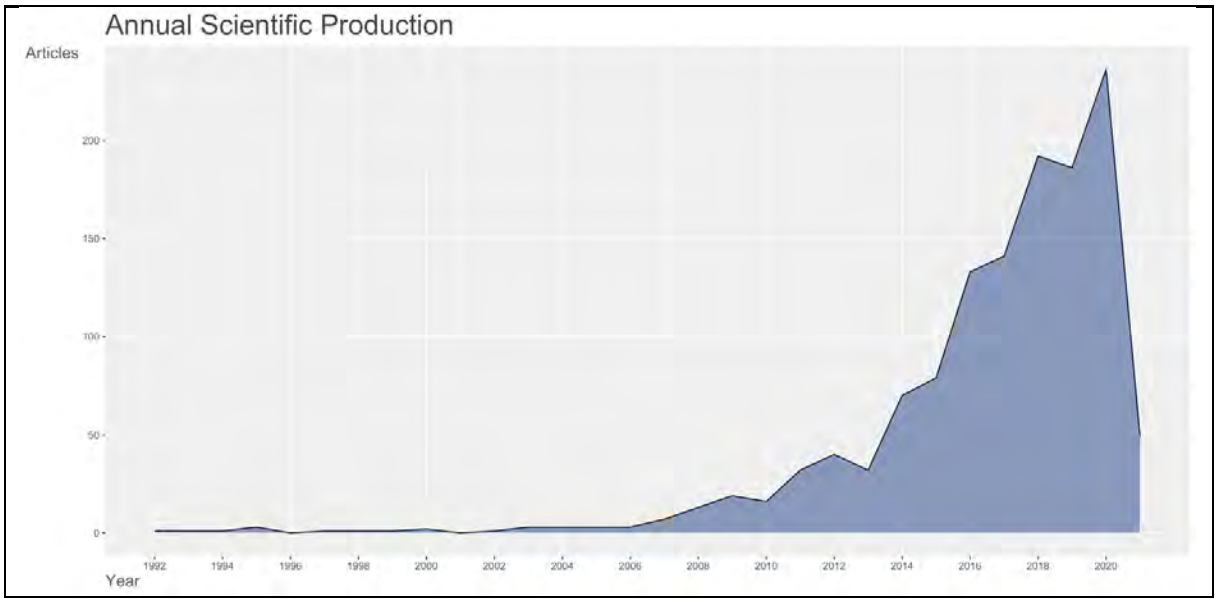

Figure 1: Annual Scientific Production – keywords: vulnerability, resilience, cities
Source: own bibliometric analysis using Bibliometrix package (in R) and metadata from WoS database

Figure 2 shows which keywords are the most frequent in the bibliometric metadata. We can see that the concepts of vulnerability and resilience are closely related to climate change adaptation. Moreover, researchers are often interested in management, policy and governance, and also frequently discuss impacts and risks.

[1] Environmental Sciences, Environmental Studies, Urban Studies, Green Sustainable Science Technology, Geography, Regional Urban Planning, Public Environmental Occupational Health, Development Studies, Economics, Public Administration, Social Sciences Interdisciplinary, Area Studies, Management, Sociology

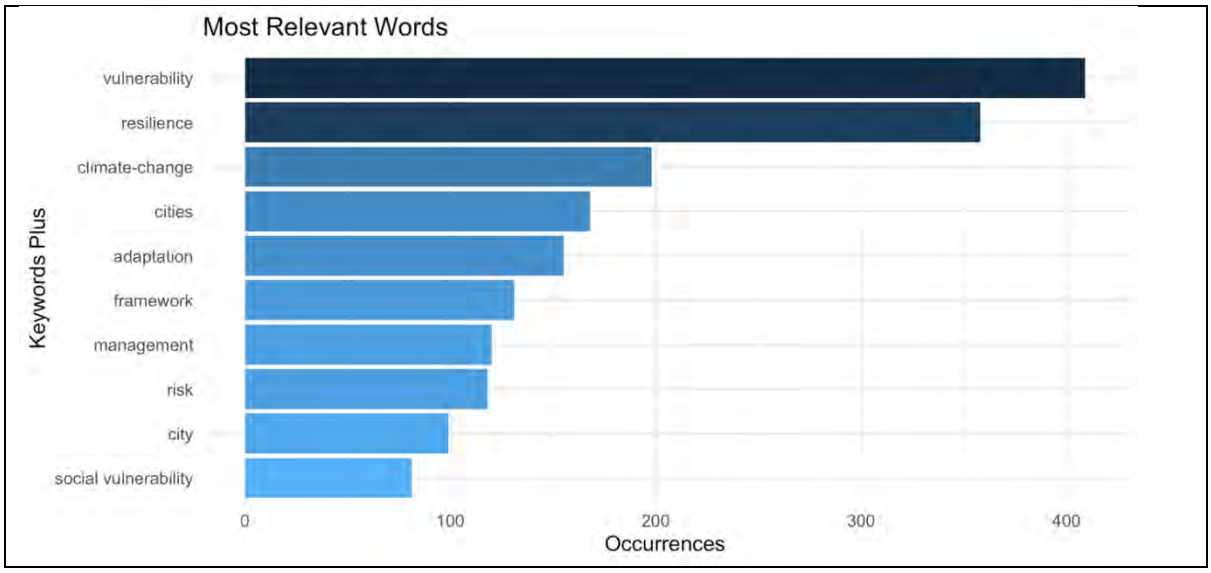

Figure 2: Most frequent keywords (based on search: vulnerability, resilience, cities)
Source: own bibliometric analysis using Bibliometrix package (in R) and metadata from WoS database

As for the most relevant sources, these are shown in the Figure 3.

Most research papers in the topic are published in the journal Sustainability from MDPI. The other two journals are linked to risk - International Journal of Disaster Risk Reduction and Natural Hazards. The importance of the topic is validated by the fact that the fourth most common journal is Cities, which is leading journal in urban policy and development.

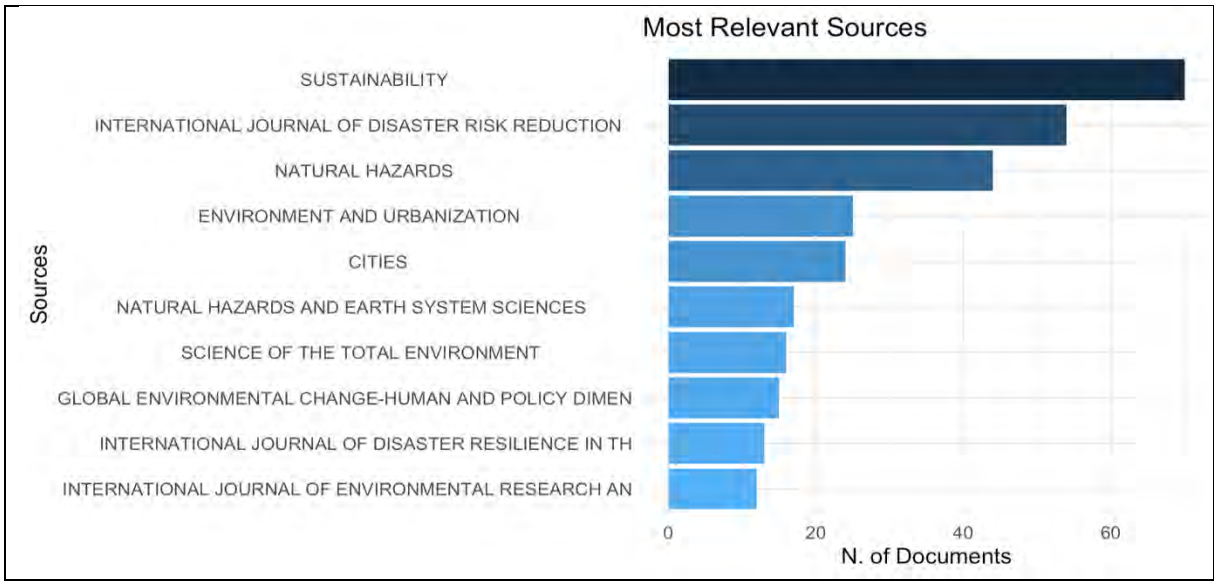

Figure 3: Most relevant sources (based on search: vulnerability, resilience, cities)
Source: own bibliometric analysis using Bibliometrix package (in R) and metadata from WoS database

Discussion and conclusion

The paper presents a comprehensive examination of the concepts of vulnerability, resilience, and adaptation within urban settings, addressing their importance in the face of escalating climate change impacts and other urban stresses. Their review synthesizes a range of perspectives from the literature, providing a detailed account of the theoretical frameworks and practical applications of these concepts.

The concept of resilience has been present in academic literature for several decades, starting in the fields of ecology and psychology, and gradually making its way to regional sciences and economics. However, the discourse in these disciplines is not mature enough, which can be illustrated by the absence of a clear definition and consensus on suitable methodology and assessment. This ambiguousness might be favourable for those who wish to use the currently popular term as a catch-all phrase for any seemingly related endeavours. While some authors do not applaud the widespread popularity of the concept and claim that prolific use will actually hamper academic efforts, others, on the other hand, welcome the debate.

Even those who attempted to synthesize a comprehensive definition of resilience, deliberately or maybe unintentionally omit certain aspects which could potentially be beneficial. Many authors do not elaborate on the idea of gradually aggravating stresses, which seems not to be particularly useful in the context of climate change. Moreover, very few authors mention the possibility to anticipate the adversities and the importance of proactive adaptation.

There are two main approaches towards resilience – engineering resilience and ecological resilience. Both of them have their advantages and disadvantages, but some researchers have also turned to a third novel approach – complex adaptive systems. Such trend only mimics the thought from Zolli and Healy (2013) (cited in (Martin & Sunley, 2015)): „it often feels as if disruption itself has become 'the new normal'". Indeed, complex adaptive systems' view seems to be more representative of what happens in cities, as they are constantly subject to change and have to face new challenges. The downside of the approach is that its analytical tools are not merely as comprehensive as those in other frameworks.

As for the implications for policy, it is clear that local authorities might not have sufficient capacities to address the challenge of building resilience in all its aspects and some areas might have to be prioritized. This is where theory of resilience will have to meet reality. Cities will have to define which functions they are to perform, and which outcomes they will focus on. This process should ideally be a part of broader debate across all actors and levels, and it should be inclusive and aiming towards socially just outcomes. In sum, they need to find the answer to the 'five Ws of urban resilience' - resilience for whom, what, when, where, and why.

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